Toward a Theory of Successful Eco-Town Development

An integrative approach to characterizing and applying key 'success factors'

Bogachan Bayulken

Toward a Theory of Successful Eco-Town Development:

An integrative approach to characterizing and applying key 'success factors'

Naar een theorie over succesvolle duurzame stedelijke ontwikkeling:

Een integratieve benadering van het karakteriseren en toepassing van cruciale 'succesfactoren'

Thesis

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Summary

This thesis is based upon the author's concerns about the impacts of rapid urbanization on the environment and the well-being of the human population in the short and long-term. The author's experiences, as an architect, helped him to understand that there are interlinkages among the political, economic, technological, societal, ecological and ethical factors that guide urban development. The author's initial objective was to understand and build upon the elements involved in planned and unplanned developments. This author investigated questions about urban planning models and development frameworks with diverse physical, social and environmental impacts and with a focus upon eco-towns in Northwestern European nations.

In the first phase of this thesis, the author developed a two-part literature review on the historical evolution of urbanization processes, trends and urban development models. In the first part of the literature review (Chapter 2), the changing, interrelated sociological, economic and political aspects, which are associated with the environmental problems, were explored. The evolutionary aspects and the shortcomings of Ecological Modernization (EM) and Sustainable Development (SD) concepts within the overarching sustainability paradigm were discussed. The review also addressed the emerging theories developed to improve approaches to urban development policies and procedures, and to contextualize the evolution of more holistic concepts that address intellectual, biophysical and institutional dimensions in broader cultural, geographical and temporal contexts.

The findings of the initial research on the initiatives of sustainable urbanism showed that the Northwestern European countries made progress in addressing environmental problems with the integration of collaborative and participatory governance systems. Mutual learning was found to play a central role in integrating environmental concerns at multiple levels of policy-making and eco-town implementation strategies. In spite of the Eurocentric characterization of EM and the much-contested effectiveness of SD, the research showed that these concepts contributed positively to the Northwestern European nations' urban development practices and policies. This author found that several experimental projects were implemented to test the economic, technological and policy variables of sustainable urban development practices.

In the second part of the literature review (Chapter 3) this author investigated the emergence of eco-town developments, initially from a broader cultural and geographical perspective, and subsequently among the selected eco-town cases within the Northwestern European region. Their frameworks, governance models and developmental processes were investigated and the challenges, opportunities and lessons derived were explored.

Based on the characterization of sustainable urban development initiatives in terms of their strengths and weaknesses, it was found that there were a number of factors that influenced the outcomes of the eco-town developments. Among these, the 'success factors' were found to be: the political commitment, the timing of the decision to initiate the projects, the financial models, the physical qualities of the development, the stakeholder involvement and the environmental model. These six 'success factors,' helped this author to develop the conceptual framework within which the case study research was performed.

The second part of the literature review revealed that there were critical gaps with regards to the social / psychological studies in the context of sustainable urban initiatives whereby quality of life (QOL) perceptions could influence the developmental goals and the desired outcomes. Therefore, in the second phase of this thesis research, diverse aspects of the QOL dimensions were explored (Chapter 4) via a QOL survey. The survey data were analyzed qualitatively, by investigating the similarities and differences of the QOL perceptions between the residents from eco-developments and from residents in conventional urban settings. The findings revealed that the residents from eco-developments perceived better QOL than those living in other contexts. A sense of community, shared values and purposes as well as the sense of place were among the most notable positive aspects that affected the residents' QOL perceptions. The results of this survey provided insights into the subjective views of the eco-development dwellers, their aspirations as well as on gaps in the planning and development practices in conjunction with the eco-town's social and environmental realities.

As a logical sequence to the two initial phases (the two-part series of literature reviews presented in Chapters 2 and 3, as well as the QOL research presented in Chapter 4) of this thesis, the author designed the case study research using the conceptual framework of the six 'success factors' (Chapter 5). The author performed in-depth research and analyses of five cases, three of which were from Amersfoort, The Netherlands (Chapter 6), and one each from Stockholm in Sweden (Chapter 7) and Freiburg in Germany (Chapter 8). The main emphasis of those chapters was upon answering the research question: "Did the eco-town development's results achieve the goals set by their planners for improving the residents' quality of life, provide support for positive behavioral and cognitive adaptations and lead to appropriate policy changes?" Therefore, in each case study chapter, the individual and collective contributions/impacts of the six 'success factors' on the outcome were explored.

Subsequently, the findings from the case study research were evaluated through an integrative, cross-case analysis of the five cases (Chapter 9). The findings showed that there were distinct differences in ways the 'success factors' influenced the level of success. It was found that activities within the six 'success factor' categories, contributed positively to the success of the eco-town development when they were integratively and synergistically

formulated and implemented. Additional aspects were found, which affected the success of the eco-town's development, such as the cultural, historical and societal contexts as well as the extent and type of participation in planning. In the final phase of this thesis (Chapter 10), the author concluded with the proposal of a unified theory of successful eco-town development in which good governance and social learning, played central roles. The author elaborated on recommendations for a number of stakeholders (the architects, city developers, policymakers and dwellers), and provided reflections on the theories used and on the methods that were employed in the research. In the final section of Chapter 10, the author provided a proposed agenda for future research.

Samenvatting

Snelle verstedelijking heeft grote effecten op milieu en welzijn van de bevolking, op korte en lange termijn. Daarin ligt het vertrekpunt voor dit proefschrift. De ervaring van de onderzoeker als architect hielpen hem begrijpen hoe de politieke, economische, sociale en ecologische factoren onderling verbonden zijn die richting geven aan stedelijke ontwikkeling. De aanvankelijke doelstelling was om zowel geplande als ongeplande stedelijke ontwikkeling te begrijpen. Het onderzoek richtte zich op modellen van stedelijke ontwikkeling en planning met uiteenlopende fysieke, sociale en milieu-impacts op wereldschaal, met een focus op duurzame steden in Noordwest Europa.

In de eerste fase van het onderzoek bestond uit een tweedelige literatuurstudie van de historische ontwikkeling van verstedelijkingsprocessen, trends en stedelijke ontwikkelingsmodellen. In het eerste deel (hoofdstuk 2) ging het om de veranderende, onderling verbonden sociologische, economische en politieke aspecten van de milieuaspecten van stedenbouw. Daarbij werden met name de evolutionaire aspecten en tekortkomingen van de theorie van ecologische modernisering (EM) en het concept van Duurzame Ontwikkeling verkend. Het literatuuronderzoek richtte zich ook op recente theorieën die het stedelijk ontwikkelingsbeleid, en de daarbij gehanteerde procedures. Ook onderzocht het de contextualisering van het ontstaan van meer holistische concepten die de intellectuele, biofysische en institutionele dimensies in een bredere culturele, geografische en historische context plaatsen.

Het aanvankelijke onderzoek duurzame stedelijke ontwikkeling liet zien dat landen in Noordwest Europa aanmerkelijke vooruitgang bereikten in het omgaan met het aanpakken van milieuproblemen in participatieve benaderingen van stadsontwikkeling. Gezamenlijk leren en kennisuitwisseling speelden een centrale rol bij het integreren van milieuaspecten in beleids- en uitvoeringsstrategieën. De theorie van ecologische modernisering en het concept duurzame ontwikkeling worden vaak als ‘Eurocentrisch’ gekarakteriseerd, en ontoereikend voor planetaire integriteit. Het onderzoek liet echter zien dat deze concepten in positieve zin hebben bijgedragen aan beleid en praktijk van de stadsontwikkeling in Noordwest Europa. Het liet zien hoe een aantal experimentele projecten geïnitieerd waren om de economische, technische en beleidsmatige haalbaarheid van duurzame stedelijke ontwikkeling te testen.

In het tweede deel van het literatuuronderzoek (hoofdstuk 3) werd het ontstaan van ecologische stadsontwikkeling onderzocht; aanvankelijk vanuit een breder cultureel en geografisch perspectief, en later in specifieke gevallen in Noordwest Europa. De gehanteerde ontwikkelings- en governancemodellen werden onderzocht, evenals de kansen en

bedreigingen die deze in de praktijk met zich meebrachten. De sterktes en zwaktes van initiatieven op het gebied van duurzame stedelijke ontwikkeling werden in kaart gebracht, met als resultaat een aantal factoren die de resultaten van duurzame stedelijke ontwikkeling verklaarden. De meest significante succesfactoren bleken: het politiek commitment, het tijdstip waarop tot uitvoering van een project besloten werd, het financieringsmodel, de fysieke kwaliteiten van het project, de betrokkenheid van stakeholders en de manier waarop milieuaspecten meegenomen werden. Op basis van deze zes succesfactoren ontwikkelde de onderzoeker gebruikt het conceptuele kader waarmee het empirisch deel van het onderzoek (case study) werd uitgevoerd.

Het literatuuronderzoek bracht ernstige gebreken aan het licht in de kennis van de sociaalpsychologische aspecten van duurzame stedelijke ontwikkeling. Die laten zien dat de perceptie van kwaliteit van leven (hierna aangeduid als QoL, *Quality of Life*) de doelstellingen en gewenste resultaten van duurzame stadsontwikkeling beïnvloeden. Daarom richtte de tweede fase van het onderzoek zich op de diverse aspecten van QoL (hoofdstuk 4). Daarbij werden de verschillende domeinen en onderliggende aspecten en facetten van QoL geïdentificeerd. Die werden vervolgens benut voor het ontwerp van een enquête over QoL met de volgende onderdelen: i) demografische gegevens, ii) woonkwaliteit, iii) kwaliteit van de buurt, iv) overheidsdiensten, v) sociale cohesie en vi) ervaren QoL. De enquête bestond uit 84 gesloten en open vragen, en werd online ingevuld. De resultaten werden op een kwalitatieve manier geanalyseerd, door de overeenkomsten en verschillen te analyseren tussen bewoners van projecten die het resultaat waren van duurzame en conventionele stadsontwikkeling. De bewoners in projecten van duurzame stadsontwikkeling bleken een hogere QoL te rapporteren dan bewoners in conventionele stadsontwikkeling. De enquête leverde inzichten in de subjectieve waardering van bewoners van projecten uit duurzame stadsontwikkeling, en hun aspiraties op dat gebied, maar ook in de tekortkomingen van de gehanteerde methoden van duurzame stadsontwikkeling.

Gemeenschapszin, gedeelde warden en gezamenlijke doelen bij het ontwikkelen van een woonbuurt, en een beleefde buurtidentiteit waren de meest belangrijke aspecten die de ervaren QoL van bewoners verklaarden. Het onderzoek werd voortgezet met het ontwerp van een case study onderzoek op basis van de zes succes factoren uit het literatuuronderzoek en het QoL onderzoek (hoofdstuk 5). Er werden vijf recente cases van duurzame stadsontwikkeling geselecteerd voor een diepgravende *case study*. Drie daarvan in Nederland, in Amersfoort (hoofdstuk 6), één in Stockholm (Zweden, hoofdstuk 7) en één in Freiburg (Duitsland, hoofdstuk 8). De centrale onderzoeksvraag in deze case studies luidde; “Hebben de projecten van duurzame stadsontwikkeling de doelstellingen bereikt die de beleidsmakers geformuleerd hadden voor de QoL van de bewoners, leverden ze aanknopingspunten voor positieve gedragsaanpassing en kennisontwikkeling bij bewoners, en leidden ze tot

beleidsaanpassingen?" Om deze vraag te beantwoorden werd in elk van de cases studies in kaart gebracht hoe de zes succesfactoren van belang waren voor de bereikte resultaten.

De resultaten van de case studies werden vervolgens geëvalueerd door een integratieve cross-case analyse (hoofdstuk 9). De resultaten daarvan laten zien dat er duidelijke verschillen bestonden in de manier waarop en de mate waarin de succesfactoren de resultaten van duurzame stadsontwikkeling beïnvloedden. Ook kwamen er aanvullende aspecten naar voren die het succes van duurzame stadsontwikkeling beïnvloeden, zoals de mate en het soort participatieve planning; en ook de culturele en maatschappelijk context. In de slotfase van het onderzoek (hoofdstuk 10) werd het onderzoek afgerond met een ontwerp van een theorie van duurzame stadsontwikkeling, waarin *good governance* en *social learning* centraal staan. Daarnaast zijn een aantal aanbevelingen afgeleid uit het onderzoek, voor verschillende groepen stakeholders (architecten, planologen, beleidsmakers en inwoners), evenals een reflectie op de gebruikte theorieën en methoden. Het onderzoek werd afgerond met een agenda voor toekomstig onderzoek op het gebied van duurzame stadsontwikkeling.

Dit onderzoek leverde veel nieuwe kennis en inzicht op in de historische ontwikkeling van verstedelijking, de theoretische benaderingen ervan en de Europese praktijk van wijk- en buurtontwikkeling. Belangrijk zijn ook de inzichten die dit onderzoek opleverde in de sociaalpsychologische aspecten die essentieel zijn in het bewerkstelligen van gedragsverandering en kennisvergroting waarmee stedelijke populaties zich ontwikkelen tot duurzame samenlevingen, lokaal, regionaal en mondiaal. Het analyseren van succes en falen van projecten op het gebied van duurzame stedelijke ontwikkeling in Noordwest Europa leverde belangrijke inzichten op in de relevante procedurele en conceptuele aspecten in relatie tot de specifieke context van projecten. Voor de onderzoeker was het vooral van belang het evolutionaire karakter te begrijpen samen met de culturele en historische achtergrond, en daaruit af te leiden welke factoren bij uitstek invloed hebben op de resultaten.

Hoewel dit onderzoek veel nieuwe inzichten opleverde bleken de resultaten beperkt waar het ging om beleidsimplementatie, het bereiken van sociale en milieudoelstellingen en veranderingen in consumptiegedrag en *lifestyle*. De zes succesfactoren droegen in positieve zin bij aan het succes van duurzame stadsontwikkeling, maar die bijdrage was contextafhankelijk. Voor effectieve, duurzame stadsontwikkeling is zowel een versterking van het regulier onderwijs nodig, als het werken met kennisplatforms voor experientieel leren. Dat leidt tot betere governance, ontwerp en dialoog in wederzijds ondersteunende symbiotische relaties tussen actoren, en daarmee tot een versterking van sociaal én natuurlijk kapitaal. Uiteindelijk betekent dat ook een versterking van het regeneratief vermogen in het sociaalecologisch systeem van samenleving en milieu, en van stad en ommeland. Er is meer onderzoek nodig naar nieuwe benaderingen en concepten, vanuit meer perspectieven om tot echte stedelijke transformaties te komen, de kwaliteit van leven in steden te verbeteren

in modellen van duurzame stedelijke ontwikkeling die repliceerbaar en schaalbaar zijn in uiteenlopende maatschappelijke, culturele en geografische contexten.

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In the past eight years of this tremendous journey, I gained a significantly clearer understanding of the many aspects of urban systems, processes and the extent to which they are interconnected in multiple directions and dimensions. A wide range of actors and their roles in the decision-making processes were examined and diverse aspects of sustainable urban development initiatives were investigated with respect to their social, economical and environmental outcomes. In this process, I met, personally and sometimes only through means of telecommunication, several people from academia, private and public institutions, expert professionals and community members with whom I shared ideas and learned much from their insights. I wish to thank all of them for their valuable contributions in the extensive research involved in making this thesis come true.

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Acronyms and Abbreviations

AC	Aalborg Charter
BNG	Bank Nederlandse Gemeenten *(Bank of Dutch Municipalities)*
BOOM	Bureau voor Onderzoek en Ontwerp voor het Milieu *(Office of Research and Design for the Environment)*
BTG	Biomass Technology Group
C2C	Cradle-To-Cradle
CABE	Commission for Architecture and the Built Environment
CBS	Centraal Bureau voor de Statistiek *(Central Statistics Bureau)*
CDU	Christlich Demokratische Union Deutschlands *(Christian Democratic Union of Germany)*
CEC	Commission of the European Communities
CHP	Combined Heat and Power
CIAM	Congrès Internationaux d'Architecture Moderne *(International Congresses of Modern Architecture)*
CMV	Conventional Mechanical Ventilation
CO2	Carbon Dioxide
CSF	Critical Success Factors
DBU	Deutsche Bundesstiftung Umwelt *(Federal Environmental Foundation)*
DCLG	The Department for Communities and Local Government
DESD	Delegation for Ecologically Sustainable Development
DESTATIS	Statistisches Bundesamt *(Federal Office Of Statistics)*
DPL	DuurzaamheidsProfiel van een Locatie *(Sustainability Profile of a Location)*
EC	European Commission
ECB	European Central Bank
EEC	European Economic Community
EGC	European Green Capital
EIA	EnergieinvesteringsAftrek *(Energy Investment Allowance/deduction)*
ELP	Environmental Load Profile
EM	Ecological Modernization
ERP	Enterprise Resource Planning
EQLS	European Quality of Life Survey
EU	European Union
EU LIFE	European LIFE Program
EUP	Entrepreneurial Urban Projects
Eurofound	The European Foundation for the Improvement of Living and Working Conditions

ERF	Energiebilanz für die Region Freiburg *(Energy balance for the Freiburg Region)*
ESDP	European Spatial Development Perspective
FIC	Fellowship for Intentional Communities
FiT	Feed-in Tariff
GAIA	GAIA Trust
GEC	Global Environment Centre Foundation
GEN	Global Eco Village Network
GENOVA	GENOVA Housing Association
GFA	Ground Floor Area
GHG	Greenhouse Gas
GIN	Greening Industry Networks
GRAG	die Demeinderätliche Arbeitsgruppe Vauban *(Committee/Platform - Work Group of Vauban)*
Ha	Hectare
HDI	Human Development Index
HRV	Heat Recovery and Ventilation
ICLEI	The International Council for Local Environmental Initiatives
IEA	The International Energy Agency
IPCC	The Intergovernmental Panel on Climate Change
ISES	The International Solar Energy Society
IUCN	The International Union for Conservation of Nature
JIT	Just-in-time
Km	Kilometer
kWh	Kilowatt hour
LA	Local Agenda
LCA	Life Cycle Analysis
LCI	Low Carbon Infrastructure
LEED	Leadership in Energy and Environmental Design
LIP	Local Investment Program
LLD	Doctorate of Laws
Lt	Liter
M2	Square Meter
M3	Cubic Meter
MD	Medical Doctor
METI	Ministry of Economy, Trade and Industry
MNT	Motivation-Need Theory
MoE	Ministry of Environment
MVHR	Mechanical Ventilation and Heat Recovery
MW	Megawatt

MWp	Megawatt peak
NAM	Norm-Activation Model
NATO	North Atlantic Treaty Organization
NCA	Necessary Conditions Analysis
NGO	Non-governmental Organization
NLG	The Dutch Guilder
NOVEM	Nederlandse Maatschappij voor Energie en Milieu *(Netherlands Agency for Energy and Environment)*
NOZ-pv	Dutch National Research Program for Photovoltaics
OECD	Organization for Economic Co-operation and Development
PCP	Public-Community Partnership
PD	Positive Development
PHAC	Public Health Advisory Committee
PHD	Doctor of Philosophy
PPP	Public-Private-Partnership
PV	Photovoltaic
QCA	Qualitative Comparative Analysis
QOL	Quality-of-Life
REMU	Regionale Energie Maatschappij Utrecht *(Regional Energy Company Utrecht)*
SD	Sustainable Development
SEK	The Swedish Krona
SLIP	Stockholm's Local Investment Plan
SPD	Sozialdemokratische Partei Deutschlands *(Social Democratic Party of Germany)*
SPSS	Statistical Package for the Social Sciences (Software)
SUSI	Die Selbstorganisierte unabhängige Siedlungsinitiative *(The self-organized independent settlement initiative)*
SUNN	Sustainable Urban Neighborhoods Network
SWB	Subjective Well-Being
THERMIE	Program (EEC) for the promotion of energy technology in Europe
ToC	Theory of Change
TPB	Theory of Planned Behavior
TPES	Total Primary Energy Supply
TWh	Terawatt-hour
UAE	United Arab Emirates
UBA	Das Umweltbundesamt *(The Federal Environment Agency)*
UN	The United Nations
UNCHE	The United Nations Conference on the Human Environment
UNCHS	The United Nations Centre for Human Settlements
UNCSD	The United Nations Conference on Sustainable Development

UNEP	The United Nations Environment Program
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UK	The United Kingdom
USA	United States of America
USD	The American Dollar
VBN	Value-Belief-Norm Theory
VINEX	Vierde Nota Ruimtelijke Ordening Extra *(Fourth Memorandum Spatial Planning Extra)*
VINO	De Vierde Nota over de Ruimtelijke Ordening *(Fourth Memorandum Spatial Planning)*
VOF	Vennootschap onder firma *(Partnership firm)*
VROM	Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu *(The Dutch Ministry of Housing, Spatial Planning and the Environment)*
WCED	The World Commission on Environment and Development
WCS	The World Conservation Strategy
WHO	World Health Organization
WHOQOL	World Health Organization's Quality of Life Index
WSSD	World Summit on Sustainable Development
WWII	The Second World War
WWF	World Wildlife Fund

Chapter 1

Eco-town developments: A novel approach in urban planning, implementation and governance

1.1 Introduction

It is estimated that by 2030, urbanization in developing countries will triple the built-up area compared with the levels that existed in 2000 from approximately 200,000 to 600,000 sq km (Suzuki et al. 2010, p.1). The rapid increases in the world's population and the rapid rural to urban population shifts, are putting pressures on cities far beyond their current carrying capacities in many ways. Greenhouse gas emissions resulting from the cities could be between 40-70% of the overall anthropogenic sources, many of which have already exceeded the recommended annual average of 2.2 tons of CO2 equivalent per capita (UN-Habitat 2011, p.3). Additionally, the level of urbanization globally, is expected to rise from 52% (2011) to 67% in 2050 (UN 2012, p.4). Consequently, many mega cities are developing without sustainable approaches in planning, implementation and governance. In regard to such rapid urban growth, several economic and political elements are driving this unsustainable urban development, which is creating 'ghost estates' with millions of vacant and unfinished housing units globally (UN-Habitat 2013, pp.5-6). These shortsighted urban development policies and practices are negatively impacting the natural resources and eco-systems (IPCC 2013) and are causing inadequate or sub-optimal quality of life for urban residents.

Many experiments to transform urban habitats into more sustainable, 'high-quality-of-life,' places have been in progress for many years but there has been only limited increase in such efforts since the 1992 Rio Earth Summit, during which Sustainable Development was introduced as a key concept globally. Unfortunately, as also underscored at the Rio+20 meetings held in Rio de Janeiro, Brazil during June 2012, efforts towards establishing and implementing forward-looking policies and urban development programs that are more *'sustainable'* are encountering barriers and challenges, politically, economically, socially and ecologically (UNCSD 2012).

Some European countries as well as Japan, China, the UAE, Australia, Canada and the United States, have been and are taking initiatives to determine if community-based and large scale demonstration projects can effectively showcase innovative approaches in planning and implementation of urban development, which can subsequently be used to guide other new urban developments and re-developments. Some of the best practices in Europe dating 1980s achieved dramatic reductions in fossil-fuel usage by replacing conventional design and construction methods. Their positive contributions included improvement in buildings with innovative systems and technologies; urban systems in heating, waste management and wastewater treatment (WWT), improved transportation systems, increased usage of renewable energy-based electrical systems, installation of smart grid networks, and efforts to change user behavior through holistic planning of the developments and good governance. However, due to these developments' relatively recent history, their longer-

term contributions and impacts on the psychological, social, physical, environmental and economic dimensions of evolving cities have not been adequately researched. It should be noted that in the last decade, to a limited extent, case studies were performed.

Although a number of positive outcomes of the eco-town developments[1] were attributed to the innovative and sustainable building technologies and design approaches, the wider adoption of their development frameworks and planning principles remained limited and in some cases experts even, questioned whether their development frameworks can be adapted appropriately in different urban contexts with other sets of challenges. Despite the similarities in the visions and operational goals (such as achieving improvements in energy usage, implementing renewable energy systems, improving water use efficiency, increased recycling and composting of wastes, reducing car ownership and usage through walking, cycling and increased use of public transport etc), the variations in their development processes, cultural and societal contexts, governance and other factors, could play significant roles in many aspects of the eco-towns' goal achievements.

As the movement towards creating sustainable cities gains momentum, the demonstration urban development models such as the eco-towns are also being implemented in rapidly developing countries. They are mostly acknowledged as flagship projects due to their relative degree of success, yet with little understanding of their complex nature and the factors contributing to their outcomes.

1.2 Problem Statement

The recent studies revealed that the environmental performance levels varied widely. Despite the similarities in the overall goals and objectives to reduce energy consumption, implement renewable energy usage, efficient water and waste management as well as providing attractive surroundings, each development has performed differently due to various factors. It was found that a number of procedural, contextual and conceptual elements (see Table 1.1 in Section 1.3) influenced the goal attainment of eco-towns and affected the perceptions and behavior of the residents. The eco-town evaluators found that dissemination of

1 'Eco-town' is an evolving term along with the definition of sustainable communities, which is being refined and improved, based upon the physical, ecological, technological, economic, psychological and social changes that occur in these developments. In the context of this paper, 'eco-towns' are associated with *mixed-use developments,* which are integrated within the wider urban area in the form of districts, neighborhoods or extensions as part of a wider spatial plan with adequate population, services and facilities including businesses to sustain the eco-town's inhabitants. They are strongly connected and make extensive use of the existing urban infrastructures. Their objective is to provide a relatively better quality of life than can be experienced in the broader community, while co-existing in the urban eco-system of which they are an integral part. (Barton, 2000; Kyvelou et al., 2012)

sustainable lifestyles, knowledge and practices based upon the lessons learned, varied with the processes by which the eco-towns were initiated, designed, developed and governed.

Despite the general perception of the positive contributions of eco-town developments, their true impact has not been thoroughly and comprehensively studied. The factors that influence their outcomes in the long-term are not understood. Moreover, as briefly discussed in Section 1.1, the nations with high urban population growth rates and strong urban economies are investing time, resources and funds to create new towns, districts and even cities, some of which have been claimed to promote sustainable urban developments (such as in China, India and the UAE, etc.). These initiatives require proper contextualization and policy tools in order to catalyze the required physical and societal change. Some efforts were made to analyze the successes and failures of the eco-town developments with regard to the consumption levels in energy, water usage and waste management or transport choices. However, the eco-town developments' impact with respect to promoting behavioral change and adoption of sustainable lifestyles has been relatively less emphasized, at least until very recently.

The consensus among 'change agents,' which have achieved relative success in planning and implementing better urban developments, is that success requires top-down commitment and support, combined with bottom-up engagement/empowerment in decision-making along with education which is an integral part of change processes (Jansen 2008). Even though there is wide publicity by political and public debates as well as some scientific research on the best practices of sustainable urban development models that suggest participatory practices in planning processes, the local community / residents' involvement in the decision-making or planning has been widely neglected (Freytag et al. 2014, p.645). Additionally, some city and local community leaders are addressing the quality of life dimensions in ways to improve urban development policies, while the focus should be more on the subjective notions such as the resident's perceptions and aspects that influence environmental behaviors.

Eco-town developments can provide insights into the physical, social, economic and environmental aspects that are relevant in terms of how effectively sustainable planning and development practices have performed, and to what extent they have influenced the behavior of residents or helped to disseminate the positive results into wider urban contexts.

In consideration of the rapidly emerging urban challenges, the eco-town development processes were not thoroughly and sufficiently analyzed. Therefore, the key factors that influence their successes and failures need to be identified and characterized to help decision-makers to more effectively contextualize and promote more sustainable urban development initiatives in different cultural and geographical contexts.

1.3 Research Questions

In order to identify the theoretical framework within which to contextualize the research on eco-town developments, the first step of the thesis work was done to analyze the urbanization processes, the evolutionary milestones as well as the trends that negatively impacted cities' urban development policies since industrialization began to evolve in the 1800s, which continue to increasingly plague many urban centers today. Therefore the following research question (RQ) was proposed:

> ***RQ 1:*** *How are the urbanization processes and trends that emerged after industrialization began in the 1800s associated with our current environmental problems?*

Subsequently, the concepts and approaches that emerged in response to the resultant social and environmental crises were found to be highly relevant to explore as they led to the policy actions and initiatives designed to mitigate the negative impacts caused by the urban growth policies and processes. In doing so, the author of this thesis firstly identified, the geographical / cultural contexts in which significant progress was made; and secondly, sought to determine the extent to which these concepts were operationalized into sustainable urban development models. These dimensions were addressed while seeking answers to RQ 2.

> ***RQ 2****: Which concepts and approaches have been developed and implemented to address urban social and environmental problems?*

These two research questions (RQ1 & RQ2) were explored through a comprehensive review of the relevant literature, which is included in Chapter 2 of this thesis. Subsequently, based on the findings of the initial review, the author sought to obtain in-depth insights into some illustrative new towns and eco-town developments that were initiated as part of the efforts to helping to create more sustainable societies, broadly (RQ3) and then with an in-depth focus upon such developments in the Northwestern European region (Chapter 3).

> ***RQ 3****: What are illustrative new town / eco-town examples that are helping to establish more livable cities?*

In order to explore eco-town initiatives in more detail, the sub-questions listed in Table 1.1 helped to guide the research process on the procedural, contextual and conceptual dimensions of their development processes.

Based on the insights gained from the review of literature on the eco-town development processes presented in Chapter 3, the author identified the gaps in the relevant literature

Table 1.1 The key factors found to influence achievement of the goals and objectives in eco-town developments.

Procedural	• *How were they initiated?* • *How were the processes governed?* • *How was stakeholder engagement / involvement ensured and implemented?* • *How was eco-town development funded?*
Conceptual	• *How was the design process managed at the architectural, urban planning and environmental model levels?* • *How was the development process managed?*
Contextual	• *What was the context within which the eco-towns were implemented with regard to size, scale, population, demographics and governance?*

with regard to the *'quality-of-life'* (QOL) dimensions and how these were contextualized within the concept of sustainable urban developments. Subsequently, the author developed the following research question:

> ***RQ 4**: How did the eco-town developments affect the perceived QOL of residents? What similarities and differences were there with regard to the elements influencing the perceptual and behavioral aspects in eco-developments and in conventional settings? Finally, how can the QOL dimensions be used to help to develop more successful eco-towns in different cultural and geographical contexts?*

Furthermore, the sub-questions, including but were not limited to the following, were formulated to gain deeper understanding of the eco-towns' impacts and contributions as well as how and in which ways they were considered successful in terms of their development processes as well as for their long-term social, physical and environmental objectives.

1. *What are the indicators for success and failure and how have they been used and how are they helping people who are or will be planning such developments in the future?*
2. *What factors of eco-town development processes have significant impact(s) on their level of success?*
3. *What are the conditions that are necessary to establish successful eco-town developments?*
4. *What lessons can be derived from successful eco-town development processes with regards to their impacts on the residents' cognitive and behavioral responses toward more sustainable lifestyles?*
5. *What lessons can be learned from eco-town developments for the broader questions about urban redevelopment as well as for new urban developments?*

These aspects were investigated and the gathered data were critically and comparatively analyzed through conducting five case studies in three different cities from The Nether-

lands, Sweden and Germany, as presented in Chapters 6, 7 and 8. Finally, together with the insights gained from the cross-case study analysis presented in Chapter 9, a unified concept of success of the eco-town was concluded together with the author's tentative agenda for future research in Chapter 10.

1.4 Thesis Outline

In this chapter, the author highlighted some of the critical problems associated with urbanization and the resultant shortsighted policy implications. The eco-town developments were addressed, along with the concerns stemming from the lack of in-depth knowledge and analyses of their frameworks, and successes and failures were underscored with respect to future developments in different geographical and cultural contexts. Also in this chapter, the research questions and the research methodology were emphasized in order to provide an overview of the thesis process.

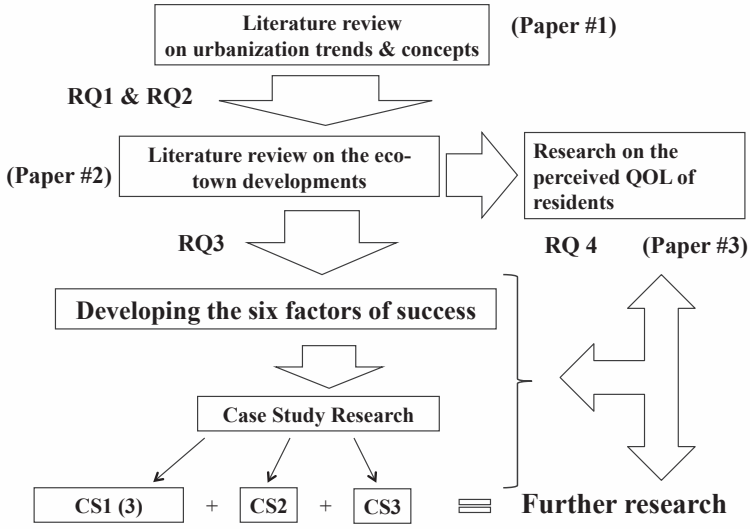

Figure 1.1 Representation of the research process and illustrative outline of this thesis

Furthermore, in Chapter 1, the conceptual framework within which the research has evolved and the theories that were found relevant were presented.

In Chapter 2, the author presented the literature review on the urbanization processes and trends, after industrialization began in 1800s. The strengths and shortcomings of Ecological Modernization (EM) and Sustainable Development (SD) were discussed. Additionally,

the evolutionary concepts within the overarching sustainability paradigm were underscored and the alternative emerging and operationalized sustainability concepts were highlighted (see Figure 1.1).

In Chapter 3, the author reviewed the emergence of the eco-towns in Northwestern Europe since the1990s, and analyzed their frameworks, typologies and processes. The challenges, opportunities and lessons derived were explored. The key factors were identified in achieving the eco-towns' goals and objectives. The author also highlighted the potential contributions of the evolving concepts and holistic approaches to more sustainable urban development processes.

In Chapter 4, the author provided results of the analyses of the survey conducted to determine the similarities and differences in the perceived quality of life (QOL) of residents living in eco-developments and in conventional settings. Key findings were discussed in relation to the aspects that were found to be significant influences of the QOL perceptions of the eco-development residents in comparison with the perceptions of residents living in conventional developments.

In Chapter 5, the case study research methodology and methods were discussed. Aspects that were associated with good case study research were reviewed. Based on the research foci, the methods that were found to be especially relevant were identified. Additionally, the indicators to measure the success of the eco-town were developed in order to operationalize the goals of the case study research conducted on the 'success factors.'

Based on the insights gained on the case study research methodology, the author presented, in Chapters 6, 7 & 8, the findings of five eco-developments selected from The Netherlands, Sweden and Germany. Amersfoort's Kattenbroek, Nieuwland and Vathorst developments were elaborated upon in Chapter 6. In Chapter 7, the author expanded upon the Hammarby Sjöstad development in Stockholm. Finally in Chapter 8, the Vauban development in Freiburg was analyzed.

In Chapter 9, the results of the cross-case analysis were presented in which the independent variables (the 'success factors') and the dependent variable (success of eco-town) were discussed with respect to their relevance, strengths and limitations in establishing successful eco-town developments. In light of the findings, the author addressed further aspects in relation to behavioral and cognitive adaptations of residents in order to achieve long-term societal changes for sustainable lifestyles and consumption patterns.

In Chapter 10, the author reflected upon the findings of the overall research on the urbanization trends and concepts, the QOL survey and the insights gained from the case studies as

expanded upon in the cross-case analysis. Additional aspects that were found to be essential for the success of the eco-town were discussed and a unified definition for the success of the eco-town development was elaborated. Moreover, recommendations were provided for planners, architects, policy-makers and potential future residents in light of the aspects that were found to be associated with successful eco-town development. The strengths and limitations of the research methodology were discussed and a future research agenda was outlined.

1.5 Theoretical Approach & Research Strategy

This research aimed to understand the processes used in the development of eco-towns in order to identify the factors that influence their goal attainment on the short and longer term, with regard to residents' adoption of sustainable consumption patterns and lifestyle choices. Based upon insights from the earlier thesis activities, the initial research plan was developed with the theoretical frameworks of **Innovation Diffusion** and **Stakeholder Involvement** to help the researcher to better understand the extent to which the eco-towns play roles as catalysts for efficient transformation of cities into sustainable urban habitats. As a result of the comprehensive, two-part literature review that was conducted to obtain a solid understanding of the urbanization processes, trends and concepts as well as the history of the eco-town initiatives in the Northwestern European context, the **Ecological Modernization** theory, was found to be pivotal for understanding the procedural, conceptual and contextual evolution of diverse eco-town frameworks and developmental processes.

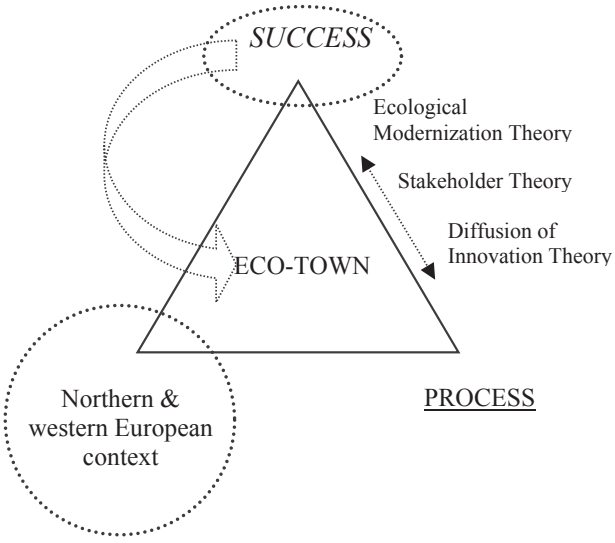

Figure 1.2 Theoretical approaches initially developed in this thesis.

As expanded upon in Chapter 2 of this thesis, Ecological Modernization (EM) has been instrumental for its relatively effective operationalization of the technological, economic and to some extent, the environmental goals within the realm of urban planning and development in the Northern and Western Europe since the 1980s. EM was also found to be essential as a concept in the theoretical context of eco-town developments. This is due to ***a.*** the challenges and opportunities of integrating socio-technical aspects in urban planning and development processes, and ***b.*** the broader policy changes and adaptations required for the evolving roles of administrations, public and private actors in the urban planning and developments.

As argued by Caprotti (2014), 'eco-urban developments' were based on *transition-focused theories* and *management approaches* aimed at economic and societal change for sustainable cities. It was also highlighted that the main emphasis for their development processes has been given into the techno-environmental solutions (for climate and energy related urban challenges) based upon ecological modernization (Caprotti 2014, p.11). The Northwestern European governments' goal for achieving eco-urban developments and the private sectors' pursuit of the '*steady-state model of economic growth and resource consumption*' have contributed to the emergence of EM (du Plessis 2012, p.11).

Thus, the review conducted on the EM theory helped to identify the context within which significant[2] improvements were made in the urban development policies and models in the Northwestern Europe and globally. The review provided insights into their synergistic impacts along with the need for design-based, holistic and more integrative approaches, such as the *Regenerative Sustainability* and *Positive Development,* for improving urban development policies and practices (see Chapters 2 and 3).

In light of the comprehensive review of the theories, concepts and approaches that played important roles in the urban development trends (see Chapter 2), the eco-town developments and initiatives in Northwestern Europe were also reviewed in order to identify the similarities and differences in their development processes (see Chapter 3). From the gathered data, it was concluded that eco-developments had dynamic processes and their successes have varied depending on how these processes were designed, implemented and governed.

The insights from this review process also underscored the importance of quality-of-life perceptions in establishing policies, frameworks, planning guidelines and governance models and thereby to ensure the success of the eco-town initiatives. Therefore, the author conducted a survey (see Chapter 4) through which the quality of life (QOL) perceptions of

2 *("The term "significant" in this sentence does not 'refer to significance levels in the statistical sense'* but the level of importance in achieving environmental goals on micro and macro levels")

residents living in eco-developments and conventional settings were explored. In this study, the physical, social and psychological contexts were investigated and analyzed through the insights obtained from the respondents, in order to determine the subjective perceptions that could potentially influence the level of eco-town's success in the long term. Together with the findings gathered from the above-mentioned thesis activities, a definition of success for the eco-town development was developed, and used as the basis for the conceptual framework presented in the following sections.

1.6 Definition of 'success' in the context of eco-town development

Contemporary use of the word 'success' refers to the achievement of goals and/or attainment of positive results in line with the initially desired outcome. Therefore, first of all, it must be clarified that the success referred to in this thesis is defined differently from the financial profitability, project management and development time, quality and/or viability, as these aspects are perceived as some of the initially desired outcomes of conventional development processes. The successes of demonstration projects such as the eco-towns have been explored with emphasis on the diffusion of innovation, more sustainable building and lessons on the factors that influence the effectiveness of dissemination of the positive results and experiences (van Hal 2000; Femenias 2004). The success of eco-towns, as used in this thesis was defined more comprehensively in terms of achievement of the social, physical, environmental goals as well as the positive policy implications in urban planning and practices. These were expressed in three groups of potential outcomes (see Table 1.2) and briefly explained in the following sections.

Table 1.2 Three groups of actions, which are used to monitor and measure the relative success of eco-towns.

	Outcome	Indicators
SUCCESS	Dissemination of positive results and experiences	• Diffusion of eco-friendly building practices; • Adoption of innovative systems and technologies that are environmentally friendly (by residents); • Adoption by developers of innovative systems and technologies that are relatively more environmentally friendly;
	Community's behavioral and cognitive adaptations	• Reduction in energy and water consumption rates; • Waste reduction; • Reduced car ownership; • Increased level of public transport use, compared to car use; • Increased level of walking, cycling etc. for daily activities
	Policy change and adjustments	• Improvements in urban development policies on regional and national levels in terms of both urban regeneration and for new developments; • Improvements in the building codes and regulations.

1.6.1 Dissemination of positive results and experiences

As expanded upon in Chapter 3 of this thesis, the eco-town developments were tentatively planned to test and promote design and implementation of innovative urban systems and building technologies, which are only some aspects among many social, environmental and other economic goals. It was found through both experience and through the review of relevant literature that innovations in design, improved sustainable building practices and technologies were aspects that the residents and the developers had approached cautiously at least initially. These initial concerns arose due to increased cost implications as well as because of the potential negative impacts on the perceived quality of lives of future residents. With regard to the desired level of dissemination of positive results and experiences, the factors such as quality, cost, and the positive view of the end-user/resident of the eco-friendly attributes of the development were found to heavily influence the outcomes. Femenias (2004) noted from her own and from the literature review of van Hal (2000) that the implementation of 'features' in the demonstration projects, with regard to quality and feasibility for commercial use, as well as the shared experiences among the involved stakeholders help to ensure positive perceptions of innovations and help to accelerate dissemination of the innovations and practices (Femenias 2004, pp.99-100).

Therefore, the diffusion of eco-friendly building practices, adoption of innovative systems and technologies that are environmentally friendly by residents and developers were found to be useful, preliminary indicators of the potential success of eco-towns.

1.6.2 Community's behavioral and cognitive adaptations

According to Norgaard (2009) the barriers in responding to climate change could be explained in three main categories. These included, 1) psychological, 2) social and cultural, and 3) structural (political economy). Norgaard noted that enhanced public awareness could be achieved through proper consideration of the scientific information as well as the psychological and sociological factors (Norgaard 2009, p.10). Steg and Vlek (2009) studied behavioral changes as discussed in environmental sociology and environmental psychology, which elaborated on individual motivations to adopt and engage in environmental behavior such as recycling, reducing consumption or making lifestyle choices that are relatively more sustainable. They underscored that the perceived *costs and benefits, moral and normative concerns and affects* were some of the motivations that help to explain pro-environmental behavior (Steg & Vlek 2009, p.311). For example, they highlighted various sets of behavioral determinants and investigated the distinction between the *antecedent* and *consequence* strategies. The former included elements that tend to change behavior through education, environmental design, information sharing while the latter suggested feedbacks, rewards or penalties (Steg & Vlek 2009, p.313).

With regards to determining the eco-towns' successes, evaluation of behavioral changes and cognitive adaptations of the individual and of the community help to assess the long-term impacts. Steg and Vlek (2009, pp.314-315) noted that the identification of behavior(s) to be changed, examining the factors underlying the particular behavior(s), application of interventions and the evaluation of the effects of interventions on behaviors as well as on the quality of life of individuals are central to understanding the cognitive, motivational and structural barriers in adopting pro-environmental behavior or in achieving long-term sustainability (Steg & Vlek, p.315). Therefore, it was found to be highly relevant to explore the residents' behavioral patterns through examining the consumption of water, energy or waste reduction, car use and ownership, choice of transport, level of walking, cycling and other aspects that can be used to identify the actual behaviors and actions, thereby, helping the author to evaluate the level of success / impacts of the eco-towns.

1.6.3 Policy change and adjustments

Urban development policies and strategies, municipal building codes and regulations can be dynamic and can change based on societal, demographic, political and economic trends. The environmental challenges also have direct and indirect impacts on the cities' safety, livability and well-being. Eco-town developments have been the demonstration projects to test improved building and infrastructure systems that were designed to minimize negative environmental impacts and to provide better social and physical conditions for urban dwellers. It was found, through review of the literature, that in some cases, the demonstration eco-town developments had little impact on broader urban policies.

According to Svane (2007) demonstration projects often remain as "one-offs" (van Hal 2000; Svane 2007; Svane et al. 2011) and hardly have any "spin-off effects" through learning and experiences gained from their development processes (Svane 2007, p.87). Svane (2011) however also suggested that there were improvements in some aspects in the development processes (in thesis author's review of Hammarby Sjöstad development) in governance and network organizations. In the Swedish cases, for example, Femenias (2008) observed a shift from "*fixed and closed concepts*" of sustainable buildings toward a more systems thinking approach, which was also supported by the changes in building regulations from "*prescriptive solutions to system goals*" (Femenias 2008, p.7). In the Dutch cases, these changes were found to have occurred together with the national policy actions on spatial planning and sustainability since the early 90s (de Zeeuw et al. 2010).

With regards to eco-town's successes, improvements in urban development policies on local, regional and national levels as well as the improvements in the building codes and regulations that are often site-specific were found to be highly relevant.

1.7 Defining eco-town's development 'processes'

Large-scale urban development projects are complex processes and involve many phases in which a number of variables define their successes and/or failures. These include phases with temporal as well as continuous timelines. For example, the initiation (decision to proceed with the development), planning and budgeting, design, implementation and delivery are some of the aspects that occur in sequence and are among the types of stages of a successive nature. The governance and the resident occupancy are on-going processes that have become important in terms of analyzing the impact of sustainable urban developments.

As briefly highlighted in Table 1.3, the phases of the eco-town development process involve complex development frameworks in part due to the psychological, social, physical and environmental contexts and the policy contexts, which are all highly relevant in terms of planning and building cities with sustainable systems. The author of this thesis reviewed the relevant

Table 1.3 Analytical phases of the eco-town development processes to help to determine the levels of success.

Phases of the eco-town development process	Contents of the development phases of eco-towns
Initiation	This phase of the development involves the decision-making to develop an area and often has political, economic, social / demographic basis, all of which can provide critical information with regards to the factors influencing the latter stages of the development process and/or the outcome as a whole.
Planning and Design	The planning and design stage involves all financial, physical and social feasibility studies, the urban and infrastructure planning, the master plan design, the architectural concepts, environmental planning, landscape design, engineering disciplines etc. In this phase, other critical aspects regarding the planning include but are not limited to the financial planning, establishing the development structure/partnerships, procurement of developers; in other words, all work prior to implementation of the project.
Development	This phase includes all preparatory and actual construction works that result in the delivery of built units. In this phase, the developers arrange for engagement of architects, engineering groups, contractors and develop the projects on the sites that are allocated for specific uses within the norms and standards/regulations determined in the previous phase of development.
Governance	The governance involves the formative process, contextualization of the decision-making mechanism on issues that concern stakeholders, management of the stakeholder participation and involvement, policy management, monitoring progress, controlling the standards and quality assurance of all construction activities, conflict resolution etc.
Resident Occupancy	In large-scale development projects, the resident occupancy may begin before construction activities are finalized due to the long time span of the development process. Monitoring of the environmental performances, resident behaviors and evaluation of the urban and building systems are aspects that are critical for assessment of the goal achievement and for documenting the level of success.

literature with these parameters in mind in order to identify the domains and the factors that are critical for the success of eco-town development. In the following sections, an overview of the research strategy was outlined and the methods were briefly discussed.

1.8 Research strategy & Methods

In light of the research questions upon which the theoretical approach was developed, the research strategy was *explorative* and the methods that were deployed to achieve some or all of the research goals were *qualitative* in general. The research process has evolved through data gathering on previous eco-town developments. In that initial stage of the research, '*pre-knowledge*' in the field was gained and the gaps in the evaluation of the investigated cases were identified [3]. As noted by Femenias, research is an "*iterative process*" between the empirical material and the literature review (Femenias 2004, p.107). Therefore, subsequent phases of the research focused on the review of the relevant literature that helped the author to understand the urban development trends and the resultant impacts that led the decision-makers to integrate the eco-town initiatives within their sustainable urban development strategies. This part of the research was presented in Section 2.2 of this thesis and is based upon the article titled "*A literature review of historical trends and emerging theoretical approaches for developing sustainable cities (part 1)*" (Bayulken & Huisingh 2015a).

In the second part of the literature review (Section 3.2), emphasis was placed on the goals, visions, and frameworks of the eco-town initiatives, and was based upon the article published as: "*Are lessons from eco-towns helping planners make more effective progress in transforming cities into sustainable urban systems: a literature review (part 2 of 2)*" (Bayulken & Huisingh 2015b). While this part of the research helped the author to narrow down his research foci, it also helped to identify the factors that played roles in their perceived successes and/or failures.

Empirical data collection in this thesis involved comprehensive review of the literature (in Chapters 2 and 3), as well as the Quality of Life (QOL) survey (Section 4.2), which was published as an article titled "*Perceived `Quality of Life' in eco-developments and in conventional residential settings: an explorative study*" (Bayulken & Huisingh 2015c). Additionally, in the case study research, the author investigated the integrative and synergistic impacts of 'success factors,' in which the gathered data were critically and comparatively

3 The initial study of the eco-towns / eco-developments was conducted among fourteen examples and the findings were presented at the ERSCP-EMSU conference in 2010 in Delft, The Netherlands. The researchers, academics and professionals who attended that presentation provided the author with valuable feedback and informed him of potential gaps in the findings that guided the author for in-depth research into the eco-town processes, frameworks and their actual goal achievements.

analyzed through conducting five case studies, presented in Chapters 6, 7 and 8. With regards to the research methods, detailed sections were presented in each study's respective chapter, whereas the case study research methodology was elaborated in Chapter 5 of this thesis.

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Chapter 2

Evolution of urbanization trends and concepts in eco-town development

2.1 Chapter Overview

Chapter 2 provides an in-depth review of the literature on the evolution of urban planning and development trends, theoretical approaches and concepts since the concerns over industrialization's negative social, environmental and economic impacts emerged in the 19th century. In this chapter the authors identified the nations, which made significant progress in their urban planning and development policies and practices. The authors determined the important milestones in the evolving sustainable urban development concepts and approaches. Therefore, the literature review presented in Chapter 2.2, began with the Garden Cities in the UK, and then continued with the emergence of New Towns of the UK and around the world. Subsequently, the authors discussed the impacts of the modernist urban planning doctrine, which was adopted widely during the rapid urbanization of the post-WWII era. The negative social and physical consequences caused by the simplification of urban functions were highlighted and the Northwestern European nations' relatively reflexive approach to urban planning strategies and frameworks were underscored.

Furthermore, the authors reflected upon the progress toward the integration of societal, demographical and spatial factors in the urban planning and decision-making processes. The Ecological Modernization (EM) as an operationalized macro-theoretical model was expanded upon with particular emphases upon its strengths and shortcomings among the sustainability paradigms. Additionally, the effectiveness of the Sustainable Development (SD) concept was discussed in conjunction with its encompassing but highly contested and paradoxical objective to reconcile all economic, societal and ecological well-being within a system that is based upon consumer-oriented economic growth and development.

Chapter 2 also reflected upon the holistic integrative approaches including but not limited to the Regenerative Development and Positive Development concepts. Together with the emerging complex social, ecological and physical urban challenges, the needs for synergistic benefits, hence more effective ways to plan and develop cities were discussed. In doing so, the authors, built upon further review of the lessons and experiences gained from the sustainable development initiatives such as but not limited to the eco-towns and eco-developments, in order to better understand how change can be fostered and supported in the context of the dynamic, complex and evolving nature of urbanization.

Section 2.2

A literature review of historical trends and emerging theoretical approaches for developing sustainable cities (Part 1)

Section 2.2 is based upon the article published as:

Bayulken, B., Huisingh, D., A literature review of historical trends and emerging theoretical approaches for developing sustainable cities (part 1), Journal of Cleaner Production (2015), pp. 11-24 http://dx.doi.org/10.1016/j.jclepro.2014.12.100

A literature review of historical trends and emerging theoretical approaches for developing sustainable cities (Part 1)

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Abstract

Spatial and urban development policies and trends have changed extensively since industrialization began in the early 1800s. Policies that were based on economic growth along with rapid urban population increases in the 20th century irreversibly and negatively impacted most urban eco-systems globally. Climate changes began to occur mainly due to fossil carbon intensive technologies upon which the urban systems and lifestyles have co-evolved. Concepts such as sustainable development (SD) and ecological modernization (EM) were among the most discussed approaches with regard to ways of responding positively to the emerging environmental concerns induced by the growth policies and development strategies. In spite of some positive contributions to urban policies that resulted in relative successes, most notably in Northwest Europe, questions remained as to whether these concepts have effectively and sufficiently catalyzed the promotion of sustainable urban developments more broadly. By building this literature review, the authors explored the evolutionary aspects and the shortcomings of the EM and SD within the overarching sustainability paradigm. The review addressed the emerging theories developed to improve approaches to urban development policies and procedures, and to contextualize the evolution of regenerative or net positive developments in broader cultural, geographical and temporal contexts. The historically significant antecedents were reviewed and visions for needed transitions were outlined in this two-part series of review articles.

Keywords

Regenerative development, positive development, sustainable development, ecological modernization, urbanization, climate change, quality of life

1. Introduction

Historically, city formations and urban development trends were driven by factors such as religion, politics and industry. The resultant was mostly limited to a "*tyranny of distance*" (Duranton 1999, p. 2169), which contributed very little to innovation in urban design and planning (Knox 2010, p. 66). Industrialization in the early 1800s however, brought mobility, technology and more economic growth along with the shift from rural agricultural to urban lifestyles and the population growth, which in turn accelerated the urbanization rate. These were the key factors that caused dramatic changes in size and number of large cities in the past two centuries. The establishment of intentional settlements, new towns and mega new developments of the 20th century fueled with capital markets (Ben-Joseph 2009) resulted in the phenomenal transformations of the urban landscape (Girardet 2003) and in the types of urban societies. As a result, rapid changes in the climate are occurring (IPCC 2013) at the expense of our valuable eco-systems.

It is estimated that the urbanization rate will triple the size of the urban area within the next two decades (World Bank 2010, p.1) while the urbanization level is expected to rise from 52% in 2011 to 67% in 2050 (UN 2012, p.4). Since the publication of the *Brundtland Commission's Report, 'Our Common Future'* by the World Commission on Environment and Development (WCED) in 1987, many initiatives have been taken to address environmental, economic and social challenges in order to establish and implement sustainable development agendas. Despite the increasing number of positive outcomes, the impacts have been minimal compared to the rate of growth (Mebratu 1998), which pose numerous other challenges with '*constantly fluctuating, interlinked, and uncontrollable variables'* (Suzuki et al. 2010, p.1&13).

From an urbanization perspective, since the early 1980s, concepts such as sustainable development as well as ecological modernization were used to contextualize and to guide implementation of environmental mitigation measures, growth policies and re-development strategies. Despite contradicting arguments with regard to whether or to what extent they succeeded, some positive contributions have been documented, however much more will be required within the coming decades.

Key objectives of this literature review were:

- To review the historical evolution of the urbanization processes and trends after industrialization was initiated in the 1800s and to assess the changing, interrelated sociological, economic and political aspects, which are directly and indirectly associated with the environmental problems today;
- To identify nations in which forward looking urban policies and approaches were integrated into their urban policy frameworks;

- To identify the limitations of current models and review transitioning concepts and approaches designed to help decision-makers integrate more effective urban development and growth policies.

This paper, the first of a two part series of articles, reviewed the literature on the evolution of urban planning and development trends since concerns emerged on the negative social, economic and environmental impacts of the industrial revolution.

In this part, key sustainable development (SD) milestones were highlighted and the ecological modernization (EM) as a concept was reviewed in the context of built environment. Furthermore alternative sustainability concepts, including the regenerative paradigm and positive development theory, were briefly discussed as synergistic and integrative approaches.

1.1. Research Methodology

The literature review for this paper involved: First, the review objectives were defined in terms of the time (era), relevance and geography. Secondly, relevant English language texts published between 1946 and 2014 were analyzed. In this phase of the research, the authors focused on urbanization, population trends and policies of urban development since the industrial revolution with particular emphasis given to the post WWII era.

The topics selected for this phase of the research included:

- *The growth and urban population trends*
- *Garden Cities*
- *New Towns of UK and around the world*
- *Emergence of Ecological Modernization*
- *Sustainable Development as a concept*
- *Local Agenda 21 (LA21) initiatives and the eco-cities movement in the post-environmentalist era*
- *Urban Metabolism and Circular Metabolism of cities*
- *Cradle-to-cradle concepts*

Secondly, the emergence of the environmental movement was researched along with the emergence of sustainable development both as a concept and as a discourse in relation to ecological modernization in the Northwestern Europe. It was found that much valuable work was done for achieving sustainable towns and cities in many parts of the world that was not restricted to Europe. However, the authors, focused on the European context because of the quantity of the wider and deeper array of cross-sectional and time series materials found on each topic. The review included literature on emerging concepts and approaches to address the shortcomings of current paradigms and to identify potential contributions for attaining

sustainability goals in theoretical and in practical terms. Therefore, in the latter phase, the research mainly addressed these areas:

- *Sustainable communities*
- *Sustainable development*
- *Sustainable development and systems thinking*
- *Barriers and challenges*
- *Sustainable development frameworks and processes*
- *Ecological modernization and urbanization*
- *Ecological modernization of industrialized societie*s
- *The regenerative paradigm, Regenerative design thinking and regenerative development*
- *Positive development theory and design principles*

During the research, university libraries, electronic databases, government and NGO sites were used as sources of information. Published, peer reviewed papers were downloaded and indexed using the reference management software (Papers version 2.0). The accessed websites were saved and access dates were indicated, where available.

2. Historical background

2.1. The Growth Issue

According to Ehrlich & Holdren (1971), the rate of population along with technological progress and economic growth are the three determinants of the human induced causes of environmental deterioration (UNFPA 2012, p.3-4). They noted that population control, correction of inequitable distribution of opportunities, redirection of technology, transition from open to closed resource cycles and the ingredients of prosperity were/are important matters to address (Ehrlich & Holdren 1971) in order to establish sustainable urban developments. Meadows (1999) referred to "growth" as *'the origin of* most of *the problems such as the poverty, environmental destruction, resource depletion and urban deterioration'*. She noted that slower growth and in some cases no or even negative growth were/are needed (Meadows 1999).

The concerns over population growth were traced back to the Malthusian theory of "environmental limits" dating as early as 1798 (Mebratu 1998). Malthus's views on the relationships between the impacts of human population growth on diminishing food resources (due to limited amounts of land) were that the resultant food scarcity would eventually stop the increasing human population. Over two centuries later, the world population is still growing about 70,000,000 annually; it passed the seven billion mark in 2011 (UNFPA 2012, p.5). As a result, rapid urbanization with economic growth policies based on linear

consumption, are still fueling resource-intensive processes. These in turn, are causing rapid degradation of our eco-systems whilst decreasing the well-being for many, hence the extinction of numerous species each year (Mickwitz et al. 2011; Millennium Ecosystem Assessment 2005). Furthermore, the greenhouse gas (GHG) emissions caused by the cities and human-based processes are estimated to vary between 40-70% (UN-Habitat 2011). Therefore, transformation of cities into sustainable urban metabolisms need significant changes that will require thorough understanding of the current paradigms and will help to develop new concepts and to 're-define' sustainability in light of present and future problems.

> *"Current trends in population growth and urbanization will lead to a significant need for new buildings in a very short period, with an additional two billion urban inhabitants expected by 2030. Such growth will bring with it a rise in energy consumption and associated GHG emissions – and not just from residential buildings but also the commercial and industrial developments that accompany them."* (UNEP 2014, p.9)

The concept of sustainability has been discussed since the 1960s and it addressed the need for a systems change broadly and holistically (Birkeland 2012, p.168). The environmental concerns in the agriculture and food industry, the human population growth, resource exploitation and depletion were some of the many issues that were critically addressed in terms of how eco-systems were being negatively affected by increasing human actions. The grassroots movements in the US began even earlier in the 1950s, followed by Rachel Carson's efforts to underscore the environmental problems which she discussed in her book, Silent Spring (1962) (Kroll 2001). The United Nations Conference on Human and Environment (UNCHE) held in Stockholm in 1972 however laid the first internationally recognized foundation on issues pertaining to the *environment versus development* (Quental et al. 2009; Seyfang 2003). The conference emphasized the need for solid strategies, plans and actions for sustainability and environmental policies as the basis for our common future. Among the principles included in the UNCHE declaration, the social and economic aspects of development were highlighted in relation to providing / improving people's quality of life (UNCHE 1972).

Economic, environmental and social implications of growth policies since the mid 20th century have become even more prominent after the publication of the *Brundtland Report* (WCED, 1987) in which the following challenges were projected: *a. human population* ***growth****, b. food and arable land scarcity, and other social and economic implications*. In spite of the limitations and shortcomings with regards to the emphases given into the built-environment (Birkeland 2012), the concerns highlighted in the Report are still valid after almost three decades in 2014.

> *'The satisfaction of human needs and aspirations is the major objective of development. The*

> *essential needs of vast numbers of people in developing countries for food, clothing, shelter, jobs are not being met - and beyond their basic needs, these people have legitimate aspirations for an improved quality of life. A world in which poverty and inequity are endemic will always be prone to ecological and other crises. Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life' (Chapter 2, section 1)* (WCED 1987)

Based on the current urbanization rate and on the way it is projected to evolve in the next three decades, the question remains as to whether the three determinants of SD can be equally or somewhat satisfied. If not, should a new development model be developed and implemented?

The common definition of 'sustainable development' (SD) of the need to simultaneously address environmental, economic and social aspects, is vague in terms of providing workable principles for planning and land use policies (Kasioumi 2011) with numerous challenges (Häkkinen & Belloni 2011), more so in the rapidly developing countries (Castells 1982; Castells 1972). As suggested by Blühdorn and Welsh (2007), sustainable development has been central for establishing the ideological basis of environmentalism in the past. They questioned how effectively SD can be achieved now and in future, the 'planet's ecological integrity' within the present established system in which economic and commercial dimensions are prioritized above social and ecological aspects (Blühdorn & Welsh 2007, p. 189). Moreover, the consumer societies continue to grow while the ecological footprints increase and resource flow rates do so as well. According to Birkeland (2012), even though the growth and consumption would stop abruptly, the fossil-fuel based systems, with which the cities co-evolved and upon which development continues to occur, would continue to be unsustainable (Birkeland 2012, p.164).

Despite the limitations of SD in terms of the global contexts (Birkeland 2012, p.163), the concept has gained considerable attention through many positive actions such as the International Council for Local Environmental Initiatives (ICLEI's Agendas) and the Earth Charter. It has become a successful 'metaphor' for *institutional* capital building at local and national levels (Khakee 2002). However, the improvements can neither be attributed to the SD concept alone, nor do they represent the full extent of social and intellectual capital building in environmental design and planning more broadly. In Northwestern Europe, the integration of environmental and resource concerns into various policy frameworks has been operationalized via the ecological modernization concept since the 1980s. Langhelle (2000) noted, that the discourse of ecological modernization revolved around SD but he argued that the two concepts (referring to SD and EM) should not be *'conflated'* as the ecological modernization pertains to some aspects of global issues (initially the economic and ecological dimensions) while SD addresses a full spectrum of developmental, economic,

environmental issues, population, peace and security, and social justice within and among generations (Langhelle 2000).

Despite the '*all-encompassing'* nature of the SD, it was argued that EM can be a complimentary approach for reconciling economic development with the ecological crises (Spaargaren & Mol 1992; Gibbs 2000). In fact some of the progress in terms of urban development and environmental policies achieved in the Northwestern European countries, were operationalized through the synergistic use of concepts among which EM played an important role. Gibbs (2000) noted that EM failed to address issues such as [social] equity or democratic participation, which are central to sustainable development and these most certainly require urgent attention in rapidly developing regions of the world, today and in future. Furthermore, the state's role to enable the institutional changes in order for the market economy to efficiently function within the desired framework, similar to the countries in Northwestern Europe, is questionable in different geographical and cultural contexts.

> *So what should be the new discourse for urban development policies through which to work to minimize the implications of current growth projections on our eco-systems and human well-being, in general?*

It is probable that urban development strategies can benefit from concepts such as the SD as well as EM, which are complimentary, considering the complexity of the challenges in today's societies. Ecological modernization is one of the most frequently used approaches in terms of operationalization of some of the goals set forward with the overarching vision of sustainable developments. The countries that are committed to the measures previously addressed by these and other earlier concepts have made considerable progress toward transitioning into relatively more sustainable societies. These concepts however, have been questioned and criticized, as they were found to be limited in terms of helping societies to transition from 'efficiency thinking' toward 'effectiveness thinking', and subsequently to the urgently needed 'integrative awareness' more broadly (Reed, 2007, p. 676). In consideration of the estimated growth of urban populations, the cities and built environment, especially in the rapidly developing nations, require more effective design-based thinking and approaches.

The following section reviews the evolution of new urban development, beginning with the Garden Cities and New Towns, and then reviews the emergence of ecological concerns as part of the historical evolution of 'sustainable development' concepts with a brief outline of the key events and agreements. Subsequently, the authors provided an insight of the contextual role of the theory of ecological modernization in order to provide a framework for analyzing the model urban developments in the Northern and Western European countries. Subsequently, the emerging concepts of 'regeneration' and 'positive development'

(Birkeland 2009; Birkeland 2014) in the urban design and development were addressed as a new discourse between the human and earth systems (Reed 2007).

2.2. Garden Cities

Ebenezer Howard's book, "*To-Morrow: A Peaceful Path to Real Reform"* (1898) amplified upon his concept of Garden Cities in which he argued strongly for the necessity of creating new towns in limited sizes surrounded by green belts that would avoid the social and physical downside of industrialized urban locations. According to Howard's vision, such developments were to contain enough facilities to maintain the communities' healthfulness including agricultural activities as well as space for recreational purposes. Howard's book inspired the development of many garden cities internationally, the first of which was built in Letchworth, Hertfordshire in the U.K. in 1903. He founded the First Garden City Company Limited that acquired 4500 acres (1821 hectares) soon to become home to 7000 residents in 1914 and grew to almost 17,000 by 1939 (Merlin 1980, p.77).

As a result of its early success, another garden city, Welwyn Hatfield, UK was planned and developed in 1920-1922; it became the first of the designated 'New Towns' in the UK. Howard's vision to create self-sufficient settlements in the UK gained momentum internationally. Especially the Letchworth Garden City attracted much attention in the following decades that was supported by businesses investing in the area mainly because of the lower tax regimes and due to the much-needed alternative to the heavily industrialized urban areas where people generally worked and lived.

Despite the efforts to establish a new understanding for changing urban development policies through revolutionary projects, initiatives in the UK were limited to the two examples. However "The Garden Cities", received higher levels of acceptance by other visionaries and followers from outside the UK such as *Floréal in Belgium, Tiepolo in Italy and Germany's first Garden City, Hellerau, which was designed and developed in 1909 near Dresden.*

While creating livable green places for communities became popular and gained international recognition in the 1930s, the trend to develop such visionary projects was severely hampered by the Great Depression of 1929, which was followed by the WWII. The UK's New Towns movement was revived during the post WWII era and was instrumental for inspiring many urban planners and developers in the UK and around the world.

The vision, which Howard created, catalyzed the UK's development of thirty-three New Towns as a response to the need to develop better planned, efficiently designed towns and to decongest the overcrowded industrial locations as emphasized with The New-Towns Act of 1946 (UK Government 1946).

2.3. New Towns of the UK and around the world

In order to resolve the impact of population growth, distribution of industries and congestion in the cities, the UK government appointed a commission that was chaired by Sir Anderson Montague-Barlow in 1937. The commission's report, known as the Barlow Report of 1940, focused upon the need to decentralize the industrial activities as well as the workforce and their residential locations outside of the urban fabric (Scott 1997, p.360). The resultant New Towns were governed by the state and each had its own committee with a development corporation that included planning and implementation departments.

The first generation of New Towns were designed and built in line with Howard's vision to create relatively lower density developments (12 persons per acre / 30 persons per ha) in accordance with the principles set by the Town and Country Planning Association (Merlin 1980). The second phase of building of New Towns however, were more experimental and had to adopt mixed-use planning with varying densities and functions in order to better accommodate the growing populations and car ownership. As Merlin (1980) and Knox (2010) noted, the third generation of New Town developments in the UK were driven by the regional development policies rather than by the initial goal to resolve the city's crowding. These new developments were increasingly planned on previously occupied or developed land unlike the early New Towns. With regard to their successes in creating job opportunities, the recent towns were relatively efficient due to the framework in which they were built with few or no distinctive characteristics in design and aesthetics (Knox 2010, p.106).

In the post WWII era, the New Towns emerged not only in the UK but also throughout Europe, in the United States and in other parts of the world in various forms and sizes and with fundamental differences in conceptual designs and principles. Some of these new towns were influenced by the ideas set forward by the Athens Charter (Corbusier 1973) developed in 1933, which was named after the place where the fourth *Congrès International d'Architecture Moderne (CIAM)* was held. The preliminary urban models known as the 'Radiant City' (Ville Radieuse) exhibited in the CIAM 4 by *Le Corbusier* were based on his early works of the 'Functional City' concept (Ville Contamporaine) in the 1920s and early 30s, which were never built. As part of Le Corbusier's efforts to establish a new approach to urban planning, he proposed a linear model with high-rise residential structures within large portions of green landscape.

Despite Le Corbusier's efforts to contextualize his adapted version of the Functional City model, the implementation of his utopian ideas toward establishing the modernist approach resulted unintentionally in some negative social and physical implications such as in the case of *Pruitt-Igoe* in St. Louis, Missouri (Popkin et al. 1995; O. Newman 1995). The original Charter's objectives addressed a number of social, environmental and physical issues in relation to urbanization and its evolution in the 20th century post war era. How-

ever the adoption of its '*oversimplified functions'* of *"dwelling, work, transportation and recreation" in planning*' (Dagen Bloom 2008, p.73) the implementations by the architects and urban planners were strongly criticized due to avoidance of urban dynamics on the cultural, geographic and environmental levels. Consequently, some planners questioned the integrity of the principles promoted by powerful figures such as Le Corbusier, Sigfried Giedion, Rudolf Steiger, Werner Moser, Cornelis van Eesteren and Walter Gropius. The so-called '*international style*' or 'the machine aesthetics' were widely criticized although they became popular among many architects and urban planners around the world.

In the development process of New Towns, there were many common factors in relation to urbanization processes and their overall social and physical consequences globally. Mass housing developments whether in suburban America or in compact-social settings in Europe, were based on resource intensive technologies, urban planning models and architecture, which in turn created carbon intensive economies. Lewis Mumford was highly critical of the Modernist's mindset towards declaring vast areas of cities as unsalvageable where renewal would ultimately be required; he advocated for the need to analytically investigate the urban development policies from sociological and ecological levels with essential social science techniques (Mellon 2009).

> *"Mumford's book* (Mumford 1958)*, the first detailed history of the Congrès Internationaux d'Architecture Moderne (CIAM), revealed how CIAM participants, in a series of conferences held between 1928 and 1960, constructed seductive exhibitions and publications that proposed a clean break with both existing urbanism and all planning traditions that had come before. The principal figures built little, and much of what they actually designed proved to be of dubious merit, but their influence can be seen today across the globe in vast housing projects, new towns, and urban reconstruction."* (Dagen Bloom, 2008, pp.72-73)

The Northwestern European examples of the development of New Towns followed a slightly different route from those influenced by *Le Corbusier* or his prototype designs. The Netherlands' initiatives to build new residential developments included Amsterdam-West, south of Amsterdam and Nieuwendam-north under Cornelis Van Eesteren's direction during and after his involvement with the Town Planning Department of Amsterdam. Although much has been attributed to the 'finger plan' formation of Amsterdam (similar to Copenhagen in Denmark) with regards to the urban development corridors spreading from a dense city center much like the shape of a hand; his contribution to the designs provided a great deal of detailing and inclusion to address the spatial problems caused by prior analyses of the social, physical, demographic contexts. As Knox (2010) noted, Van Eesteren's work reflected a far better vision of the 'Functional City', with a more multi-disciplinary approach that involved neighborhood scale dynamics. Similar projects were developed in Finland, Denmark and Sweden where progressive forms of modernism

based upon a scientific approach with demographic, social and economic studies designed to anticipate future urban challenges.

While planners of the urban development models were taking progressive steps in the European geography, the developing countries with emerging economies were increasingly encountering new problems. The migration of labor from agricultural rural lands to urban locations to find jobs and to obtain higher income required, more urban space. These demographic changes were accelerated especially after WWII by social and economic trends, which increased the demand for a larger urban workforce that in turn put more pressures on the growing urban landscape and upon its eco-systems. John Friedmann discussed these dynamics from a wider economic and political perspective as to how the urban processes were influenced by the global economic trends, and policies. He suggested that the cities were formed mainly based upon the economic variables, which ignored other factors such as their historical, cultural bonds, or their need to be interconnected with other places, globally (Friedmann 1969). His work on the 'world city hypothesis' (Friedmann 1986) discussed the relations between the political determination of territorial interests and the spatial organization of production and international division of labor. His work was expanded upon with the dimension of social construct added to the economic and political aspects, which were identified as influential factors in cities throughout the world system (Knox & Taylor 1996).

In the US, the demographic shift gained more momentum with the decentralization of defense related industrial plants and activities away from existing urban locations by relocating them in and around the smaller towns. Already in the 1920s, Henry Ford was one of the strongest advocates for the decentralization of industrial activities; then President Franklin D. Roosevelt began to support that idea in 1934 (Mumford 2008). As a result of his political commitment, the relocation of hundreds of war related production plants to smaller towns and cities caused migration of the workforce to the economically deprived areas. The demographic and socio-economic changes led to automobile- dependent suburban residential developments to become increasingly popular in the post WWII years.

Mumford (2008, p.31) described this new phenomenon as '*the new post war urban norm that replaced the mixed-use urban America with the automobile based single-family house settlements'*. In the following three decades, along with the US, the developing countries have in one way or another adopted similar growth trends with urban policies that were supported by the economic and political establishments.

The next phase of urban development began with deindustrialization in the 1970s, which was referred to as "*the decline of the manufacturing employment in the advanced economies*" (Rowthorn & Ramaswamy 1999, p.34). The most rapid sectoral shifts occurred in the

rapidly growing economies where manufacturing and services employed the majority of the workforce. The socio/spatial/economic restructuring due to developments in transportation, communication, information technology and production led to vast increases in the numbers of corporate leaders who moved their factories to locations with cheap workforces or with other incentives.

However, de-industrialization had different impacts on the countries with regards to the urban development trends and policies. For example, in Europe, the cities had a different transitional phase as they changed from being heavily industrialized to becoming increasingly engaged in fulfilling the needs of the service sectors. In countries like the US however, employment opportunities moved away from the city centers due to higher costs of manufacturing causing the smaller towns and cities to become the new growth centers.

Despite the varying types of urban development models in the US, Europe, Canada or Australia in the post war era's restructuring phase, rapid population shifts from rural agricultural to urban lifestyles have been a common trend almost everywhere due to changing demands caused by globalization. These shifts and rapid transformations, together with the population growth, intensified the phenomenal urbanization and its processes to a point where a fossil-fuel dependent system became indispensable for local and national growth policies, at least until the first oil-crisis occurred in 1973. This shock and its impacts on the urban development processes were among the driving forces behind initiatives to create more self-sufficient settlements, villages and towns. Especially, after the beginning of 1980's economic downturn brought serious attention to issues such as securing energy, food and water supplies, which are all inter-connected to social, psychological, ecological and physical well-being within the urban built-environment.

Subsequent to the crises in the 1970s and 1980s, some countries in Northern Europe implemented more environmentally sound urban developments by using holistic and integrated approaches. In fact, more than 60 Swedish towns and villages such as Övertorneå, Kangos and Eskilstuna, were claimed to have become substantially sustainable in terms of managing their communities through local initiatives (James & Lahti 2004; Knox 2010). Similar to the Swedish efforts, Denmark also adopted sustainable growth policies wherein Thisted and Samsoe (Samsø Island) produce more than 100% of their local energy requirements through renewable energy systems due to a strong commitment to environmentally sound urban management and governance.

The successes of community and municipal level initiatives, such as in the Scandinavian context, which fostered the implementation of new, energy-efficient, near to net-zero fossil carbon developments, were in part achieved as a result of experimentation, continuous learning and extensive stakeholder engagement that began in the 1980s. Such exemplary

urban development initiatives were soon also developed by nations in Western Europe such as the Netherlands, Germany and the UK, based upon progressive urban policies designed to foster more sustainable urban developments. These initially included experimental and relatively small housing projects in order to study the economic and environmental aspects of integrated energy, water management systems, efficient building materials and construction technologies. Larger developments in scope were initiated following the Rio Summit in 1992 during which mitigation of environmental impacts of urbanization processes through establishing local action plans were addressed. Local Agenda 21 of the International Council for Local Environmental Initiatives (ICLEI) encouraged all actors including citizens, businesses, public agencies, organizations and all variety of institutions to be involved in activities with a common goal, which is sustainable development (Khakee 2002).

In Section 3, the authors of this review summarized the emergence of the sustainable development concept and clarified the steps taken, which paved the way to local campaigns and programs promoted within LA 21.

3. Emergence of Sustainable Development and Agenda 21

The United Nations Conference on Human Environment held in 1972 in Stockholm, Sweden addressed environmental issues including pollution in the Northern Europe. It was the first fully dedicated international conference concerning the links between the environment and development. People attended the conference from 113 states and representatives from 19 inter-governmental agencies and organizations. The insights gained at the conference led to the development of environmental protection agencies and programs in numerous countries, throughout the world. Three agreements were reached in the conference. These were the Stockholm Declaration, an action plan with recommendations and five issue-specific resolutions (Quental et al. 2009, p.18). One very important outcome of the conference was the creation of the United Nations Environmental Program (UNEP). In the declaration, UNEP was given the task to pursue progress on ‘eco-developments’, referring to the term as the equivalent of the sustainable development concept. During that year the ‘Club of Rome’ published the “Limits to Growth” in which a number of scenarios were explored, which stressed the severity of resource consumption due to a rapidly growing world population. As a result of these developments, additional environmental agencies at national governmental levels were established.

In 1976, UN-Habitat’s first global meeting held in Vancouver was focused on human settlement trends and cities in relation to rapid urbanization. ‘*Habitat I*’ catalyzed discussions on ways the urban problems could be addressed, not only through top-down decision-making

with strong governmental interventions but also with governments being facilitators rather than simply being providers (UN-Habitat 2006, p. 6).

In 1980, The International Union for Conservation of Nature and Natural Resources (IUCN), UNEP and WWF published 'The World Conservation Strategy' (WCS) with the objectives of: a. *maintaining essential ecological processes and life support systems; b. preserving genetic diversity, and; c. ensuring the sustainable utilization of species and ecosystems'* (IUCN et al. 1980). In that report, sustainable development and its prerequisites were outlined with much emphasis given to the protection of environment through systemic change. It was developed to serve as a template or a manifest toward achieving a broad range of sustainability goals, which required deeper understanding of the interrelatedness of human and nature (see Section 20 of WCS).

Only after the mid 1980s, sustainable development (SD) has become a key topic in academic, community, national and global discussions, especially after the publication of the Brundtland Commission's Report, "Our Common Future" (WCED 1987). Although it was arguably developed with the political agenda of focusing on the '*environmental management and protectionism of the Northern Europe and the human health and development needs of the South'*, it drew attention to the environmental, intergenerational and social dimensions of economic development theory (see Figure 1);(Scottish Executive 2006).

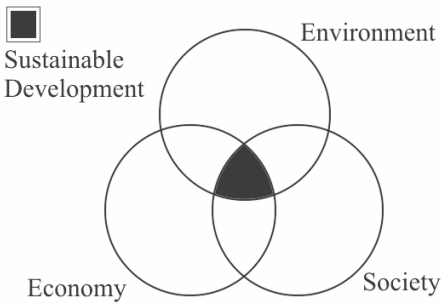

Figure 1 The Venn diagram of Sustainable Societal Development as included in "Our Common Future."

The Sustainable Societal Development concept was perceived and integrated in policy frameworks in different ways, in which some focused upon environmental protection while others sought to improve on the health and development or the economic growth aspects. Woods (2006) emphasized that there are diverse interpretations and definitions of SD in different contexts. He highlighted the controversy about the economic, ecological and social

imperatives and questioned as to whether SD can be achieved, considering the extent to which practical application has encountered so many challenges (Woods 2006).

As an alternative approach to the model put forward by the Brundtland Commission, also perceived by many as 'weak sustainability' (Hediger 1999), a stronger stance was conceptualized, that was designed to perform all economic activities within the limits of social equity while ensuring that the eco-system remained intact at all times (See Fig.2).

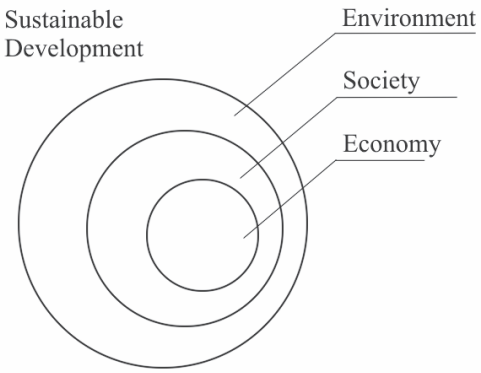

Figure 2 The Russian doll model explanation of Sustainable Development in which the Environment is the central element upon which the society and economy are totally interdependent.*(Adapted from Scottish Executive, 2009, pp.25-26; O'Riordan 1998)*

Despite the critical views of the different approaches to SD and its position theoretically, O'Riordan & Voisey (1997) addressed the stimulating effect of the concept in terms of the needed institutional changes in raising awareness on the scope and the complexities of the changes that have to be made to transition societies to being truly sustainable (O'Riordan & Voisey 1997). A similar conceptual model was developed by Mebratu (1998), which he called the 'Cosmic Interdependence Model' suggesting that all economic, social and ecological (both *biotic* and *abiotic*) dimensions are interrelated and subject to second-degree effects of their interaction, regardless to how they may act, when they are free from each other (Mebratu 1998, pp.513-514).

Subsequent to the publication of 'Our Common Future', the Earth Summit was held in Rio de Janeiro in 1992. It paved the way to the publication of Agenda 21 (UNCED 1993), which is comprised of 40 chapters and provided the blueprint for SD. A number of complimentary steps were taken after the Rio Earth Summit (1992), during which some European countries adopted policies to mitigate the environmental impacts of urbanization processes by establishing and encouraging long-term local action plans (Local Agendas 21). One of

these efforts was initiated as a result of the *Charter of European Cities and Towns: Towards Sustainability* (CEC, 1994), which further addressed the need for social justice, sustainable economies and environmental sustainability (Burton 2001). The charter, also known as the 'Aalborg Charter' (Box 1), clearly stated the need to involve all citizens as key actors in decision-making processes and underscored the need to train and educate the public including the elected officials in the concepts of sustainable urban developments (CEC 1994).

Box 1. The Aalborg Charter was developed in 1994, as a result of the Conference of European Cities and Towns.

The Aalborg Charter (AC) was developed in collaboration with the European Commission in order to monitor the progress and to implement policy agendas towards the goals of The Earth Summit in 1992 to be carried out in local levels within European cities. The AC set goals and provided the much-needed commitment to establish sustainable developments through Local Agenda 21 initiatives. It suggested that 'towns and cities are the largest, appropriate, social unit to address the imbalances on all architectural, environmental, social, economic, political levels that harm the planet as well as the smallest scale at which to begin contextualizing and resolving these problems in holistic and integrated ways'.

As a major step toward sustainable urban developments, The AC was initially signed by eighty local authorities and was later endorsed by 253 international organizations, which pledged to take specific actions towards transitioning to sustainable towns and cities. This led to the adoption of the Local Agenda 21 (see Section 3.1.) processes for developing long-term action plans in numerous cities and towns in many parts of the world.

3.1. The International Council for Local Environment Initiatives and the role of Agenda 21

The International Council for Local Environmental Initiatives (ICLEI), which has 1012 cities and towns from 84 countries, worldwide as members (ICLEI 2012) was conceived in 1989, established in 1990 and officially began operations in March 1991. ICLEI has been and still is an important catalyst in terms of mobilizing local authorities and administrations towards adopting local actions and policies through a number of international programs and projects. Its mission is:

> '*…to build and serve a worldwide movement of local governments to achieve tangible improvements in global sustainability with special focus on environmental conditions through cumulative local actions' (ICLEI).*

One of ICLEI's key contributions has been the Agenda 21, which is one of the four treaties *(the Rio Declaration, the Forest Principles, the Biodiversity Treaty and Agenda 21)* approved during the Earth Summit, known as The 1992 UNCED. The Agenda 21 mainly proposed

an extensive global action plan to motivate and to help nations to design and implement strategies to mitigate their greenhouse gas emissions. It consisted of four sections, including the social and economic aspects of all institutional and organizational facets towards establishing Sustainable Developments. (*The Local Agenda 21 (LA21) was proposed as part of the Agenda 21 in Chapter 28 of the forty chapter treaty document discussed during the Earth Summit in Rio de Janeiro in 1992*.) In fact the Rio +20 conference held in Rio in May of 2012, was designed to prioritize the themes and issues that were considered to be critical factors in making progress on the sustainable development agenda, as reflected by the Agenda 21, such as; *Combating Poverty, Changing Consumption Patterns, Promoting Sustainable Human Settlement Development, Biodiversity and Forests, Oceans, Water Resources, Advancing Food Security, Energy from Renewable sources.* (UNCSD 2012)

Among these, the Local Agenda 21 (LA21) called for changes in planning, which require a complete reorientation from both technocratic and the political aspects of the past (Lawrence 1998). It focused on multi-stakeholder engagement both in decision-making as well as in the implementation of sustainability programs. Although initially the LA21 initiatives received wide international popularity among the local governments, community groups, NGOs, businesses or universities (ICLEI, 2002), the commitment to goals and strategies to establish sustainable developments proved to have challenges in the longer-term (Moore 2003; Norgaard 2009).

Some of these challenges were found to be due to inter and intra-institutional relations and powers and to be due to the need to shift from traditional approaches to the adoption of the new paradigms of SD. Consequently, progress in taking the proper steps toward the success of LA 21 has been slow due to the necessity to achieve such dramatic organizational transformations (Lawrence 1998, p.2). The factors, such as culture, education, and socio-economic conditions were found to influence the level of trust toward the institutional capacity to make the needed changes (Owen & Videras 2008, p.268). It was found that LA21 focused attention on the concepts of sustainability and its linkages with urban planning and the built environment among an array of social, environmental and institutional issues that required urgent attention to mitigate the impacts of climate change and interrelated challenges.

In most countries, the openness, sufficient data gathering and monitoring as well as capacity building are issues that have not been adequately integrated into the LA21 processes. ICLEI's Project findings were included in the Melbourne Principles, which identified the circumstances and common barriers that are encountered at the local and institutional levels when LA21 concepts are being implemented:

- *The decision-making process at local levels is often faced with challenges that require immediate results but the long-term planning towards sustainable development requires far more targeted approaches with long-term vision and commitment.*
- *The local governments have a vague idea of how to integrate* ***sustainability*** *into their political, economic and/or administrative agendas.*
- *The findings highlighted the lack of understanding about the consequences of the technological, infrastructural and administrative reforms / actions endorsed by the elected officials would yield economically, socially and environmentally.*

(ICLEI's citation from UNCSD, Dialogue Paper by Local Authorities, 2001)

Some of the LA 21 case studies, implemented through ICLEI initiatives revealed remarkable results in regard to how they established collaborative, participatory and experiential/educational processes. The projects varied from urban renewal to eco-friendly energy production or from water conservation to governance built upon bottom-up, decision-making and top-down commitment among all stakeholders.

3.2. What are the evolving roles of ICLEI and LA21 initiatives in helping to make progress toward more sustainable cities and towns?

With regards to the adoption of sustainability goals and objectives, the frameworks of the Earth Charter (Box 2), the Melbourne Principles, the Bellagio Principles and the Aalborg Charter, have become important keystones in terms of addressing the challenges. They also helped the development of action plans towards achieving policy adaptation and raising awareness among communities about the urgency of making progress toward more sustainable societal patterns.

ICLEI is an active promoter of implementation of the agendas developed by these and other initiatives through setting up the mechanisms, tools and programs with which to work and progress. Its role has been and still is integral for promoting sustainable cities and towns initiatives through their active participation and through organization of local and international events some of which have had significant impacts on policy decisions on both local and national levels. (Lundqvist 2000; Fudge & Rowe 2001; Khakee 2002)

Despite the criticism of slow progress and inadequate responses to policy changes, **eco-towns** became one of the best ideas that were introduced under the LA21 initiatives. They were initially considered to be the potential catalysts to improve current urban development policies via building exemplary projects with which to experiment, experience and to learn. More in-depth research on the eco-town developments was conducted and expanded upon in the second part of this two-part series of articles. In this paper, the authors broadly identified the sequence of events through which the thinking and acting process around urbanization evolved in relation to the environmental concerns that emerged since the beginning of industrialization. Additionally, the authors posed ways of mobilizing key concepts and ap-

Box 2. Earth Charter and the efforts toward establishing the term 'sustainability'.

In March 2000, The Earth Charter Commission drafted a more refined and updated version of the Earth Charter after six years of collective work. The document serves as a soft legislation consisting of 77 principles divided into four main visionary sections; I. Respect and Care for the Community of life; II. Ecological Integrity; III. Social and Economic Justice; and, IV. Democracy, Non - Violence, and Peace. The Earth Charter, as an initiative and a declaration was 'almost' adopted formally in the Rio+10 in Johannesburg bringing the nations around to a common understanding of the "Way Forward". Although the work toward having it recognized officially by the governments worldwide still is an on-going process, thousands of institutions, individuals, organizations including ICLEI and UNESCO have endorsed the Earth Charter as a global consensus statement for the meaning of the term "sustainability."

In spite of these efforts to institutionalize 'sustainability', the grassroots community-led sustainability initiatives have been around since the 1960s (Hofstra & Huisingh 2014, p.460) and early 70s (Lietaert 2010; Sanguinetti 2014). These included but were not limited to the eco-village networks, co-housing projects, intentional communities that focused on building socially and environmentally sustainable lifestyles with enhanced sense of community and nature in which to live and nurture (Sanguinetti 2014).

Sustainability was used and defined by the World Conservation Strategy in 1980 (IUCN et al. 1980; Birkeland 2012) and more recently it was highlighted by the WCED in 1987. Blühdorn & Welsh (2007) expanded upon the eco-political and eco-sociological reasons for transitioning ideas into policies revealed such limitations and referred to the contributing factors as the technological innovation, market instruments and managerial perfection (p.186), which were 'considered' to be among the appropriate means of achieving sustainability. They further underscored that the notable actors defending SD have prioritized the economic and commercial interest over ecological concerns (pp.189; 201).

proaches, which included sustainable development and ecological modernization that were found to be effective in helping to provide a framework seeking to achieve sustainability.

Therefore, with regard to understanding the change processes towards urbanization and urban development policies, Section 4 expanded upon the emergence of ecological modernization as a way to address the challenges associated with the current paradigms, hence the need for new strategies, concepts and approaches.

4. The Ecological Modernization Theory and its emergence through the change processes

The urban, industrial, technological and societal processes during the three decades following the WWII have been unprecedented in terms of the extent to which the growth policies affected the environment and resource depletion. Some of the environmental management efforts of the 70s and early 80s did not solve the problems but, rather caused a more dispersed nature of degradation over time and space (Picou 1999, p.99). Furthermore,

societal inequalities and their side effects were documented to be caused based upon the 'successes' of the dominant industrialized society (Beck 2008, p.78). In the 1980s, social and environmental scientists increasingly studied the linkages between environmental deterioration and societal and institutional changes; based upon some of that work the concepts of Ecological Modernization (EM) theory were developed (Mol 2000).

Martin Jänicke and Joseph Huber were among a small group of social scientists that initially worked on the concepts of EM (Spaargaren & Mol 1992; Jänicke 2008) (or '*greening technological change*' as defined by Jänicke & Lindemann) in the 1980s in Germany (Jänicke & Lindemann 2010, p.127). They emphasized that economic growth and industrial development can benefit from movement towards environmentalism. The EM concepts evolved around the assumption that the productive use of natural resources can become, in the same way, productive use of the capital and labor, increasing the efficiency in energy and resource management through innovative thinking in design and production in all areas. This would help to mitigate the impact of growth to the environment by internalizing the environmental risks into the productive systems by using prevention approaches and other internalization techniques. The theory of EM, emerged from the discussions pertaining to the "Risk Society Theory", which criticized science and technology and promoted deindustrialization and de-modernization (Mol & Spaargaren 1993, p.433).

Despite initial confrontational views, the theories of Risk Society and Ecological Modernization were found to be synergistic because they can be used as frameworks to analyze the reflexive character of science and technology, and to explore different aspects of society-environment / nature relationships in the context of the risk profile of modernity in the environmental context (Mol & Spaargaren 1993, pp.455-456).

The early approaches of EM paralleled the earlier works of neo-Marxists as well as the de-industrialization theorists by challenging the core institutions of modern society such as the centralized state, industrialism and capitalism (Mol & Spaargaren 2000, pp.25-43). Although, EM originated from the '*debates dominated by de-industrialization / demodernization'* (Spaargaren & Mol 1992; Mol & Spaargaren 2000, p.19), the theory was often associated with technocratic characterization in which ecological aspects were associated within the context of capitalistic notions rather than with socially transformative or behavioral changes of society (Mol & Spaargaren 2000).

Based upon these earlier debates, Hajer (1995) defined EM with two significant variants; the techno-corporatist form, which he named the technological-administrative approach and the reflexive EM which is associated with social learning, democratic governance, institutional arrangement approaches, which were further analyzed by Christoff (1996), who categorized them as weak and strong types of ecological modernity as follows:

The weak form of ecological modernization includes:

- *Technological solutions to environmental problems;*
- *Technocratic/corporatist styles of policy making by scientific, economic and political elites;*
- *Restricted to developed nations who use ecological modernization to consolidate their global economic advantages;*
- *Imposes a single, closed-ended framework on political and economic development.*

The strong form of ecological modernization includes:

- *Broad changes to institutional and economic structure of society that incorporate ecological concerns;*
- *Open, democratic decision-making with participation and involvement;*
- *Concerned with the international dimensions of the environment and development;*
- *A more open-ended approach with no single view, but multiple possibilities with ecological modernization providing orientation.*

[Source: Derived from Christoff (1996) pp.490-491]

Jänicke defined EM's conceptualization as addressing the *'technology-based'* and '*innovation-oriented'* approaches of environmental policies. Within a market economy, interventionist strategies if needed, would only receive resistance from those within the already established patterns of industrial activities. He observed that resolving environmental problems would be less likely to face barriers if market based solutions were adapted (Jänicke 2008, p.557).

He defined EM as the innovation and diffusion of environmental technologies and characterized the environmental innovations in the following three steps:

- *" First, due to market failure, they typically need political (or at least organized societal) support. This is why "ecological modernization" is essentially a political concept.*
- *Second, environmental innovations are an answer to problems that have (or will have in the future) a global dimension. Therefore, they tend to have global market potential based on global environmental needs.*
- *Third, the global industrial growth itself creates a demand for environmental innovations since many natural resources are scarce and the sink capacity of the earth is limited."* ***Excerpted from*** **(Jänicke 2008, *p.558).***

Jänicke's pragmatic approach in establishing environmentally sound technologies required both social and physical changes in which such reforms have been proven to have chal-

lenges on all social, political and economical fronts. The concept of Sustainable Development (SD) was therefore, argued as a shift in the political power from the transnational level to the local levels that would engage in *"a discourse of the civil society and not of the nation-state"* (Gibbs 1998). Buttel (2000) also emphasized the possibility to incorporate these parallel concepts of autonomy, civil society, and state-society synergy theories in political sociology within the same fold where EM would either succeed or fail as a social theory depending on the strength of the synergies within the context of SD.

The debates surrounding the core principles of EM, evolved significantly since the concept was first developed in the early 1980's. While the postmodernists and constructivists challenged the core principles of EM and even of SD, simply because they considered them as part of the continuum of established ideas by the old modernization theories (Mol & Spaargaren 2000); the stand of postmodernists and relative constructivists has been to radically deny all or any borders, thereby '*liberating from the narratives one of which is the ecological crisis*' (Mol and Spaargaren 2000, p.29).

Box 3. Brief summary of the postmodernist and constructivist views in ecological sociology.

According to Jones (2002), many academics have denounced the social constructivist thinking for researching environmental problems because constructivists suggested that the attention should be paid to how the assertions about environmental problems were made and how these are related to the interest groups or the decision-making processes rather than exploring the objective conditions through better science and data (Jones 2002). While they were claimed to accept the '*epistemological relativism' and reject 'epistemological realism*' (the status of knowledge of reality, Jones 2002), the common view on constructivism agreed upon the observer's perception of the conditions of reality relative to one's ideas and/or wishes (Jones 2002).

With regards to the postmodernists, on the one hand they critiqued the very notion of globalization and development and the consequences in the sense that the local and indigenous narratives are often neglected (Blaikie 1996) at the expense of privileged status of scientific knowledge. The postmodernist school of thought suggested that there should be multiple and diverse ways of actions that can be negotiated in terms of finding reasonable ways to resolve environmental problems (Blaikie 1996); and not just the '*meta-narratives such as modernization, dependency, neo-Marxist or neo-Malthusianism*' (Blaikie 2000,p.1037). On the other hand, postmodernism has been criticized for its disengagement with the detailed research into development processes and policy (Blaikie 2000), not to mention for the very strong critical language it deployed against other contesting views and concepts. According to Mol and Spaargaren (2000), postmodern / constructivist thinking challenges the creation of every grand narrative and further seeks to deconstruct in order to reveal that these narratives are only arbitrary (Mol & Spaargaren 2000).

The critical viewpoint of the constructivists / postmodernists (see Box 3), was no longer accepted as relevant or adequate especially after the publication of The Brundtland Report with which a number of physical and social issues were highlighted beyond the emphasis

of the originally considered linkages between economic and environmental concerns. Although the emergence of EM as being more of an economic and environmental reconciliation (Dryzek 1992), the formative notions of the theory were further developed around *sociocratic* approaches based upon debates towards understanding these linkages between the characteristics of the contemporary modern society and the environmental concerns of the 80s and 90s (Mol & Spaargaren 2000). In fact, Buttel (2000, p.64) argued that ecological modernization has been mostly driven by the efforts to respond politically to radical environmentalism and develop ways in which to guide managerial and techno-spatial production (Buttel 2000). Furthermore, he emphasized that the efforts of non-mainstream environmental groups at local levels of which the proponents of EM have questioned, contributed much positively in terms of establishing ecological viewpoints between the state and the private sector. Indeed, deforestation, excessive use of fossil fuel dependent technologies, loss of biodiversity, ozone layer depletion and climate change have all contributed to the evolution of EM and helped to catalyze the development of environmentally sounder policies and governance, especially in the Northern European countries. In fact, by the mid 1990s, countries such as the Netherlands, Germany, the Scandinavian block as well as Switzerland had all made considerable progress on both pollution abatement and also on improvements in eco-efficiency within their manufacturing and urban processes (Buttel 2000). The commitment of these nations towards adopting more sustainable paths within highly established urban mechanisms appealed the most in terms of seeking to understand the challenges and barriers they faced and how such social, political and institutional changes occur within relatively limited time and resources.

To better outline this transformation, partially attributed to EM, Mol (2000, p.46) identified three stages of the theory's development, first of which he characterized as the changes in the realm of technological innovation. This occurred through new approaches to industrial production that challenged the state and bureaucracy in the early 1980s. In the second phase after the mid 80s, ecological restructuring occurred in the institutional and cultural dynamics with more studies on production and consumption patterns. During the third stage, from the mid 90s onwards, more emphasis was devoted to global dynamics in the context of EM (Mol 2000; Mol 2010). Despite the extent to which these evolutionary advances helped to improve the environmental policies and our understanding of the EM's role at political, social and technological levels, it was defined as being necessary but not a sufficient condition to achieve SD (Langhelle 2000, pp.318-319). Further studies increasingly focused on the societal issues as well as on the physical conditions along with the economic and ecological aspects, which EM emphasized.

In the context of urban planning and design, more specifically in the Northwestern European countries, such as Sweden, Denmark, the Netherlands etc. (Ole Jensen & Gram-Hanssen 2008), the EM occurred in response to a combination of factors. The R&D programs that

were supported by governments were found to play an important role in these innovation-oriented countries (Jänicke & Jacob 2006, p.179). According to van Vliet and Stein (2004), the formation of public-private partnerships (PPP) also led to the liberalization of network-bound urban systems (such as the water, energy, waste) from the monopolies of governments. This, in-turn, resulted in various forms of differentiations in the service providers, technologies, resources as well as the provider-consumer roles, relations and arrangements (Van Vliet & Stein 2004). Furthermore, the adoption of ecological considerations in restructuring these sectors led to the '*niche development*' so as to '*experiment with new technologies, articulate changes in the institutional framework*' and measure economic success as well as to assess social desirability (Van Vliet & Stein 2004; Kemp et al. 1998). As noted by Spaargaren and van Vliet (2000), the number of environmental innovations since the mid 1980s increased significantly and became available to consumers that are willing to adopt more sustainable lifestyles (Spaargaren & Van Vliet 2000).

With regards to the built environment, Rivolin and Faludi (2005) further highlighted the importance of the Nordic models used among countries, which adopted European Spatial Development Perspective (ESDP) in which mutual learning and exchange played a central role in integrating environmental concerns into many levels of their policy making and implementation strategies. They further noted that the Northwestern European countries such as Sweden, Denmark, Germany and The Netherlands became the leading nations in having developed collaborative and multi-level governance systems, which resulted in the discursive nature of European spatial planning (Rivolin & Faludi 2005; Faludi 2004). In spite of the Eurocentric character of EM and its lack of critical stance toward the '*transformative potential*' of '*capitalism'* as well as '*modernizationism'* within the development studies (Buttel 2000, p.64), the integration of EM into the policy framework became the foundation for these nations' progress toward SD since the early 90s (Fudge & Rowe 2001).

As a consequence of these concepts' positive contributions, a number of experimental projects in larger scales were initiated, which in fact were focused upon new types of the urban development and planning realm, initially, in the Northwestern Europe and later in other countries. The authors of this paper documented some of the eco-development projects as exemplars of large-scale experiments in which innovative systems and technologies were tested in relation to their effectiveness, societal acceptance and policy implications since the early 1990s. These were expanded upon more in detail in the second part of this two-part series of review articles.

5. Discussion

EM as a theory and its value for guiding the process of reconciling urban growth policies and environmental protection was challenged on many occasions since the concepts and the theoretical framework emerged. The authors of this review investigated EM because it '*focused on the transformation in actual studies and practices of production as well as on consumption*' (Mol & Spaargaren 2006, p. 40). Also, with regards to environmental planning and policy making in most European countries and in some industrialized nations, *(such as those noted by Jänicke & Lindemann (2010); Jänicke & Jörgens (2000) in terms of the institutional and societal level progress)*, EM played an integral role in contextualizing objectives and operationalizing goals relatively more efficiently than many other concepts in environmental sociology.

While EM, as a macro theoretical model, emphasized that economic growth and environmental protection can be achieved synergistically (Baker 2007); in the context of urbanization processes, it did not adequately address social justice, the distribution of wealth and the society–nature relations (Langhelle 2000), thus it has been criticized in terms of its lack of contributions to social changes. As argued by Baker (2007) and Langhelle (2000), SD and EM should not be '*conflated'* as the former involves a wider set of actors and engagement with a deeper set of principles in order to achieve social change and the latter encourages technological innovation and modernization. In relation to the emerging political, economic and social aspects compared to the conditions three decades ago, the concept of SD requires a workable plan and a new developmental model so that the economies of societies will be firmly attached to their ecological roots (WCED 1987; Baker 2007). With regards to the SD's effectiveness in sustaining '*planetary ecological integrity,*' its foundation on the established consumption-oriented economic system posed ever-growing questions in terms of its potential to achieving true sustainability (Blühdorn & Welsh 2007, p.189).

Furthermore, policies and programs that promote sustainable urban developments, including but not limited to the Agenda 21 and LA21 initiatives, or the green building councils, which constantly work on improving the design codes and regulations; these have made valuable contributions, yet with little impact due to the rapidly growing urban population's, demands and increased material flow rates (Blühdorn & Welsh 2007, p.190). With regards to institutional changes in built-environment design, the emphasis has been given primarily to the technical and economic aspects rather than to sustaining the whole system of human and non-human habitat (Reed 2007). As Birkeland addressed, building rating tools has done much to increase consumer awareness, however the actual performance levels of green buildings did not achieve the desired impact in the context of urban sustainability as they were developed based on reductionist frameworks (Birkeland 2012, pp. 164,180).

Surely, sustainable cities must be established through evolving partnerships among '*heterogeneous mixes of actors,'* such as the developers, architects, engineers, politicians, educators, and citizens in general, of the society and pursue alternative urban development scenarios based upon environmental values that will create synergies in implementing better energy, water and waste management (Gibbs 1999). And, the vast amount of published material on concepts such as SD, EM, post-environmentalist or post-ecologist approaches, the evolving nature of economic and societal conditions show the extent to which the continuous evaluation, discussions and participation should be encouraged in order to accelerate the rate at which the cities make the transition into more 'Circular Metabolisms' (Girardet 2008; Kennedy et al. 2011). According to Reed (2007, p.674), this transition from a *'fragmented'* to a *'whole systems' model is a cultural leap, one which the consumer society needs to make'.* Therefore the shift from a *restorative* to *reconciliatory* and ultimately to the *regenerative* approach in design and development is required based upon the interconnectedness of the system as a whole (Reed 2007).

Holistic thinking in the realm of urban planning has become a key topic across disciplines, especially since the works of Herbert Girardet's '*Circular Metabolism*' in 1996. He highlighted the key notions of understanding cities as 'urban metabolisms'. Through that lens city planners can more effectively implement 'sustainable developments' (Kennedy et al. 2011). His works were based on Abel Wolman's (1965) study of urban metabolism, which focused on the ecological limits of cities in relation to the growing and continuous production of waste and consumption of goods. Abel Wolman suggested that the cities have metabolic requirements that can be defined as all of the materials and commodities needed to sustain the inhabitants. He emphasized that the metabolic cycle (in fact he implicitly hinted at the circular metabolism concept on which Girardet worked three decades later) is not complete until all waste has been removed with a minimum or no hazard (Wolman 1965, p.156). Girardet further improved upon Wolman's study and drew attention to the differences between the circular and linear urban metabolisms and the negative environmental consequences of the use of conventional urban systems with particular emphasis on all three tenets of SD (Girardet 2008; Kennedy et al. 2011). Others worked on the metabolic approach as an urban development framework with more in-depth and workable models such as the '*Extended Metabolism Model of the City*' (P. Newman 1999). Newman developed his model categorically so that it could be utilized in industrial areas or for assessing material flows at the household and neighborhood levels as well as for demonstration projects.

As a similar conceptual approach, '*Cradle-to-cradle' (C2C)* (McDonough & Braungart 2002) addressed the urgency to shift from an eco-efficiency thinking to a focus upon eco-effectiveness. As a result C2C approaches are evolving around the idea of essentially eliminating waste through either cycling it back to the industrial processes which was referred to as 'technical nutrients' or ensuring the full integration back onto nature as 'bio-

logical nutrients' (McDonough & Braungart 2002a). They called for the need to establish a culture of upcycling as a goal that sought to establish a holistic framework in industrial, economic and social facets of development. In a way, **C2C** has become a manifesto for the systems thinking similar to the metabolic approach of Wolman or Girardet. McDonough and Braungart observed that the previous concepts, approaches or frameworks were limited in the sense that they were designed to provide eco-efficiency and that they could only minimize the damage but not the prevention of the ecological destruction per se. They sought to create a new system whereby, industrial processes are designed with 'ecology' as the central value around which economic and societal elements are supported, thus creating positive effects (McDonough & Braungart 2002b).

With respect to the C2C as a 'systems thinking' approach, the fractal triangle of McDonough and Braungart provided a conceptual model that used ***ecology***, ***economy*** and ***equity*** as the three fundamental dimensions with environmental health in mind. Achieving 'positive effects' of processes from all human induced activities is becoming increasingly urgent as the implications of climate change become increasingly evident. This relatively new way of thinking about the ways we plan, produce, develop, consume and manage societies within planetary boundaries must be improved through exploring new paradigms that encompass the approaches such as regenerative and positive developments.

The relative success of the Northern and Western European nations in achieving environmental policy goals, can be attributed to the stepwise adoption of EM and SD concepts and to the gradual change in the environmental policy implementations based upon active citizen participation through education, experimentation and empowerment. However, according to some observers, application of these two concepts have reached the limits in dealing with the complex living systems in rapidly growing urban populations (du Plessis 2012). Together with increasing environmental, societal and economic pressures globally, a relatively more integrative and holistic paradigm of regenerative sustainability offers a refined and more focused perspective to move forward. As Cole suggested, the strategies and approaches that were widely discussed earlier are and will remain valid (Cole 2012, pp.48, 51). But the evolving regenerative sustainability paradigm that is designed '*to restore and regenerate the social and ecological systems*' (du Plessis 2012, p.15) through reestablishing the human-nature symbiotic relationships and envisions mutually beneficial outcomes, which are positive for all *human* and *non-human* inhabitants for the societal evolution within planetary limits (Mang & Reed 2012). However it must be noted that the regenerative design thinking also has limitations with regards to resolving today's sustainability problems as the material flow rates are constantly increasing, thus society is exceeding the earth's ecological carrying capacity, exponentially (Birkeland 2012, p. 163). Although the concepts such as the Circular Metabolisms, Circular Economies, C2C, Living Machines, Regenerative Sustainability, have addressed holistic design and development

approaches, still, a further shift from reductionist to restorative thinking to creating positive realities is urgently needed.

Birkeland suggested that, in order to achieve sustainability, pre-industrial levels must be taken as the ecological baseline or benchmark upon which to improve (Birkeland 2012, p.163) design and development of cities (not as products but as regions). Additionally, the support systems of nature must be increased radically to mitigate the deterioration and degradation of all ecological, social and economic dimensions that are inter-linked to urbanization. Furthermore, the 'total resource flows' need to be significantly reduced for achieving the combined effect to generate positive development (PD) (Birkeland 2014, p.6). Therefore, she referred to PD as an effective design-based approach, which addresses intellectual, biophysical, institutional dimensions to help to improve societal and natural well-being as a whole (Birkeland 2012, p.6). The approaches that promote closed-loop systems thinking, some of which were presented in this review article, have become the components rather than solutions individually or more holistically. As also emphasized by Birkeland, the complexities caused by today's growth rates are unlikely to be phased out because the '*systems of development*' are built upon fossil-fuels and fossil-based resources. There are potential benefits of the concepts to be merged to reduce and to restore the ecological damage caused by growth policies in general, however there is also an urgent need to strategize and operationalize the transitional concepts such as regenerative and positive design thinking in order to achieve net positive results.

6. Conclusions

As *the 'spatial concepts are becoming increasingly rigid' (Hajer & Zonneveld 2000, p.343)* and standardized, more universal planning guidelines and regulations on national scales are being formed (Hajer & Zonneveld 2000). The flexibility and variation toward adapting environmentally sound urban development practices (based on the local and regional conditions) are becoming restricted, thus new challenges are emerging. The resilience of cities against the '*exogenous shocks*' (such as climate change, population growth, economic and social crises, resource constraints, biological and other disasters, etc.) as well as '*endogenous factors*' (physical capital such as housing, infrastructure, services or social capital of health, education, security etc.) urgently need to be addressed (Pearson et al. 2014, pp.7-14). As these urbanization challenges are posing numerous social, environmental and economic threats for the growing urban populations, the cities also become pivotal in terms of opportunities such as implementing strategies, experimenting with new concepts, as well as disseminating results and findings of innovation and new knowledge (UN-Habitat 2011).

As reviewed in earlier sections of this paper, the developing nations with emerging economies are vulnerable to shortsighted urban development models due to increasing political and economic pressures. They are therefore, more likely to ignore the social and ecological implications of rapid urbanization and policies. Leaders in developing countries urgently need new, applicable and workable approaches through which sustainability goals can be operationalized on all policy levels and among all stakeholders. Urban development models in high growth areas also require improvements and dialogue within and among actors. Such transformations can be accelerated through dedicated research, education, use of experimental urban development models, monitoring and consensus building among all stakeholders of the societies and not just some interest groups per se.

Despite extensive dialogue about the challenges for achieving sustainable urban developments, lessons and experiences from the initiatives such as the Garden Cities, New Towns, eco-developments, Eco-towns and the eco-cities offer valuable insights as to what works and why. These experiential processes also reveal insights into how change can be fostered and supported in the context of the dynamic, complex and evolving nature of urban transformations. The concepts that were reviewed in this paper emerged from concerns that stemmed from the negative impacts of industrial and developmental processes that were initiated in the late 19th century. Those concerns are still valid and the more detrimental consequences are occurring in ways that may be irreversible. The urgently needed shift in mindset that must happen will require efforts by all stakeholders (Hoxie et al. 2012). Despite the challenges on economic, societal and political levels, effective ways must be designed, implemented and embedded in the mindset of all people. This is especially important for rapidly developing countries, which have a projected growth of 2.3 billion in population by 2050 (UN 2009). Forward looking urban development policies that are designed with an ecological worldview will help societies make the transition to post-fossil-carbon societies that are equitable as well as ecologically and socially sustainable in the short and long-term future.

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2.3 Reflections on the findings of Chapter 2

The first part of the literature review presented in Chapter 2 provided this thesis author, the body of knowledge that was necessary to understand how the concerns for negative social, environmental and physical impacts caused by rapid urbanization had emerged and have been addressed since industrialization was implemented during the 1800s. The policy level decisions and the institutional mechanisms, tools and frameworks that were established to resolve sustainability issues during the past three decades were explored and the extent to which they performed better or why they produced less successful results were discussed. In conjunction with the urbanization trends of the 20th century, the authors of this chapter first investigated the Garden Cities and subsequently followed their study through to the emergence of the New Towns of UK and the post-WWII era urban planning and development trends that emerged around the world. The wide adoption of modernism's simplistic approach to separate the functions of living, working and socializing both within the realm of architecture and in terms of developing new towns and cities was found to cause undesired social, physical and environmental consequences, some of which were discussed in conjunction with the emergence of the sustainability concepts and urban policies of the second half of the 20th century.

Chapter 2 also provided an in-depth look into the theoretical approaches that were operationalized within the realm of urban planning so as to provide insights into the change processes in urbanization and with respect to urban development policies. The research on Ecological Modernization (EM) and Sustainable Development (SD) showed that establishing sustainable urban developments within the classical developmental paradigm required synergistic and systems thinking approaches in order to effectively operationalize sustainability goals and address the emerging and complex urban challenges. The societal and ecological integrity aspects were found to be relatively less emphasized within the EM's technology and innovation driven framework while the SD's effectiveness to reconcile all social, environmental and economic goals was found to be vague and was challenged by the emerging threats of *climate change, population growth, economic and social crises, resource constraints, food and water insecurity, biological loss and many other disasters.*

As a result of the study conducted on the theoretical approaches that made significant contributions to operationalizing environmental policies and measures, *the relative successes of the Northern and Western European nations were attributed to the stepwise adoption of EM and SD concepts and to the gradual change in the environmental policy implementations based upon active citizen participation, education, experimentation and empowerment*. With regards to the change processes in urban planning and development, although the impacts of EM and SD were found to be significantly positive in the Northern and Western European nations since the mid 1980s, the authors concluded that design-based

holistic concepts were urgently needed in order to more effectively make the transition to sustainable post-fossil carbon societies.

In that context, Regenerative Development and Positive Development theories were discussed as more holistic sustainability concepts, which can help to shift from a restorative to reconciliatory and ultimately toward achieving regenerative and net positive realities.

In the subsequent phase of the thesis research, the eco-town developments, whose emergence coincided with the EM and SD concepts' integration into the urban policy frameworks in the Northwestern Europe, were found to be valuable sources of information that could provide insights into the progressive steps taken by these nations.

Therefore, as presented in Chapter 3 of this thesis, the eco-town developments, their typologies, processes and frameworks were reviewed, firstly more broadly and then through the in-depth study of the Northwestern examples. The similarities and differences of the development frameworks were explored and the aspects that could help the planners and decision-makers to achieve future eco-town based urban developments' sustainability goals and objectives were discussed.

Chapter 3

Eco-town developments as a tool to catalyze sustainable urban transformations: Literature Review (Part 2)

3.1 Chapter Overview

Chapter 2 provided important insights into the concepts and approaches set forward to address urban, social and environmental problems, from which the eco-town based initiatives had emerged. These were found to be valuable examples for analyzing modalities and the extent to which the integration of environmental planning in urban planning and development policies evolved in the Northwestern Europe since the late 1980s and 90s. The progressive urban policy approaches of the Northwestern European nations were emphasized. In this phase of the research, the nations, which adopted forward-looking urban planning policies, strategies and frameworks, were identified and their sustainable urban development initiatives were investigated.

In Chapter 3, findings of a review of the relevant literature on the eco-town based programs and initiatives was presented, based upon their typologies within the broader geographical contexts and subsequently, with a particular focus upon the development processes and frameworks of the eco-towns studied in Germany, Sweden and The Netherlands.

The review process included exploration of the contexts in which the eco-town developments were initiated since the emergence of the planned communities in the 20th century. This provided the authors, insights into the contextualization of the eco-town initiatives as well as the similarities and differences that were found among the various cultural and institutional contexts. Subsequently, the procedural, conceptual and contextual factors, which were considered to have influenced their goal achievements, were discussed.

This second part of the two-part series of the comprehensive literature review helped to provide the necessary knowledge about the eco-towns' development processes and helped the author to identify the key aspects that were essential for achieving relatively more successful eco-town based urban developments in the Northwestern European contexts.

Additionally, the operationalized and emerging theoretical approaches were reflected upon and the strengths and weaknesses of the existing developmental models and frameworks were discussed. The paradigm of Sustainable Development in conjunction with the policy frameworks upon which the demonstration eco-town developments were introduced lacked effective contextualization. Thus, the design based integrative and holistic approaches were amplified upon to deal with the growing number of emerging new towns and cities or urban re-developments and to more adequately address their populations' social, cultural, physical, environmental, political and organizational changes and adaptations.

Section 3.2

Are lessons from eco-towns helping planners make more effective progress in transforming cities into sustainable urban systems: a literature review (part 2 of 2)

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Are lessons from eco-towns helping planners make more effective progress in transforming cities into sustainable urban systems: A literature review (Part 2 of 2)

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Abstract

Eco-town developments have been the testing grounds to improve upon the urban policies and practices in the Northern and Western European countries since the early 1990s. It has been widely discussed as to whether or how they have helped transitioning of towns and cities into more sustainable systems in the larger urban context through educational, experiential, societal diffusion and changes in governance processes. The countries in different cultural and geographical contexts with rapid urbanization rates, seek to establish similar developments with relatively less knowledge of the contextual and procedural differences in the eco-towns' processes or the reasons for their varying levels of impact. This article was prepared to summarize and systematize the insights that have been obtained from 'eco-town' based urban developments implemented in the Northwestern Europe with particular emphasis given into the examples from The Netherlands, Sweden and Germany. The review of the relevant literature was conducted with the focus on: ***a.*** the context in which the demonstration eco-towns were developed since the emergence of planned communities in the early 20th century, ***b.*** the typologies, processes and frameworks through which the eco-towns were initiated, built, governed and evolved. The authors analyzed the wide diversity of frameworks and processes that have played roles in the relative successes and/or failures. The review provided insights into their procedures and the aspects associated with the diffusion of the lessons into the broader urban planning and development methods. The findings suggested that the political commitment, timing, financial aspects, physical qualities, stakeholder involvement and environmental planning were key elements in achieving the eco-towns' goals. Future research is recommended to critically analyze the impacts of these historically new urban development models and frameworks in order to create more effective approaches for achieving positive outcomes for all societies within ecological boundaries.

Keywords

Regenerative development, positive development, sustainable development, eco-towns, urban transformation, planned communities, quality of life, urban security, societal equity

1. Introduction

Urbanization and urban development in the 20th century were driven by economic growth policies based on resource-intensive processes that caused rapid degradation of our eco-systems and are decreasing human well-being for many inhabitants. It is estimated that cities contribute 40-70% of the annual greenhouse gas (GHG) emissions attributed to anthropogenic sources while they consume about 75% of the total energy (Boone & Ganeshan 2012, p.14). It is further estimated that the buildings account for 40% of the overall global energy consumption, which in turn release about 30% of all energy-related GHG emissions (UNEP 2014, p.9). This and many other urban processes cause extensive air, water and solid waste pollution problems in the rapidly developing urban regions in emerging economies (UN-Habitat 2011).

In an effort to address these social and environmental implications caused by unsustainable urban growth policies, alternative design and development models emerged as grassroots movements in the early 1960s. These included co-housing projects and intentional communities (Sanguinetti 2014; Lietaert 2010), which also contributed to the emergence of the eco-villages and eco-communities during the course of next three decades in the Northwestern Europe, the United States and subsequently around the world. While some of these developments were initiated with social ambitions, such as social interaction, cooperation, participatory design and governance (or for better quality of life) (Kirby 2003; Van Schyndel-Kasper 2008), others did so for environmental stewardship (Miller & Bentley 2012) or resource efficiency as their main drivers (Baas et al. 2014, p.27). These community-led initiatives, despite their wide recognition for socially and ecologically sustainable design principles somewhat failed to make significant impacts / contributions to the mainstream design and urban planning paradigms. Together with the release of the Brundtland Commission's 1987 Report, more concerted efforts began in order to address sustainability and the concept of sustainable development (SD) although there remained contested views in terms of the limitations of their definitions.

Subsequently, the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit in Rio held in 1992, emphasized all dimensions with regards to sustainable urban growth and addressed issues pertaining not only to the ecological aspects but it also covered social and societal aspects to more thoroughly attain sustainability (Seyfang 2003, p.224). The most significant document released from the Earth Summit was the Agenda 21 (UNCED 1993), which has been used as the foundation for many Local Agenda 21 (LA21) urban development activities around the world. Such activities were also the foundations for the "Eco-towns" that were planned and implemented to fulfill multiple roles, among which they were designed to serve as catalysts for the broader society to make changes toward more sustainable town and city development and transformation processes.

Some countries in Europe, including but not limited to the Netherlands (de Vries & Rashevskaya 2009; van Hal 2000; Duijvestein 2005), Sweden (Vernay 2013; Kasioumi 2011; Khakee 2007), Denmark, Germany (Frey 2010; Freytag et al. 2014; J. Williams 2013) and Spain (Kyvelou et al. 2012)) as well as in Japan (Low 2013), China (Chang & Sheppard 2013; Caprotti 2014a; Caprotti 2014b; de Jong et al. 2013), Australia and the United States (Miller & Bentley 2012), have been and are taking progressive urban change initiatives, in different scales or ambitions (Rapoport & Vernay 2014), to determine if building demonstration eco-developments can showcase innovative approaches in urban planning and implementation, which can be used to guide new urban developments and re-developments. However, due to their relatively short history and due to the fact that these experimental projects are ongoing dynamic processes, relatively few, in-depth studies have been done with regards to their frameworks and processes or their environmental and social impacts. Therefore, it was deemed to be valuable to analyze the key similarities and differences procedurally, conceptually and contextually among those planned communities with respect to their initial goals and outcomes and to build upon their experiences.

This paper is the second one of a, two-part review of the literature on the evolution of urban planning and development trends since concerns emerged on the negative social, economic and environmental impacts of industrial revolution. The first article reviewed the emergence of key concepts of sustainability and sustainable urban developments and also highlighted different conceptual approaches.

In this second article of the series, the authors expanded upon the emergence of the demonstration eco-town developments in the Northwestern European countries that were initiated during the 1990s. Their frameworks and processes were investigated and the challenges, opportunities and lessons derived were explored. The authors explored whether and/or how the insights obtained will contribute positively for planning and implementing more advanced developments in other contexts. Therefore, the authors highlighted the potential contributions of the evolving concepts and approaches so that better urban development policies and practices can be established more effectively in other cultural and geographical contexts.

1.1 Scope of the literature review

The literature review was based upon journal articles, conference papers, grey literature and research-based findings that were relevant to the historical evolution of the sustainable development concepts with particular emphasis on eco-towns that were initiated during and since the 1990s. This research was conducted from the following perspectives: Firstly, the emergence of sustainable developments was reviewed based upon papers published between 1983 and 2013. Secondly, the relevant articles on eco-town developments within the Northwestern European countries, with emphasis on Sweden, Germany and the

Netherlands, were comparatively evaluated with particular focus upon their objectives, frameworks, processes and results.

1.2 Terminology

Sustainable development (SD) refers to '*the use of resources concerning all activities in relation to human development while preserving the environment for present and future generations'* (WCED 1987). In the context of urbanization and its processes, sustainability as a concept has been found to challenge numerous policies of urban growth within a system that is based on consumerism. Economic, environmental and social implications of growth policies since the early 20th century became prominent with *the Brundtland Commission's Report* (World Commission on Environment and Development, 1987). In that report, the following challenges were projected to become critically important in terms of development, which needed urgent attention: *a. human population growth, b. food and arable land scarcity, and c. various other social and economic implications* (WCED 1987; Gilland 1983, p.203). According to Birkeland (2012), the Report contributed positively in many ways to raising awareness of sustainability, however only within a '*neoclassical economic framework*' (Birkeland 2012, p.168). She further noted that it also had shortcomings with regard to the built environment as it failed to underscore the "*centrality of cities*" in *environmental issues and/or solutions*, despite the fact that other researchers, including Wolman (1965; 1971), have already discussed these aspects (Birkeland 2012, p.169).

In this literature review, the term *"eco-town"* was focused upon demonstration urban development projects initiated as part of SD initiatives in the 1990s. They were and are being implemented at district scales in the proximity of the existing urban fabric or as an integrated development with mixed-use properties to provide its citizens a better quality of life through environmentally sound planning and implementation and through integration of innovative urban systems, technologies and improved governance. Similar to Barton's (1998) definition of eco-neighborhoods, the term 'Eco-town' was initially used generically within the urban context, which recognized the 'ecological imperatives' and also highlighted energy efficiency, transport efficiency, environmental quality and community creation as key goals (Barton 1998, pp.164-167). However, the eco-town initiatives varied widely in size, scope, objectives and implementation models depending on the cultural and geographical contexts. Therefore, the review of relevant literature also included searches for the terms such as: '*low-carbon developments*', '*smart cities*' and '*eco-cities*', which increased the number of relevant papers found published in this field, some of which were associated with the eco-towns as identified in this paper.

The terms, 'Regeneration' and 'regenerative design' were explored by J T Lyle (Lyle 1994; Reed 2007; Birkeland 2012) as early as 1994 along with many other approaches in ecological design including but not limited to 'positive development', 'biomimicry',

'permaculture' or 'cradle to cradle' (Birkeland 2012, p.168; Birkeland 2014). Regeneration, in the context of built environment, was described by Cole (2012a) as the renewal and rebirth of a place after 'major acts of devastation' or the deterioration of the conditions that existed previously (Cole 2012a, p.1). 'Regenerative development' refers to urban developments that are contextualized within a symbiotic human and nature relationship, forming a mutually beneficial environment (Mang & Reed 2012, p.36) whereby, the inhabitants live and improve the 'system of the place' within which they live.

1.3 Methodology

This article addressed 'eco-town' development from two perspectives: Firstly, the published materials on eco-towns from around the world were reviewed. Secondly, the collected data were categorized according to relevance, type and quality. The review was done between 2008 and 2014 with regard to eco-town developments that were initiated during and after the 1990s. During this period, many initiatives were initiated globally, however due to the relatively small amount of material with qualitative and quantitative information; the initial literature review was limited to fourteen eco-developments of varying sizes, scopes and in eleven different locations. The data were analyzed and, comparatively evaluated. Subsequently, the research conducted on the selected cases between 2010 and 2014 was focused upon the examples with ex post evaluations from the Northwestern European countries. The evaluation of the selected cases included procedural, conceptual and contextual aspects (see Table 1) in order to clarify the differences and/or the similarities of the development processes, hence the level of applicability of their development models for future developments in other contexts.

Table 1. Evaluation criteria for comparative analyses of eco-town development processes.

Procedural	• How were they initiated? • How were the processes governed? • How was stakeholder engagement / involvement ensured and implemented? • How was the project funded? • …
Conceptual	• How was the design process managed at the architectural, urban planning and environmental model levels? • How was the conceptual framework established? • ……
Contextual	• What was the context within which the eco-town was initiated and implemented with regard to size, scale, population, demographics and governance? • What were the initial goals and objectives?

Furthermore, the literature on the concepts of sustainable development, 'Ecological Modernization' (EM), 'Positive Development' (PD) and 'Regenerative Sustainability' were reviewed during the same timeframe with particular emphasis on the urban policies and

urbanization processes. The search terminology was developed based on the key topics that were found to be relevant within the scope of this review, which consisted of but were not were limited to:

- *Eco-town*
- *Eco-town development frameworks*
- *Eco-municipalities*
- *Eco-development*
- *Eco-neighborhood*
- *Eco-villages and eco-village networks*
- *Sustainable urban districts*
- *Low-carbon development*
- *Eco-cities*
- *Smart cities*
- *Regenerative design and development*
- *Positive development principles*

These analyses included published materials from major databases including the information obtained from university libraries, electronic databases, official government and NGO websites as well as the organizations and institutions that were selected for in-depth analyses of eco-town processes addressed in this paper. Primarily, English language documents were searched and analyzed. Moreover documents in the German, Dutch and Swedish languages were found to be valuable; therefore they were analyzed after being translated via Google's Translation tool. Peer reviewed papers were downloaded and indexed using the reference management software (Papers version 2.0). The sites accessed were saved and dated where available.

2. Brief background on SD in relation to the initiatives of eco-town developments

Subsequent to the Rio Summit in 1992, some European countries adopted urban policies to mitigate the environmental impacts of urbanization processes by establishing and encouraging long-term local action plans such as the International Council for Local Environmental Initiatives (ICLEI)'s LA21. One of these efforts came as a result of the *Charter of European Cities and Towns: Towards Sustainability* (CEC, 1994) that underscored the need for social justice, sustainable economies and environmental sustainability (Burton 2001). This charter, also known as the 'Aalborg Charter' (AC), clearly stated the need to involve all citizens as key actors in the decision-making processes and also the need to train and educate the public including the elected officials in the concepts of sustainable urban developments (CEC 1994). As a major step, The AC was initially signed by eighty local authorities and later by an additional 253 international organizations, which pledged to take specific action towards transitioning

into sustainable towns and cities. This led to the adoption of Local Agenda 21 processes for developing long-term action plans. As a result of the campaign, many initiatives from local to national levels were built, one of which became known as the ***Eco-towns*** in Europe.

Despite the complex nature of efforts to establish sustainable developments, demonstration projects *including the eco-towns* have evolved into being testing grounds for policy makers, academics and professionals to learn how to establish improved urban development practices in relation to their frameworks, processes, planning, implementation methods and assessment of the perceived quality of life of the eco-town's residents.

3. Eco-town initiatives

'Eco-town' is an evolving term along with the definition of sustainable communities, which is being refined and improved, through the *physical, ecological, technological, economic, psychological* and *social* changes that are occurring in societies. In the context of this paper, 'eco-towns' refer to '*mixed-use developments*', which were integrated within the urban area as part of a wider spatial plan to provide their people, the services and facilities and businesses to sustain them. They were connected to make extensive use of the existing urban infrastructures while having claimed to provide a relatively better quality of life for their residents, as they co-exist in the broader urban eco-system in which they were established. (Kyvelou et al., 2012, p.562)

The terminologies for 'eco-towns, have varied according to the types, concepts, policies, programs and initiatives that were integrated within the different cultural and geographical contexts. For example, the Department of Communities and Local Governments (DCLG 2006) in the UK, defined eco-towns as settlements of between 5,000-15,000 homes in the form of a neighborhood or groups of neighborhoods where any larger size would refer to eco-cities. In the context of other European nations such as Sweden, Germany, the Netherlands and Spain, the term "eco-town" was understood to be a development with mixed-use properties and with environmentally friendly planning, implementation and integration of innovative urban systems and technologies. The definition in Europe was associated more generically with eco-developments that were built and/or which are being built to demonstrate sustainable urban development models upon which this paper is focused.

Kyvelou et al. (2012) characterized European examples as the 'eco-neighborhoods' (pp. 562-564) with populations of around 7500 people. Their definition of the projects from the 90s in the European context also referred to the demonstration projects that were built to promote a learning, experiential process for stakeholders. These developments exhibited high levels of technical / technological solutions (recycling of water, integrated renewable

energy systems etc.) and opportunities for decision-makers to test their policies and choices in governance (Kyvelou et al. 2012). Earlier, Barton (1998) categorized eco-developments in different scales from individual units to the size of villages and towns. His typology involved rural to urban settings from various geographical contexts. Hodson and Marvin (2010) investigated eco-towns within the context of integrated eco-urbanism which they referred to as the places with integrated local food, water, waste and energy systems that supports and sustains healthy lifestyles in general (Hodson & Marvin 2010, p.303). Moreover, the characterizations of eco-developments go beyond the size and scope of eco-towns (at least beyond the ones that are discussed in this paper) such as those that were initiated and/or which are being built in the size of cities and even regions (Caprotti 2014a; Caprotti 2014b; Joss & Molella 2013; de Jong et al. 2013). In other parts of the world, the term was often defined more broadly, not only for residential developments but also for industrial town developments depending on the program or initiative they represent (see Section 3.1).

Even in the case of demonstration eco-towns, European examples were found to follow a number of different approaches with regards to their objectives, environmental policies and in their design. The drivers were found to differ according to location, time and conditions in which the projects were introduced (see Table 2).

Table 2. Comparative elements of eco-town initiatives evaluated for this literature review.

Drivers for initiation of the development	The Main objective	The Scale / Level	The Leadership
- Political consensus	- Sustainable growth	- Individual	- Governmental / (Ministry)
- Business interest	- Environmental care	- Community	- Local level / (Municipality
- Local initiative	- Eco-efficiency	- Neighborhood	/ community)
- Community initiative	- Urban regeneration	- Municipality	- Corporate level
-	-	- Metropolitan	(Investor / developer)
-	-	- National	

As expanded upon in the first article of this two part literature review series, in the Western European and Scandinavian contexts, the early steps to help cities make the transition toward more sustainable patterns involved various programs some of which were supported by governments and local authorities and some were simply initiated by communities themselves. These initiatives varied in size, scope & scale within neighborhoods and within larger contexts (Barton 1998; Kyvelou et al. 2012). Some of the initiatives that were started with moderate budgets and resources, gained popularity while some others that were planned to help the leaders to gain insights and experiences, initially failed in aspects such as energy, water management, construction, materials, transportation, biomass & biodiversity due to their limitations in societal and governance contextualization. Some of the early Dutch developments were basically a ‘live and learn’ process (see Section

4.1), designed and built to understand the leverages for making positive changes and for overcoming the social, political and economic barriers throughout The Netherlands' evolving environmental policies (Keijzers 2011) since the 1970s.

The lessons learned from these experiences were due in part to proper monitoring, which helped the Dutch, to design and implement, subsequent, high quality eco-developments such as 'Stad van de Zon' in Heerhugowaard and Nieuwland in Amersfoort. Similar initiatives were taken in Sweden and Germany. Sweden's Green Welfare State (Lundqvist 2000, p.23) was designed to create sustainable communities along with local and central governmental initiatives to develop eco-towns as part of their urban development programs. As illustrative of these efforts, urban developments such as Augustenborg in Malmö, Hammarby Sjöstad in Stockholm, Sweden, Vauban and Rieselfeld in Freiburg, Hafen City in Hamburg, Kronsberg in Hannover, Germany were developed and can be named among some of the many initiatives globally.

Other governments such as Spain, China or UAE developed eco-town initiatives after the 90s to experiment and showcase implementation of progressive approaches in their urban development policies and practices. Due to the general consensus among Northwestern European nations on the need to address climate change and related impacts on their populations from a broader and more holistic perspective, more significant progress was made in this region than in other regions.

3.1. Eco-towns in the Asian context:

In the context of Asian countries, the Japanese initiatives were the most widely recognized and researched as part of the eco-town initiatives, however with significant contextual differences in the vision, scale, goals and frameworks. Japan's plan to develop eco-towns was introduced in 1997, with the objective to achieve economic stimulation through waste reduction and recycling with increased use of renewable energy sources (GEC, 2005). Financial support for their eco-towns was provided by the National Government and by city administrations in collaboration with the Ministry of Environment (MoE) and Ministry of Economy, Trade and Industry (METI), for projects that were anticipated to be environmentally sound. Most of their projects were identified as either hardware or software projects. The hardware projects consisted of integration of material's recycling and reuse in industrial production, while the software projects were associated with information technology, planning and engineering.

Since the Kyoto Protocol, Japan's 'eco-towns' program achieved significant progress through implementing policy changes to foster the adoption of extensive innovative urban solutions mainly through promoting the 'reduce, reuse and recycle' (3R) approach in their heavily industrialized cities. This approach was regarded as progressive, especially in the

context of the *"dense population, geographical closeness of industry, business and settlements and a highly developed transport infrastructure."* (Bahn-Walkowiak & Bleischwitz 2007, p.9). The key results in terms of the achieved rates of participation and implementation of the program were mainly because they developed local initiatives through strong commitment of the national government and local authorities. They also developed and implemented regulations, provided economic incentives and facilitated active participation of stakeholders at the community level. Among the 26 eco-towns in Japan, *Kawasaki, Naoshima, Kitakyushu* and *Minamata* were the most researched Japanese eco-towns (Norton 2007, p.6). Despite the similarity of the use of the term 'eco-town', the Japanese initiatives were launched to establish innovative approaches in industrial production and administration, thereby, to help to develop more sustainable industries, not primarily for providing more sustainable communities for their inhabitants.

In the Asian context, China's approach to planning and developing eco-towns was within a different framework from that of Japan's industry driven approaches. Compared to Japan's very urbanized and land-strapped cities, China is rapidly becoming an urbanized society due to its economic growth policies since the early 80's (Chen 2007). The administrative boundaries are changing and are constantly pushing the rural citizens to become urban dwellers as the new mega-cities emerge (Kojima 1995; K. H. Zhang & Song 2003). Especially in the last two decades, Chinese states and cities have experienced very rapid transformations fueled by the political economy, which often '*ignored welfare provisions or other basic needs'* of the broader public (Xu & Yeh 2005, p.303). One of the main reasons for this could be the allocation of state power to local governments that enabled them to start their own land development companies in partnership with private commercial developers and to therefore, be able to initiate many large scale projects in short time horizons (Ben-Joseph 2009, p.2693). The political and economic factors were mostly the drivers rather than the environmental concerns in their rapid rate in creating new mega city projects in the Chinese states (Hald 2009). However, more than 40 eco-town / eco-city projects were initiated (Knox 2010; Ben-Joseph 2009, p.2697) but they were significantly different in the initiation and development processes and frameworks in comparison with their European counterparts.

Chinese efforts to improve their urban planning and implementation policies are being increasingly based upon lessons from the experiences in *the Erdos-Dongshen, Huangbayiu* or *Dongtan Eco-towns*. It was learned that they needed to give greater attention to participatory and more holistic design processes. They learned that community participation was vital from the start of any project, in order to obtain societal acceptance of innovative systems and technologies (X. Zhang et al. 2011). Although greater attention was required to the social and environmental aspects in the rapidly developing regions of China, the

environmental degradation and its impacts on biodiversity, climate change as well as on the quality of life of communities have not been adequately addressed.

The Chinese efforts to create multiple mega-cities may require more across the board, bottom-up decision-making processes in order to achieve sustainability on all social, political, economic and environmental levels (X. Zhang et al. 2013). Both in theory and in practice, the European models followed relatively more holistic systems thinking approaches than those used by their Chinese counterparts. These less holistically planned systems pose multiple challenges in design, governance and implementation due to the rapid urbanization's unintended consequences such as short-term political and economic interests dictating the processes, instead of sound ecological and sociological principles being used to help to ensure that the new developments are more sustainable in both the short and in the long-term (X. Zhang et al. 2013).

4. Comparative approach of analysis of the findings of the review of literature of the eco-town developments in Northwestern Europe

As expanded upon in Section 3, the eco-towns were and are being implemented in various sizes, scopes and contexts around the world. Due to the extensive amount of data that would need to be gathered and analyzed in order to more comprehensively evaluate their processes, a global assessment was considered not feasible. Instead, the authors focused on the Northwestern European examples with ex post evaluations most of which were published in peer reviewed journals. In that context, the review of the relevant literature revealed several factors that were identified to play a role in their implementation processes. These factors were categorized into three groups in order to clarify how they performed in terms of achieving the initially desired goals of the projects. They also helped the authors to better study and analyze these outcomes comparatively and in relation to the evaluation of various models and frameworks used in the eco-town development processes.

From the review, it was found that the context in which the eco-towns were initiated, designed, developed as well as their governance models strongly influenced their relative successes and failures. The findings are reviewed in the following sections and the insights from these findings were formulated to help future eco-town planners to avoid potential problems and to build upon the success-factors.

4.1 The drivers for planning and implementing of Eco-towns

In the early European context, the drivers were very similar. They usually focused on a few goals such as providing affordable housing, improving energy efficiency through renewable and integrated energy production, waste reduction, and water recycling. These

earlier models, which were usually conservative in size and scope, were mostly community level, alternative movement initiatives located in the periphery of cities or on rural land (Kyvelou et al. 2012, p.563). The projects of the 90s were implemented by governments to showcase their commitment to establish sustainable development through initiatives such as the Ecolonia in Alphen aan den Rijn (Barton, 1998, Vernay 2013), Ecodus in Delft (de Vries & Rashevskaya 2009) and Nieuwland in Amersfoort in the Netherlands (de Zeeuw et al. 2010). Similarly, in Sweden, the examples included projects such as Malmö Bo 01, Hammarby Sjöstad and others (Femenias 2008; Femenias et al. 2010) while in Germany, Rieselfeld and Vauban in Freiburg are among the most recognized and researched developments (Ornetzeder & Rohracher 2006; Freytag et al. 2014; Scheurer & Newman 2009).

The eco-town projects initiated in the early and mid 1990s in the Northwestern Europe, were designed to establish urban development models tentatively with circular metabolisms (Girardet, 1996). They had different drivers that included holistic environmental agendas for urban transformation, social justice or economic equity (Kyvelou et al. 2012). Some of the projects were introduced because they were designed to take advantage of "*events"* such as the Olympic Games or EXPO fairs that were referred as the "*situations of opportunity*" (Svane 2007b) and could therefore, enhance the image of the host cities (Kyvelou et al. 2012, p.564). In contrast, some eco-towns were developed based on decades of planning to be integral to national commitments for transitioning their cities to become models of forward-looking urban development procedures and policies.

Additionally, recently, countries such as the UAE and China have been working on developing city scale projects designed to develop and test replicable models, which Hodson et al. (2010, p.310) refers as the '*global financial products'*. Due to their size, technological and economic dimensions, it is not yet clear if they are replicable in other contexts (Hodson & Marvin 2010). Furthermore, due to their relatively short history, the environmental performance of their integrated systems and technologies is still being studied (Pandis Iveroth et al. 2012), and assessed with little emphasis on 'quality of life' consequences. Moreover, transferability of the lessons and replicability of these examples in different spatial and temporal contexts require in-depth investigations in terms of their appropriateness as they pose complex political, economic and cultural aspects (Guy & Marvin 1999, p.273; K. Williams 2010, p.130).

The following section of this paper highlighted the similarities and differences found with respect to the elements that influenced the outcome of the eco-towns' development processes and gained knowledge into their frameworks with particular emphasis given into the Northwestern European context. Subsequently, the authors evaluated the effectiveness of the current principles upon which the eco-towns and similar initiatives were introduced in order to transition rapidly growing cities into sustainable urban forms.

4.2 Vision / Design / Frameworks

As stated in Section 4.1, the demonstration projects in Europe were implemented in response to diverse drivers. Besides the goal to resolve affordable housing shortages in the 80s and early 90s, the early models were initiated to experiment with and to test innovative urban solutions. The more recent examples were however, designed and built to showcase more holistic integrated mixed-use urban developments. For example, Hammarby Sjöstad in Stockholm, Sweden, was developed as part of a scheme to decontaminate a brownfield site, which was once used for industrial activities. Vauban in Freiburg, Germany, was a showcase settlement project for energy efficient housing and reduced car use that was developed on a former army base. The Rieselfeld, also in Freiburg Germany, was built on the site of a former sewage works. Similarly Hafen City in Hamburg, Germany, was designed to fulfill the needs for environmentally sound development in a mixed-use, integrated district that was part of the vision to rehabilitate a waterfront area. For example, Nieuwland development in Amersfoort, The Netherlands was developed to test building integrated photovoltaic systems, whilst maintaining high standards of social and environmental sustainability. Stad van de Zon in Heerhugowaard, also in The Netherlands, was built on previously vacant land in order to create a CO2 neutral community. Among these examples and others, the character, affordability, connectivity and improved physical, social and environmental qualities were crucial objectives of their planning and design.

Some of the most significant cases were developed to establish sustainable neighborhoods or were strongly influenced by the relative degree of democratic, transparent and inclusive governance structures, and by their design and development processes (Kyvelou et al. 2012; Toussaint 2012; Pandis et al. 2011; Svane 2007a; 2007b; Femenias 2008: van Hal 2000). Although the principles and frameworks had common threads (see Table 2), it was found that they varied in their implementation models depending on the community, the place

Table 3. Diverse types of sustainability frameworks that were adopted for building sustainable communities and urban developments that were reviewed for this document.

Sustainability tool / framework	Objective(s) / focus area
Bioregional One Planet Framework	To establish sustainable communities
LEED for Neighborhood Development	To build sustainable urban developments
DPL's Sustainability Profile	To establish sustainable urban planning
ICLEI's set of tools for sustainable local change	To create sustainable local governments
Cambridgeshire's Quality Charter for Growth	To Eco-town development
Charter for New Urbanism	Set of principles for Sustainable Urban Developments
New Zealand Urban Design Protocol	Green urban design protocol
Eco DISTRICTS	Establish Sustainable neighborhood / district
Regenerative Design Methodology	Create regenerative urban developments
Positive Development Assessment Tool / Framework	Bio-physical design-based systems approach
(…) and more	(…)

or the conditions during which they were planned, developed and implemented (Peterson, 2008). Consequently, diverse profiles, typologies, processes (Kyvelou et al. 2012) as well as different frameworks (See Table 3) were developed and used.

After in depth research, these frameworks were found to stem from basic principles similar to those stated in The Freiburg Statement on New Urban Neighborhoods (see Box 1). Despite Barton (1998)'s skepticism, which he referred as '*a rather nostalgic idealism'* and *'counter to dominant market trends*' (p.162), these principles applied to almost all eco-town processes and frameworks that were used in the contextualization of Western and North European eco-developments.

Box 1. The Seven Principles of the Freiburg Statement on New Urban Developments.

- *Heterogeneous social composition, with special attention to the needs of children, elderly and low-income groups;*
- *A pedestrian-dominated public realm to facilitate 'good social life' and provide an attractive human-scale environment;*
- *Diversity of use- housing, work, shopping, civic, cultural and health facilities in a fine-textured, compact, low-rise urban fabric;*
- *Active and frequent participation of all segments of the population in planning and design of the area, thus an incremented not authoritarian design process;*
- *Architectural identity that is rooted in the collective memory of the region, reflecting characteristics most valued by the local community;*
- *Pedestrian, bicycle and public transport networks within the neighborhood and linked to the city as a whole, thereby discouraging automobile use;*
- *Ecologically responsible development principles consistent with social responsibility and cutting energy use and pollution.* ***(Making Cities Livable, 1996)****,* (Barton 1998, p.162)

Subsequently, the 'Hannover Principles' were developed by McDonough & Partners (1992), and addressed a more relevant and refined set of principles that resonated with the severity of the environmental challenges discussed in the urban contexts. These principles, which formed the theoretical background for the EXPO 2000 (McDonough 1992; McDonough & Braungart 2012), stated the basic steps as to how the urban developments should be envisioned both physically and philosophically.

1. *Insist on rights of humanity and nature to co-exist.*
2. *Recognize interdependence.*
3. *Respect relationships between spirit and matter.*
4. *Accept responsibility for the consequences of design.*
5. *Create safe objects of long-term value.*
6. *Eliminate the concept of waste.*
7. *Rely on natural energy flows.*

8. *Understand the limitations of design.*
9. *Seek constant improvement by the sharing of knowledge.*

The Hannover Principles, Design for Sustainability (McDonough 1992)

The initiators of eco-town developments have emphasized similar other sets of principles, visions and mission statements that were found to reflect their sustainable development values. Based on the review of relevant literature; the authors of this paper highlighted the common elements that were found to influence the outcome in the following sections and subsequently addressed the aspects that require further investigation and testing.

4.3 Environmental management / goals and objectives of Eco-towns

Based upon ex-post studies, clearer insights on the implications and actual achievements revealed that the 'goal achievement' has varied depending upon many factors including but not limited to the governance model, stakeholder involvement, systems design and decision-making or funding. In fact, almost all elements of the eco-town development processes were found to influence the outcomes (van Hal 2000, p.143) either positively or relatively less successfully depending on the extent to which they were included.

The literature review showed that peer-reviewed evaluations of eco-towns were limited and only in a small number of cases critical analyses of the 'goals achieved' have been performed and published. Or the evaluations are not very reliable due to the lack of initial data from that site at the beginning of the eco-town's development (Pandis Iveroth & Brandt 2011, p.1061; Peterson 2008, p.10). In some cases, the data were too generalized to the urban context in which the eco-towns were situated and the official reports provided little or no specifics on the eco-town's actual achievements, therefore, it was difficult to assess the relative success or failure within the timeframe of the analyses. This literature review revealed that the key reasons why the initial goals of eco-town initiators may or may not have been achieved, depended on the way they were contextualized and how their development processes were managed as a result.

The most significant findings in terms of the 'environmental plans' of eco-towns reviewed were:

a. The environmental goals that were identified through design panels comprised of environmental supervisors, designers and experts in their respective fields were found to have significantly improved the level of goal achievement since they were introduced early in the process. *(e.g. In Nieuwland in Amersfoort, The Netherlands and also in the case of Vauban in Freiburg, Germany)*
b. Furthermore, establishing ambitious environmental objectives helped to ensure that they were achieved due to the development and implementation of a clear vision and a working framework that effectively supported the goal achievement in that geographic

and cultural context. One of the strongest factors that contributed to the project's success in terms of the environmental goals was identified as the participation of people in forming their own place of residence *(For example, Vauban in Freiburg, Germany)* (Sperling 2002; Kronsell 2013; Frey 2010)

c. In the case in which the detailed environmental plan was established later in the development process, it was found to cause conflicts with the design and implementation due to lack of proper stakeholder involvement in the process *(In Hammarby Sjöstad in Stockholm, Sweden)* (Vestbro 2005; Pandis Iveroth & Brandt 2011).

In conclusion, a sound and realistic environmental agenda that is introduced as early as possible in the planning process is an important element that yields significantly improved impacts on the outcomes of the development. However, commitment of the government agencies and administrations is also critically important in terms of ensuring that the environmental measures are designed to achieve the goals. Moreover, during subsequent literature assessments of additional cases, other factors, which are elaborated upon in Section 5, were found to play critical roles in helping to establish successful eco-town developments.

4.4 Financial Plan / Funding of Eco-towns

Planning and funding of large-scale developments such as eco-towns require sound financial planning in terms of operationalizing the design, administration and development from the beginning through the implementation processes. Therefore, commitments from the local administrations as well as from the central governments are vital to ensure continuity of such long-term developments, thereby minimizing financial risks due to changes in the political climate, project champions and the actors involved. Such changes were observed in Hammarby Sjöstad in Stockholm Sweden (Brogren & Green 2003) and resulted with significantly less commitment to the original vision, goals, and objectives to adjust to the changed expectations (Pandis Iveroth & Brandt 2011). As stated in Section 4.1 however, urban events such as the Olympic games, Expo fairs and national programs are critical *'situations of opportunity'* (Svane 2007b) that often create synergies for all economic, political and social justifications, hence the consensus for the development of eco-towns. In the case of Hammarby Sjöstad, despite the loss in the Olympic bidding, the political commitment from both the City of Stockholm (Svane 2007a) and the Swedish government's Ministry of Environment played a positive role as they were politically and financially committed through the Local Investment Program (LIP) designed to encourage implementation of eco-cycle districts (Lundqvist 2004; Bylund 2006).

In Dutch cases however, long-term planning, experimentation and operationalization were involved in order to address housing and urban development projects. For example, the finance for the developments was traditionally provided through the government funding agencies or banks set up by municipalities (SUNN 2011), such as the Bank Nederlandse

Gemeenten (BNG) with strong commitment of the local and regional administrations. In the early experimental and demonstration projects, overall funding was provided through a combination of local, regional and central governmental programs *(Interview in Vathorst i-Centrum, 2013).* Together with the adoption of public-private partnerships (PPP) as a model after the mid 1990s, funding mechanisms became increasingly formulated through loans acquired by the development companies (consortium) thus making the market indicators, the environmental ambitions, the project goals and economic feasibilities, crucial additional variables in the already complex development processes. This change occurred not only in The Netherlands but also in other parts of Europe together with the increased involvement of the market sector in the spatial decision-making, which used to be predominantly centralized in governance and implementation (Heurkens 2012, p.115).

In the cases studied however, the funding was initially provided through governmental programs and city administrations, especially in land acquisition, urban and infrastructure planning and installation. With regard to the PPPs, which became widely accepted and is increasingly used by local and national governments as a model, it was found to be integral to understand the local conditions and the needs of communities (Kyvelou & Karaiskou 2006, p.601) in order to achieve successful implementation of projects including eco-towns. It was further emphasized by the relevant literature that the use of public finance along with public participation through strong democratic local leadership were essential elements to attract private investment, which is instrumental for urban development and regeneration (Adair et al. 2000, p.147). Kyvelou and Karaiskou (2006) further addressed the critical issues pertaining the PPP models with regard to achieving sustainability goals. The local authority's control over the design and development processes was found to be essential. Other essential elements in conducting successful PPP processes included but were not limited to the level of expertise of the private parties, the local authority's negotiation skills and knowledge during which innovative solutions and standards are decided; moreover the local government should be able to set the standards and to monitor the process, while ensuring good collaboration with the public parties (Kyvelou & Karaiskou 2006). In this context, an alternative approach, which is the Public-Community Partnership (PCP), was found to be successful as it was implemented in the development of Vauban, Freiburg. This resulted in collaborative and participatory design and development in which the future residents were involved as the building groups thereby helping to ensure the quality and standards. This is amplified upon in Section 4.6.

4.5 Design and Development of Eco-towns

Physical qualities with distinctive architecture were attributed to the increased citizen interest in the development and they help to ensure success of the projects. However the design culture / process has evolved and is still evolving from being *a user-centered* into becoming a '*for' and 'with' user design* process (Sanders 2002) by the mainstream since the mid

1990s. The eco-town developments being experimental and experiential developments in the Northwestern European context, the participatory culture in which designers and other stakeholders were engaged and involved from the beginning to the completion, evolved more effectively than if these elements were not present. Both in the design and development, it was found that eco-town development models had inclusive, multi-disciplinary design and development processes. The level of stakeholder participation (see Section 4.6) among the cases however differed and consequently resulted in achieving different levels of outcomes than initially expected.

For example, in Amersfoort, the Netherlands, Nieuwland development's architectural and urban characteristics were influenced much from the environmental measures, which in turn created a rather different sense of place for the early residents than has been perceived for the conventional settings of the Dutch neighborhoods. The design principles were found to be rather restrictive and the building integrated PV technologies were relatively new for the architects (Jadranca & Horst 2008), which in turn resulted in somewhat monotonous patterns. These initial perceptions were found to have changed through the evolving design processes as the designers and community gained shared experience and knowledge with increased level of confidence and consensus (interview with Prof. Kees Duijvestein 2013).

In the Hammarby case, due to elements such as the location as well as characteristics of surrounding sites, the project has become highly popular (Vestbro 2005) despite the regulations for ambitious environmental goals that were introduced at later stages (Pandis Iveroth & Brandt 2011, p.1059). On the one hand, the design attributes such as large openings to make good use of the surrounding views were found to create conflicts with the environmental goals (see Box 4) of the project (Johansson & Svane 2002, p.209). On the other hand, the building codes were found to require investments that were perceived to be too expensive for the developers to justify for sales to end-users (Svane, 2007a, p.4). For example in Hammarby Sjöstad, the environmentally friendly building materials were initially claimed by the developers to be 25-30% higher than the conventional methods and materials (Rutherford 2013, p.13). Rutherford, (2013) also noted that only an increase of 2-5% increase in costs was reported, at least by one of the major developers while this cost was reflected as a 15% surplus in the sales price of the built units. Because the environmental model in Hammarby Sjöstad was introduced relatively later than in other similar projects, it was far more difficult to establish and conduct a sustainability agenda in its true meaning, consequently, compromises had to be made. It is important to highlight that the cost of innovation has almost always been priced higher than the actual values especially when introduced without large-scale experimentation or testing through substantial period of time. The developers tend to cover unforeseen direct and indirect costs that can occur due to more than expected levels of maintenance and/or replacements. These problems can cause serious losses not only financially but also in terms of credibility and

trust. In Hammarby Sjöstad, the lack of a clear environmental agenda and the developer-oriented approach resulted in the significantly higher costs per dwelling as was highlighted by Rutherford (2013). For example, in Vauban, higher environmental standards were also claimed to cost more (about 13% for the passive house standards as calculated in 2009) (City of Freiburg 2014) but the building groups that were established from future residents helped lower the overall building expenditures by 15-25% when compared to the average rates in the city of Freiburg at that time (City of Freiburg 2013). As Femenias (2008, p.7) suggested, '*the participation of a large range of actors and stakeholders in the design and development stages with an integrated approach*' is key to achieving successful implementation of eco-town developments. Such participation was found to be valuable in creating consensus among interest groups and for reducing goal conflicts (Box 2).

Box. 2. Orjan Svane's categorization of goal conflicts with regard to the Project Team's efforts in establishing environmental objectives in Hammarby Sjöstad, Stockholm.

Svane (2007b, pp.80-81) elaborated on the goal conflicts in three main categories, which were identified as internal, external and procedural. The internal goal conflict was described as a situation during which two or more environmental objectives could not be met at the same time. The external goal conflict was defined as the situation in which the economic and environmental objectives clashed so that the environmentally friendly building technologies or materials would be too expensive. As a result the residents wouldn't want to pay for the extra costs. The procedural goal conflict according to Svane, occurred when the environmental objective(s) were in conflict with the rules, the decision-making or the governance model.

In Vauban in Freiburg, Germany and in Stad van de Zon in Heerhugowaard, the Netherlands, the three elements of ecological modernization, adapted from Jensen and Gram-Hanssen's categorization of sustainable building design (Femenias 2008; Ole Jensen & Gram-Hanssen 2008), became integral procedural elements in these developments:. 1. The governance *(types of cooperation and roles of actors); 2.* Standardization *(standards, tools, models)* and 3. Visibility *(measurement, monitoring)*. These helped to ensure that the design and development measures were more attuned with the project's vision and objectives and also with the end-user's perceptions about the place in which to live. In summation:

- The design processes were found to work well with multi-actor involvement with multi-disciplinary and holistic approaches, especially when the stakeholders included potential future residents and not only the interest groups, during the design and development stages.
- Competitions, workshops and on-going consultations with involved parties were vital steps for consensus building, which supported the development and implementation of successful designs and appropriate development strategies.

4.6 Stakeholder involvement in the planning and implementation of the eco-town

As stated in Section 4.3, stakeholder involvement was found to be as vital as the environmental model, which has profound impact on both the design and the quality of the development in relation to the desired social, physical and environmental outcomes. The literature review revealed that active citizen participation and engagement are core concepts in the northwestern countries in Europe since the 1990s, particularly concerning matters of urban policies and developments (Loopmans 2010, p.798). With regards to the demonstration project processes, strong stakeholder participation, both in width and depth, were found to positively impact the outcomes (Edelenbos 2005, pp.428-429). As defined by Edelenbos, the '*width'* of participation as one dimension, which was essential to determine if adequate opportunities for participation were made available, and if so, was the participation made accessible to all and how frequently were the participants informed during the process? The '*depth'* of participation was assessed with regard to the extent that the citizens or future residents could influence the decision-making and the realization of the outcomes.

Public involvement was found to be important not only in the planning but also during and after the implementation (Shepherd & Bowler 1997, p.727). In spite of the potential downsides identified with regards to time delays and costs incurred through public participation (Solitare 2005, p.920) it was also suggested that conflicts are inevitable and that the *'conflict resolution process'* can become a productive, cooperative vehicle by which to improve the process and to improve the results of environmental decision-making (Shepherd & Bowler 1997). Referring to the Vauban's development process, Kronsell (2013) noted that the social learning can take place when citizen participation is provided early, is truly inclusive and built on the ideas of the engaged citizens (Kronsell 2013). In that regard, the question emerged as to whether the objective should be to create the highest quality environmental plan (*such as those that were created through centralized top-down decision-making approaches*) or to produce a plan that will be efficiently implemented and supported in the future (Brody 2003, p.415). Selection of the key stakeholders and efficiently empowering their participation were found to increase the chances of implementing a successful eco-town with an environmental plan that will be supported and implemented in the long-term. According to Shepherd and Bowler (1997)'s characterization of environmental conflicts, establishing an environmental plan requires consensus, and "*acceptability depends on public perceptions and opinion*" (Shepherd & Bowler 1997, p.729).

In the Dutch and German examples, participation was encouraged and supported increasingly over time, to a large extent, while in the Swedish development examples (See for example; Khakee, 2002) participatory culture already existed with the exception in Hammarby Sjöstad (Kasioumi 2011, p.104). Among the examples in the Northwestern European context, it was found that effective participation of diverse interest groups in decision-making and implementation increased consensus and long-term applicability of the environmental agenda.

4.7 Governance of Eco-towns

Government support in policy-making, financial backing and legal attributions were essential for empowering city administrations to become committed in both the design and implementation processes of eco-town developments and similar initiatives. Besides local authorities' strong control over the developments, particular emphasis was given to providing access to information on a continuous basis as well as to engaging communities in the process through workshops with multi-disciplinary project teams (Scheurer & Newman 2009). The governance models of **eco-towns** initiated in the 1990s in Northwestern European countries were relatively more de-centralized and interactive, similar to the environmental governance in The Netherlands as characterized by Driessen et al. (2012), with regards to their actor formations, institutions that were involved and the way the decision-making processes were formulated. Especially, with regards to the demonstration eco-town developments, the role of local and regional administrations were found to be integral for providing the authority to ensure that the multi-actor partnerships were established within the environmental measures and guidelines.

For example, in the Nieuwland development, the public-private partnership was formed between the municipality and the market sector (developers) whereby, the environmental supervision played a central role in terms of ensuring the standards and also the quality during the design and development process. In Nieuwland's development, The Netherlands Agency for Energy and the Environment (NOVEM) and the EU's program for the promotion of energy technology in Europe (THERMIE) have supported these measures in order to promote building integrated energy systems at district levels. In Vauban, Germany, the collaboration between the government and the local administration initiated a broad participation of the agencies such as ICLEI, EU LIFE Program, the German Environment Foundation and the future residents from an early stage of the planning and design. Federal and State subsidies provided low-interest loans along with tax breaks which further motivated the community building projects (Sperling 2002). In the Swedish examples, the Local Investment Program (LIP) provided subsidies to a number of applications to build eco-cycle district projects including Hammarby Sjöstad.

In order to efficiently conduct the design, development and decision-making processes, legally appointed bodies similar to the Forum Vauban in Freiburg and others such as KuKa in Kronsberg and GlashusEtt in Hammarby Sjöstad were established. These '*catalytic agencies*' (Kasioumi 2011) encouraged citizen participation, stakeholder engagement and more importantly facilitated institutional capital building through broad exchange of information and alliance-building among the key actors.

Also, the planning approaches were found to have differences along with different impacts on the desired outcomes (Williams, 2013). Community involvement and inputs from other stakeholders during the vision and design stages onwards, generated significant impacts

with regards to end-user motivation, in the decision to become a resident and / or it influenced their lifestyle choices and behavioral patterns. Governance, as a result, was found to be more effective when a shared vision was developed and implemented that included the committed parties rather than only forcing, regulating, or encouraging implementation of pre-developed plans. (Williams, 2013, p.696; Vestbro, 2005).

4.8 Monitoring of progress toward achieving the goals of eco-towns

The review confirmed that documentation, follow-up and evaluation aspects were addressed as core elements in all eco-town demonstration projects (Femenias et al. 2010) in order to assess whether the initial goals and objectives were met. Thorough evaluation design requires sound baseline data (Bamberger & White 2007, pp.64-65) so that comparative analyses can be made on a time-series basis as the eco-town evolves. However, this process was often not well managed and was frequently neglected due to the overwhelming amount of other work, especially during the beginning of the projects. With regard to all future eco-town developments, it is essential to conduct the baseline data gathering process before the project is started so that a solid foundation is established for monitoring progress or lack of progress toward achieving the goals.

It was also found to be critical to include independent researchers to conduct sound scientific and reliable evaluations of eco-town initiatives so that the '*stakeholder / beneficiary'* bias is avoided (Femenias et al. 2010). Along that line, Bamberger and White (2007) underscored that the rigor of the evaluation process as well as the constraints involved with regards to budget and time in primary data collection have great significance in monitoring the eco-town's successes or failures. The researchers found that it was possible to reduce time and data acquisition costs by partially using, available secondary data sources in the evaluation processes (Bamberger & White 2007; White 2006, pp.16-17).

Anticipated environmental performance of eco-towns was largely based on theoretical models that were developed during the planning and development stages (Pandis Iveroth & Brandt 2011, p.1062). The actual performance, based upon sound data analyses that were supported with qualitative interviews among the residents, revealed that the differences between projected consumption and the actual consumption were very different as illustrated in the case of Hammarby Sjöstad (Vestbro 2005). Similarly, in other developments, it was found that the environmental models used to estimate waste, water and energy usage, calculated the efficiency levels of the buildings and the development as a whole. The user behavior however, significantly affected the performances of the systems; hence the achievement level of environmental goals was also affected. Therefore, eco-town coordinators should perform thorough and prompt evaluations of the data obtained from the monitoring processes and perform monitoring and assessments based on behavior of the residents. They should provide feedback, reports, and other information to all relevant eco-town stakeholders on a regular basis.

5. Discussion

The systems and technologies implemented in the demonstration projects were excellent examples of how integration of diverse energy, water, waste and transportation modalities and infrastructure options may help citizens to reduce their carbon, water and other footprints as they conduct their daily activities within urban environments. The eco-town projects reviewed for this paper were developed to demonstrate innovative, integrated approaches at the local scale that could be/are being adopted and implemented effectively if the system was designed and implemented holistically. However the question as to whether the initial goals and objectives have been met in terms of all social, physical and environmental levels is very broad and requires extensive longitudinal data with in-depth research. Within the limits of this literature review, some aspects of eco-town projects were clarified with regard to their contributions to documenting the gaps between the promises and visions of the planners and the realities experienced by the people who actually live in them.

- *What lessons were learned that could help others to establish better eco-towns in the future?*

With regards to '***commitment***' on all political, financial and institutional levels, eco-town projects were built not only as showcase flagships but also to introduce innovations in building technologies, urban systems, planning and, to serve as educational opportunities for the wider society. Due to a large number of actors/stakeholders involved in their initiation, funding, development and administration, it is very important to ensure that the parties, including the citizens, are continuously engaged, committed, empowered and informed. Eco-town projects have been initiated as part of local and national policy initiatives and sometimes as part of the nation's commitment to demonstrate their willingness to transition to more sustainable town and city structures and functions. In such cases the city administrations have sometimes made good use of opportunities such as major urban events to promote and showcase their eco-town projects. Although such eco-town projects were introduced after long planning and experimentation, the ***timing*** of the implementation was found to play a significant role in building shared vision, consensus and momentum. This was true if national policies and/or local initiatives played key roles in their initiation.

Participatory design supported with workshops, 'speak out' sessions (Sarkissian & Bunjamin-Mau 2009), competitions were found to help raise awareness, and to increase the sense of community ownership and commitment to the eco-town projects. In this process, ***catalytic agents*** such as those discussed in Section 4.7, helped to coordinate stakeholder interactions, organize events and inform and engage citizens to help to ensure a strong forum for involvement and empowerment of all stakeholders.

With regard to the importance of the structure and timing of the environmental plan as discussed in Section 4.3, establishing goals and objectives as early as possible provides a better foundation upon which to build commitment to fulfill the required standards and to achieve the objectives. This helps to create consensus among the designers, developers, and residents. Eco-towns based upon environmental and social plans with clear goals and timetables established at the beginning of the development reduced conflicts among the actors during the development as well as after resident occupancy.

- *Have the initial goals and objectives been achieved in terms of social, physical and environmental impacts compared to conventional urban developments? If so how and if not why not?*

With regards to reducing fossil-fuel dependency by replacing conventional design and construction methods with innovative solutions, the eco-towns have helped to foster work to improve environmental performance. Such changes included but were not limited to improvement in buildings with innovative systems and technologies; urban heating systems, improved waste recycling and management and enhanced variety of transportation options and in some cases emphasis was made on integration of renewable energy systems to help to reduce reliance upon the fossil carbon-based energy systems.

Moreover, most projects were designed to educate, involve and empower residents so that their behavior helped the eco-towns to achieve mutually agreed upon goals. Holistic planning and good governance were found to be essential to eco-town success in terms of accomplishing goals whether they are improvements in the use of energy, water, management of wastes or recycling. Some of these goals however, were never met or had only marginal significance in terms of the overall environmental plan and objectives.

For example, the literature review on the performance levels of the eco-towns revealed that the resident behavior played a significant role in achieving environmental goals. In Stockholm's Hammarby Sjöstad, it was found that the factors that affected the results occurred due to the residents' behavior, conflicting with the operational goals and procedural factors in relation to the design and development of the project; such as the car ownership per dwelling (Vestbro 2005) or consumption levels of electricity and water (Pandis Iveroth & Brandt 2011).

In the cases where the planning and design stages involved multi-stakeholder participation and even future residents' inclusion in the decision-making process, the environmental goals were achieved relatively more effectively, compared to those that followed top-down governance. Therefore, the consensus among actors as to how to efficiently integrate the soft legislation (regulations) with the lifestyle changes was found to be pivotal for

achieving the environmental goals of the projects. Vauban in Freiburg for example, was considered to be one of the more successful developments in terms of its goal achievements; this was found to be due to its contextualization / conceptualization and governance. Vauban accomplished a high level of success in building consensus among all stakeholders. This provided an improved level of standards in the building technologies used, in the resident's lifestyles and behavior due to commitment to the shared vision (Kasioumi 2011). The main reason the residents chose to move into the developments was because they had the opportunity to influence the design of their property, their residential environment and the community in which they would live (Scheurer & Newman 2009). Together with impressive achievements in water and waste recycling, Vauban's success can be attributed to the Public-Community-Partnership (PCP) model established by the Forum Vauban, which empowered community participation in the process from the beginning phases of planning of the Vauban development. As a result, these two examples were found to be particularly valuable because they represent significantly different approaches in initiation, frameworks and processes as well as in their sizes, and results.

It is worth noting that these two examples also raise the question of causality, which this study did not seek to answer. However, significantly, participatory processes (especially in the design stages), such as in Vauban's development, may attract the residents that are willing to adopt and maintain more sustainable lifestyles. This in turn, can increase the level of success in terms of achieving environmental, social and economic goals. In the case of Hammarby Sjöstad, participation of residents in the design and/or development processes was found to be almost none and this might have resulted in the residents' selection mostly due to the desired physical qualities of the development rather than the environmental aspects.

In that context, among the eco-developments built in the Netherlands, the consumption levels of both the electricity and gas were found to differ among the dwellings of the residents who participated in the development process and those that did not. A study published by V&L Consultants (2009) revealed that the usage of gas, water and electricity decreased significantly for the residents' homes who were involved in the process compared to both the reference homes in the surrounding urban areas and the dwellings (within the eco-development) with residents who were not engaged in the development process (de Vries & Rashevskaya 2009).

These and other findings helped the authors of this paper to better understand the types of variables that were found to influence the outcomes, more specifically the level of achievement in environmental goals. However it is important to note that the objective was not to generalize the results, but rather to transfer the insights gained through the review of the existing literature. Therefore, the authors sought to summarize the findings in two forms of eco-town development processes as shown in Table 4.

Table 4. Evaluation matrix of two types of eco-town development processes to build more livable and sustainable communities and urban developments.

	Stronger form	Weaker form
Initiation	Both institutional and community initiatives + Economic and political consensus with long-term planning at the policy level	Economic / business interest + Political consensus around opportunistic events and occasions
Funding	Governmental, Institutional + Private funding	Institutional + Private funding
Design	Participatory / with and for user-designed involvement	Top-down / User-centered
Development	Public-private partnerships (PPP), Public-community partnership (PCP) / Multi-stakeholder involvement with early adoption of environmental plan	More market oriented with flexible environmental plan / entrepreneurial urban projects (EUP)s *
Governance	Decentralized – interactive / Bottom-up decision making with implementation of the shared vision from the very beginning phases.	Centralized / Top-down decision-making, encouragement or regulation of implementation of the pre-developed plan / vision

* Ben-Joseph (2009, p.2692) defined the EUPs as the mega projects such as those in India, UAE and China, which are based upon new standards beyond the local codes and regulations in order to achieve their visions while resulting in similar aesthetics and characteristics regardless to their location, climate or culture.

The insights gained from this literature research revealed several procedural factors that contributed positively to achievement of the goals for eco-town developments. Among the most significant examples in the Northwestern Europe, (more specifically the eco-town developments researched in Germany, The Netherlands and Sweden), the review revealed that the most notable factors influencing the level of success were as summarized in Table 5.

Furthermore, the research conducted among the eco-town related studies documented a number of shortcomings in the existing body of literature. Most researchers focused on aspects such as the environmental performances, innovative systems and technologies and the development frameworks or the extent of actors that were involved in these rather complex processes. This issue was similarly addressed by *Seuring and Müller (2008)* underscoring the lack of an integrated perspective in understanding sustainable development, in their review of supply chain management related literature, in which they highlighted the need to include the social issues while investigating the interrelations of all three dimensions (Seuring & Müller 2008). With regards to the literature review conducted in the context of eco-town developments; social outcomes and societal dimensions were found to be mostly neglected, despite the extensive amount of published material that already existed in '*societal level of analysis, values related to sustainability and the elements of good society*' (Sirgy 2012, p.563).

Table 5. Factors that were found to influence the level of success of eco-town developments.

Political commitment	Provides the much-needed financial and regulatory conditions required to establish the size and scope of innovative projects such as the eco-towns.
Timing	Utilizing opportunities and proper timing, for introducing initiatives that require consensus among all political, public, financial and other actors who are involved or affected by the processes, helped to establish the essential elements such as finance, publicity and demand.
Financial model	The local municipal and national funding agencies allocate the necessary funds combined with private-public-partnerships (PPP) further strengthen the multi-actor engagement in the process.
Physical qualities	Elements such as the architectural characteristics, environmental qualities and urban amenities help to establish the local identity with which one feels satisfied or unsatisfied in the context of perceiving a sense of place and belonging. Enhancing the physical and social characteristics of the development within which the residents experience and evaluate their life compared to other urban settings were found to be an important QOL factor in the success rate.
Stakeholder involvement	Stakeholder involvement and empowerment from the very early stages of the planning, development and throughout the process helped to raise participants' awareness of their impacts on the outcome and therefore, resulted in higher levels of environmental performance within the projects due to responsible behavior among the residents.
Environmental model	Clear definitions of the goals and objectives with realistic plans and timetables to operationalize them helped to increase confidence and support from the diverse stakeholders. Also, early introduction of the plan with involvement and empowerment of all political, local and financial aspects were found to be essential for achieving the goals.

While these aspects were found to be less emphasized in the context of demonstration eco-town development processes, earlier and also less ambitious developments such as the eco-villages, eco-neighborhoods and community-based initiatives were found to have emphasized environmental / technical as well as the social dimensions. As discussed by Baas et al. (2014) in the Swedish cases and further explored by *Van Schyndel-Kasper (2008)* more internationally, the bottom-up efforts in establishing developments involved environmental stewardship, strong community values and providing better quality of life for all members of the community. Important commonalities were found among the eco-village examples including the themes of '*systemic thinking, ecosystem health and overall sense of respect for all human and non-human inhabitants*' (Van Schyndel-Kasper 2008, p.17) some of which future eco-town planners may potentially adopt.

6. Conclusions and Recommendations

In this two-part series of literature review articles, the urban development trends and the concepts that emerged and evolved along with the phenomenal transition of urbanization processes, starting from the late 19th century until present times, were reviewed. In this paper, the authors specifically focused upon the processes of the demonstration eco-towns that were developed in the Northwestern European context and sought to determine if they have helped or may help urban planners and municipal governmental leaders to accelerate the transition to more sustainable societies. It was found that it is important to assess the potential for the lessons learned from these developments to be applied in other parts of the same countries as well as in other countries. Furthermore it was important to ascertain what is transferable and what may need to be adapted to the climatic, geographic and cultural contexts of new settings.

Eco-towns, by nature, were perceived as urban development models that were designed and built to demonstrate a variety of advanced environment-friendly features. As the security or insecurity of energy, food and water provision for rapidly developing nations becomes more urgent, urban development models, some of which have much in common with the eco-town developments, began to gain momentum especially, among countries that can afford to build one or more to test and demonstrate their efficiency as well as their applicability. At the present rapidly increasing urbanization rate, it is critically important to take collective action with bottom-up participation and top-down commitment to establish more demonstration projects like the integrated eco-towns so that they become living examples in which to experience, learn, participate, enjoy and to mainstream the lessons learned from them. The challenges remain in terms of political and economic commitments as the true costs and benefits of these innovative urban models are not thoroughly understood by policy makers. Their implications on psychological, physiological, sociological, environmental, and economic dimensions still require sound analyses and monitoring in order to compare and build upon the novel attributes of these urban development models with the conventional urban settings.

Revisiting Seuring and Müller's (2008, p.1706) review notes; they concluded (again with respect to their research topic of 'supply chain management' which became somewhat relevant in the context of eco-town developments) that there was *"a deficit in the take-up of theoretical background"*(Seuring & Müller 2008) whereby, the development approaches became one dimensional rather than putting emphasis on all three dimensions of SD. As Birkeland (2012) suggested, the paradigm of Sustainable Development should seek to '*make everyone better off*'. She noted that the existing assessment tools and methods focus more on the improvements of resource consumption levels, instead of on the net positive impacts that mostly allow "*offsets which represent ecological losses rather than eco-positive gains*" (Birkeland 2012, p.165).

The policy frameworks upon which the demonstration projects were introduced still lack effective contextualization and therefore, a new approach is required in order to rapidly shift from a 'fragmented systems thinking to a holistic one'. Reed (2007) suggested that the role of designers and all stakeholders should be to create a whole system of mutually beneficial relationships to transition the eco-efficient design to a more effective movement that will help to regenerate the health of our environment of which the humans are a part. Such holistic approaches, one of which is called the '*regenerative'* thinking or paradigm has been researched and emphasized by those such as, (du Plessis 2012; Reed 2007; Mang & Reed 2012; Hoxie et al. 2012; Cole 2012b; Cole 2012a) and others. In line with the eco-town developments that were reviewed for their frameworks and processes in this study, regenerative design offers synergistic thinking that can positively contribute to the successes, hence the dissemination of the lessons and the results. As suggested by Cole (2012a), this approach requires a process-based framework rather than a product-based tool in guiding the design process, thus have various implications that could potentially emerge from the transition from green to the regenerative design. These aspects according to Cole (2012b, pp.51-52), were identified as:

- *Re-establishing the design characteristics that were region-specific or indigenous in ways that offered solutions that were used perhaps traditionally but have largely been avoided by the mainstream architectural (also urban) design practices. By doing so, he emphasized, collective knowledge can be regained and subsequently adapted to the contemporary context.*
- *Secondly, the consensus among the stakeholders, whose involvement, participation and long-term commitment to the process has been pivotal in achieving the goals of the project in the first place.*
- *Thirdly, creating the body of knowledge and re-setting of responsibilities among the diverse set of professionals / designers with holistic systems thinking, hence the design approach.*

Furthermore, Birkeland (2014) suggested that a more comprehensive approach is needed to address the current paradigm's (SD)'s shortcomings. She emphasized that the '*physical development must also reduce the resource flows and transform the built environment on all scales*' in order to tackle current global sustainability issues (Birkeland 2014, p.6). Therefore, she proposed the Positive Development (PD) as a design-based theory (and also as a framework) to improve upon the alternative approaches (such as the regenerative) and to move beyond the restorative or reductionist thinking, especially deployed in the realm of mainstream urban planning.

Therefore, while the eco-town developments are increasingly becoming the testing grounds for all social, environmental, technological and economical aspects, they also require new

approaches in order to address the implications of rapid urban growth. These potential implications were expanded upon in this two paper series of literature review and they were identified, in parallel, as the contributing factors for establishing successful eco-town developments. The transfer of the best practices and lessons gained from these urban development projects in the Northwestern Europe to other cultural and geographical contexts could be catalyzed through the integration of design-based thinking, which requires 'place' and 'culture' based contextualization and operationalization of goals central to improving the environment in which to live, thereby helping to create positive net developments for all inhabitants.

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3.3 Reflections on the findings presented in Chapter 3

In Chapter 3, the authors presented a review of the eco-town based initiatives both within the global context and also with the emphasis upon the examples found among the Northwestern European countries. Their drivers, visions, frameworks and typologies were investigated and the key aspects, which were found to be essential to initiate, design and implement successful urban models, were discussed. The review of the development processes among the examples initiated since the late 1980s and during the 90s revealed that the systems and technologies in terms of diverse energy, water, waste and transportation modalities and infrastructure options were innovative integrated approaches implemented as part of the sustainable development initiatives at the local and national levels. While some of these developments were initiated to explore the policy implications and economic viabilities of sustainable planning and practices, others were introduced to improve the cities' images through demonstrating innovative planning and urban systems based on the premise of gaining exposure through important urban events such as Expo fairs or Olympic Games. On both cases, these experimental and demonstration models provided valuable lessons on ways in which the development processes varied and influenced the outcomes.

In that regard, the review helped to clarify some of the key aspects that affected the level of success. These were associated with the initiation, planning and implementation phases as well as the governance models of the development processes in which the political commitment, timing, financial model, physical qualities, stakeholder involvement and the environmental model were identified as the six 'success factors.' [4]

The findings of this review suggested that the effective results in terms of reducing the overall carbon, water and other footprints, required holistic and participatory approaches in the decision-making processes. Also, within the limits of this literature review, some aspects with regard to their contributions as well as the gaps between the promises and visions of the planners and the realities experienced by the eco-town residents were clarified. While the planners of the large-scale urban development projects sought to achieve reduced material-flow rates of energy and water or better waste and wastewater management, earlier examples of community-based initiatives focused upon the environmental, technical as well as the social / societal dimensions with relatively more emphasis given into systemic thinking throughout their planning and implementation processes. These less ambitious

4 The six 'success factors' were derived from the review of literature on the eco-town developments (in Chapter 3) in which the successes and failures were investigated with the emphasis upon the initiation, design and development processes. Due to the explorative nature of the review article, the term 'element' was used synonymously and also within a rather neutral connotation, which was found to be more correct for that stage of the research. In this thesis, from here on and out, *the political commitment, timing, financial model, physical qualities, stakeholder involvement* and *the environmental model*, which were identified to influence the outcome of the eco-town's success, will be referred to as the six 'success factors.'

developments, in the scale of neighborhoods and eco-villages were developed mostly with bottom-up efforts, and sought to establish environmental stewardship, strong community values and better quality of life for their residents.

In this context, the two part literature review on the urbanization trends, theoretical approaches and sustainable development initiatives provided the author of this thesis the motivation to further explore the extent to which the initial goals and objectives of eco-town based developments have been met socially, physically and environmentally. It was found that the societal dimensions and holistic thinking were less emphasized despite the earlier initiatives, which highlighted both the social aspects and the human-nature relation as prerequisites since the planned communities emerged in the 60s and 70s.

Therefore, Chapter 4 was designed to explore the perceived quality of life aspects in conjunction with the social, physical and environmental characteristics of these developments in which the relatively less discussed subjective notions of successful planning and development processes of the eco-towns were addressed. In order to operationalize the goals of this phase of the research, a QOL survey was conducted to understand the similarities and differences of perceived QOL dimensions between the residents of the eco-town based developments and the conventional urban settings.

Chapter 4

Perceived quality of life in eco-town developments

4.1 Chapter Overview

As highlighted in Section 3.3 of Chapter 3, the social/societal dimensions within the context of eco-town developments were not adequately addressed until recently when the perceived quality of life (QOL) aspects became more emphasized within the realm of urban planning and development policies. Due to the technological innovations and advancements of the 90s became increasingly associated with sustainable urban planning and development strategies, the socio-psychological aspects of urbanization processes were relatively less emphasized, hence the impacts on the behaviors and attitudes of the urban dwellers.

With regards to the objective to plan and implement eco-town developments as the potential catalysts to help urban populations to become sustainable societies; the comparative successes and failures of these relatively new urban development models remained undocumented at least with respect to their attributes in terms of influencing behaviors, attitudes, perceptions and lifestyles of the residents living in them.

In Chapter 4, the QOL concepts and approaches were reviewed in relation to the elements that affect the subjective well-being of dwellers and for the broader implications of perceived QOL dimensions of planning and implementation of new urban developments and/or re-developments. Therefore, as an initial step, the QOL domains were identified and characterized through the review of illustrative QOL studies in which demographic factors, residential and local environment conditions, the neighborhood qualities, governmental services and other social aspects were elaborated. In order to obtain information about the experiences, reflections and insights of people living in eco-developments and in conventional settings, a questionnaire was designed in which multiple facets of social, physical and environmental aspects were explored.

The rich data gathered from the residents living in conventional and eco-developments from various geographical contexts and cultures as well as the responses to the open-ended questions, revealed important differences in terms of the perceptions of QOL of residents living in eco-developments compared to other urban contexts. These were expanded upon in the results section where the satisfactions with home-life situation, neighborhood quality, health situation, economic situation, satisfaction with the community and governmental services as well as the QOL perceptions of the residents were evaluated. In this chapter, the insights and subjective views of the residents from both groups of developments were elaborated, which could provide key social and physical characteristics to consider whilst planning sustainable developments both in the urban as well as in rural contexts.

Section 4.2

Perceived ‘Quality of Life’ in eco-developments and in conventional residential settings: An explorative study

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Perceived 'Quality of Life' in eco-developments and in conventional residential settings: An explorative study

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Abstract

Initiatives such as 'eco-developments' are part of the movement to experiment with ways to reduce negative environmental and social impacts of urban settlements while aiming to enhance the resident's perceived Quality of Life (QOL). Due to the relatively short history of such experimental developments, their impacts upon the resident's QOL have not been thoroughly studied or documented. Therefore, eco-development's successes and failures are not clear with regards to their influence upon resident's perceptual and behavioral patterns. The literature reviewed for this research revealed that multiple factors contribute to resident's perceived QOL. The questionnaire used for this research was developed based upon key factors that were found to influence resident's life satisfaction. The findings suggest that 'neighborhood satisfaction', 'home-life satisfaction' and satisfaction with 'sense of community' were highly important elements in relation to how residents perceived their QOL. Resident from eco-developments had different priorities from residents in conventional developments. The factors such as income level, health situation and local government services that were initially expected to contribute highly to the QOL were found to have less importance when in-depth qualitative analyses of the responses were performed. The survey results revealed that the physical and social elements of one's immediate surroundings played an integral role in terms of better perception of QOL. Furthermore, residents from eco-developments were found to perceive a higher QOL than the residents who lived in conventional settings.

Keywords

Quality of life, Life satisfaction, Subjective well-being, Learning communities, Eco-developments,

1. Introduction

As a result of rapid increases in the world's population and the rapid rural to urban population shifts, many mega cities are developing without adequate planning; consequently they are negatively impacting the much-needed natural resources and eco-systems, while not providing adequate or optimal human habitats for quality of lives for many of their residents. Some work to transform our urban habitats into more sustainable places has been in progress for many years but there was only limited increase in such efforts since the 1992 Rio Earth Summit, which became one of the major milestones.

Unfortunately, as also underscored at the Rio+20 meetings held in Rio de Janeiro, Brazil during June 2012, efforts towards establishing and implementing forward-looking policies and urban development programs that are more 'sustainable' are encountering barriers and challenges, politically, economically, socially and ecologically (UNCSD 2012).
The consensus among 'change agents', which have achieved relative success in planning and implementing better urban developments, is that success requires top-down commitment and support, combined with bottom-up engagement/empowerment in decision-making along with education which is an integral part of change processes (Jansen 2008).

Progressive steps towards establishing sustainable communities through eco-villages & eco-towns have been and are being taken in many countries throughout the world, to obtain valuable lessons about how to more effectively provide better QOL for urban residents (Takeuchi et al. 1998; Barton 2000). Several authors have sought to determine whether or not these developments act as "learning communities" towards achieving sustainability goals and objectives for subsequent application of the lessons learned within large-scale urban developments (Delambre 2010).

However, due to the relatively short history and that these experimental developments are ongoing, dynamic experiential processes, relatively few, in-depth studies have been done to assess their contributions on the Quality of Life (QOL) of their residents. Therefore, because the comparative successes or failures were largely undocumented with regards to how their attributes influence the residents' perceptions, attitudes, lifestyles, behaviors, this research was designed to investigate the factors, which influence resident's perceived QOL and to provide guidance for new urban developments.

The authors of this study first reviewed the QOL concepts in relation to understanding the elements, which may need to be monitored in seeking to effectively make societal transitions toward more sustainable lifestyles. The authors reviewed literature on similarities and differences of perceptions of QOL of residents living in 'conventional urban developments' and in 'eco-developments.'

The authors then provided the details of the methods used to plan and used the QOL questionnaire based upon the results of a comprehensive literature review to identify and characterize the domains to be included in the questionnaire. In the final section of this paper, the authors presented their findings based upon the responses to the questionnaire that was distributed via an on-line survey tool among residents living in eco-developments and in conventional developments.

The goals of this research were:

a. To document the similarities and differences in the QOL perceptions of residents of eco-developments in comparison with those of residents of conventional developments;
b. To derive lessons from the similarities and differences between the QOL perceptions of residents in the two types of developments in order provide insights to assist urban planners to design and to implement better, more sustainable urban systems.

2. Context of the QOL concepts, approaches and the implications for new urban developments

The concepts pertaining to QOL are evolving for addressing issues such as health, environment, livability, urban psychology and many other social and physical aspects that influence human lives directly and indirectly. The QOL concepts are becoming increasingly relevant for measuring progress in achieving improved QOL to fulfill sustainability goals and objectives. Findings from the use of these concepts are being used to help in the design of relevant local, regional and national governmental policies and strategies designed to foster sustainable regional development in more holistic and inter-disciplinary ways (Costanza et al. 2007).

However, establishing policies and programs for empowering people to improve their lives is a complex task that requires thorough study to understand the human psyche and the ways in which it affects human behaviors and lifestyles. Since the mid-twentieth century, for political and economic reasons, social scientists have sought to construct and use indicators and the resultant indices for comparison of the QOL of people in social units such as towns, cities or countries (Hagerty & Land 2007). Authors such as Marans & Rodgers (1975), Campbell et al. (1976), Kahneman et al. (2003), de Hollander & Staatsen (2003) studied and concluded that the QOL concepts are multi-dimensional; therefore, '*uniformity is not a necessity*' in understanding these broad concepts (van Kamp et al. 2003; Y.-J. Lee 2008). While earlier researchers found variations in the QOL measurements and in the strength of relations between subjective and objective measures, more recent studies have established relatively better insights of the conceptual links between the life domains and the life satisfaction of an individual and communities as a result (Sirgy et al. 2009). Key contested issues revolve around how to measure one's perceived QOL and whether or not the findings can be generalized for societies living in different cultural and social contexts.

Initially, the concept of QOL was associated primarily with health and economic aspects. During the past decade, the concepts of sustainable development, urban environmental quality and QOL have become pivotal for our understanding of the sustainability of cities, consequently, understanding and measuring these societal elements has become essential due to their relationships to individual and societal well-being.

The methods to measure these elements consist of different subsets that include subjective and objective approaches to obtain insights into people's satisfaction of the political, economic, social, and environmental aspects that influence the well-being of individuals and of communities. Various sets of indicators and tools were developed by groups such as the World Health Organization (WHO)'s WHOQOL, Organization for Economic Co-operation and Development (OECD)'s Better Life Index, and the United Nations (UN)'s Human Development Index (HDI), to measure the impacts of diverse societal dimensions upon QOL of urban and rural residents. However, these complex tools, which were designed to provide objective measures to assess general well-being of populations are not always applicable for gaining understanding of the perceived level of well-being in local scales where subjective measures help to assess the actual views of inhabitants more directly (Costanza et al. 2007).

Sirgy et al. (2009) further explored the deductive-based measures' validity in relation to the subjective measures of community well-being and overall life satisfaction. They found that a better way is "*to capture residents' perceptions of community systems (community services and conditions) in the way they are perceived to impact residents' various life domains*". In order to do so, a composite index and statistical methods were used to assess the reliability, correlations as well as structural relationships between various 'community systems' based on well-established theories, such as the bottom-up spillover theory. While they suggested that their method is more effective than the inductive measures such as those developed based on facet-based community well-being assessments, they also emphasized that the life domains that are satisfied to a certain degree in a community may show *little or even no bottom-up affect* on the overall perception of QOL (Moller & Saris 2001).

The literature review, conducted to learn how QOL is measured, revealed that simplified methodologies were developed and used to analyze the specific facets or domains that affect the QOL of residents in smaller social units as well as at broader community levels. These methods involve gathering information on objective indicators by measuring data such as health, crime, taxes, education, housing and other aspects of people's lives (Marans & T. Lee 1980) along with gathering information about subjective views of individuals about their life experiences and about their perceptions of well-being within their community, which the authors of this paper found to be relevant.

3. Identifying and Characterizing the 'Quality of Life' Domains

As a model for the different domain structures for this research, illustrative QOL studies such as the *'European Quality of Life Survey' (EQLS)* (Eurofound 2003; Eurofound 2010) were found valuable because both subjective and objective elements were used to evaluate the demographical, cultural, economic, governmental and social dimensions through longitudinal and cross-sectional analyses (Eurofound 2014). Although their tool was designed specifically for measuring QOL in European cities, their structure and content that were relevant for this research were based upon the methodological framework in eight sectoral domains: *(1) Economic situation; (2) Housing and the local environment; (3) Employment, education and skills; (4) Household structure and family relations; (5) Work-life balance; (6) Health and healthcare; (7) Subjective well-being; (8) Perceived Quality of Life.*

In spite of the comprehensive structural approach and the methodology used in these surveys, it was found to be neither practical nor essential to adopt the same format for this particular study. Instead, the domains and their incorporated facets (Eurofound 2003) were studied and subsequently, a relatively less extensive model was developed to reflect upon the aspects that were more relevant for the goals of this research. These included: *i) demographic data, ii) residential quality, iii) neighborhood quality, iv) government services v) social cohesion & perceived QOL.*

i) Demographic data

The demographic factors such as the employment situation, marital status, health situation, education, household and economic variables are all found to effect one's hedonic well-being and the life satisfaction in general (Eurofound 2013a). Ferriss' (2006) analysis of community well-being in relation to how demographic factors affect the QOL was built upon information from variables such as fertility/ mortality, food supply, family structure, population increase or decrease among a variety of other factors that impact personal QOL and thereby, influence the community's subjective well-being (SWB). The family domain, according to Lucas et al. (2003), is notably a QOL influencing factor because being married, unmarried, divorced, separated or losing a partner were found to have emotional impacts on one's life in the short and long-term.

Within the context of demographic data, the resident's economic situation and relative income levels are important QOL factors because they influence a person's/family's ability to achieve and to maintain a certain lifestyle, and especially to ensure the economic means, which are essential to provide for one's basic needs. Although a higher income compared to a reference group was found to positively affect one's life evaluation, *it is suggested that it neither provides happiness nor does it relieve stress or unhappiness* (Kahneman & Deaton 2010). Moreover, lower income and sustained unemployment were associated with lower

emotional well-being and to a lower QOL. It was also suggested that having a job could as well be associated with being part of a meaningful activity and social network (Eurofound 2013a), thus it was found to be more important than one's level of income (Eurofound 2013a; Powdthavee 2011).

It is evident that health has a major impact on one's perceived QOL. The respondent's health was found to be interlinked to the physical, environmental and social aspects, of the life-style of the community (de Hollander & Staatsen 2003) and life satisfaction (Sirgy & Cornwell 2002).

The research confirmed the importance of:

a. The neighborhood's physical attributes, such as its spatial and architectural features, building density, open spaces, natural environment, accessibility of public transportation and recreational facilities;
b. The social dimensions, such as its socio-economic status, the pattern of social networks, and the cultural factors, all interact and influence resident's perceived QOL.

ii) Residential quality

The conditions of residential and local environment are accepted as major factors that influence one's subjective well-being due to a number of attributes such as: ***a.*** *the physical characteristics of the residence,* ***b.*** *its setting and location,* ***c.*** *its connectivity level,* ***d.*** *its proximity to facilities,* ***e.*** *the availability of goods and services,* ***f.*** *its costs, values, aesthetic and technological attributes as well as the community in which one lives and socializes.*

In the residential context, the neighborhood satisfaction has a positive impact on one's feelings towards life through a hierarchy of satisfaction effects including *housing* satisfaction and subsequently for *home satisfaction, which* leads to one's life satisfaction (Sirgy & Cornwell 2002). Home satisfaction was found to be an integral part of life satisfaction, as it was perceived to be a refuge, a place that provides shelter where there is emotional attachment due to one's personal life experiences (New Zealand 2007).

Similar findings were documented in the *European Foundation for the Improvement of Living and Working Conditions* (Eurofound)'s report on subjective well-being (2013a, pp. 55-56). The objective or 'physical' elements such as the size, availability of outside space (or the lack thereof) had an impact on one's housing and life satisfaction. Residential place and its local environment should therefore, be addressed in the context of research designed to reveal the extent to which its attributes influence the QOL, as a whole (Rogerson & Rice 2009).

iii) Neighborhood quality

Most researchers have focused upon the impacts of rapid urban development and on the extent to which such development deteriorates the natural environment thus causing the loss of biodiversity and other natural resources. On a micro level, the environment and the way an individual interacts with it on a day-to-day basis, is comprised of diverse aspects such as the home environment, the neighborhood (physical) environment (pollution, noise, traffic and climate), transport and recreational opportunities and their relations to stress and somatic or psychological problems (de Hollander & Staatsen 2003) which are influencing factors on the overall QOL. There are many environmental attributes that have positive affects upon health and health-related quality of life (Stigsdotter et al. 2010) such as the approximate distance from a green space and individual's enhanced healthfulness that is associated with daily exposure to and interaction with nature or green features in the vicinity of their residential spaces.

Supporting empirical evidence on how one's health is linked to overall neighborhood characteristics were documented in a number of studies (Ewing et al. 2003; Doyle 2006) and from various health implications whether physically or psychologically. For example, higher percentages of children living in conditions that lack adequate natural features were found to develop physical and mental illnesses than when such features are present (Jackson et al. 2008). Moreover, places where there are safety concerns due to criminal elements or that are less walkable due to unconnected streets, bigger lot allocations with inclusion of cul-de-sacs tend to increase the number of people with weight related health problems. In-depth research also revealed that people living in public transport-orientated neighborhoods were found to be considerably healthier that encourage residents to walk at least one or two, 15-30 minute walks more per week than those living in less walkable counterparts (PHAC 2008). High walkability was also observed in neighborhoods with higher population densities, greater land use mixes and higher connectivity levels while less active neighborhoods had lower densities, and were mainly residential with low connectivity levels (PHAC 2008).

Additionally, the availability of various amenities such as accessibility to healthcare facilities, museums, art galleries, theaters, concert halls, cafes, pubs or shops and sport facilities, provide higher levels of satisfaction of one's sense of place, thus they positively influence the perceived QOL. Therefore, in the context of measuring QOL in a social unit, it is essential to understand the interactions among these elements and to also gain insights into how neighborhood qualities affect one's overall perceived well-being.

iv) Governmental services

The services and governance in towns, cities or in neighborhoods provide the conditions for living whether they consist of infrastructure, security, and administrative services. With re-

gards to the societal well-being and development of the community, the quality of services is as important as the way they are introduced and conducted within a community (Bovaird & Loffler 2003). Both the improvement in the services that are provided as well as the way they are exercised from political, environmental and societal perspectives influence one's perception of QOL. Stakeholder engagement, active participation of the community and transparency of the strategies and policies within and between the agencies and sectors are prominent as civic literacy and empowerment increasingly become central towards establishing and maintaining sustainable communities.

The European Foundation's reports on the QOL emphasized that satisfaction with the perceived level of access and perceived quality of services such as education, healthcare, public transport system, childcare support and state pension or welfare system all contributed - in varying degrees - to the overall perception of QOL in the European cities (Eurofound 2013b; Eurofound 2014). Those reports suggested that **social context** is important to understand in seeking to determine the extent to which the public services play a role in one's perception of QOL; as perceptions were found to vary depending on the societal structure and macroeconomic conditions (Eurofound 2013b; Abbott & Wallace 2012).

v) Social cohesion & perceived QOL

Social cohesion is another integral element to one's subjective well-being and to the community's satisfaction with life. With regards to the overall importance of neighborhoods and their impact on the community, in general, Forrest & Kearns, (2001) discussed the relation between the neighborhood, social cohesion and identity as a way to restore the roles of neighborhoods in contributing to the community's well-being. In doing so, the residential neighborhood, becomes the place where one socializes, spends time for both recreation and leisure and perhaps works, thus creating the social networks, which provide a sense of community and belonging.

> *"It is these residentially based networks, which perform an important function in the routines of everyday life and these routines are arguably the basic building blocks of social cohesion—through them we learn tolerance, cooperation and acquire a sense of social order and belonging,"* (Forrest & Kearns 2001).

For instance, walkability in a neighborhood – as discussed in health related QOL, has been linked to higher social capital and cohesion through enhanced personal connections, communication and involvement among individuals and within community (Rogers et al. 2010). Similarly, related studies were conducted on the social and physical environment with emphasis given to both independent and joint effects on human behavior (Van Cauwenberg et al. 2014). While the physical qualities of place may provide the conditions to cultivate interaction among residents, there were also subjective aspects such as shared

values and purpose, mutual trust and willingness to help one another in a community that contributed to social cohesion (Jongeneel-Grimen et al. 2014).

In summation, the QOL assessments are vital to understanding both the objective factors that influence life experiences as well as the subjective well-being that is linked to perceptions of how we feel about our environment. Marans & Rodgers (1975; Marans & T. Lee (1980); Connerly & Marans (1985); Connerly & Marans (1988) explored these issues conceptually and empirically with regards to perceptions of how individual's subjective views differed depending on their characteristics, needs or past experiences. Their studies suggested that individual assessments or perceptions were affected by the attributes themselves rather than only by the setting of the attributes. "*Capturing people's evaluations of the quality of their lives, given their own values and preferences"* (Eurofound 2010) requires understanding as to how they evaluate their current and future conditions of life and whether these are social, physical or environmental attributes.

As Sirgy & Cornwell (2002) suggested that satisfaction with the physical features in a social unit such as a neighborhood, affects one's neighborhood satisfaction as well as his or her housing satisfaction and that these have strong correlations with one's perceptions of QOL. (Fornara et al. 2010) studied the macro-evaluative dimensions of residential quality at the neighborhood level and from the works of Amerigo (2002); Canter (1983); Bonaiuto et al. (1999), they concluded that the spatial, human, functional, and contextual attributes are the key determinants that should be included in the assessment of neighborhood satisfaction.

More recently, Sirgy (2012) expanded upon the multiple dimensions of QOL research that emphasized the concepts related to *"social quality, structural relationships, and other qualities of societies*', seeking to address the '*values or normative basis of a good society*' (Sirgy 2012). According to Sirgy (2012), values related to 'sustainability along with social cohesion' are important elements for establishing 'a good society' that further require aspects such as '*institutional integration, positive relations within the family, welfare to the disenfranchised, freedom, social equity and solidarity'* in its social fabric (Sirgy 2012).

As reviewed briefly in this section, measuring perceived QOL must include multiple facets of social, physical and environmental dimensions on both individual and societal levels. Based on the research found in literature and reviewed by the authors of this paper, these domains were included in the questionnaire that was designed to obtain quantitative and qualitative assessments of resident's perceptions of their QOL (see Section 4.3).

4. Data Gathering and Assessment Methodology

4.1. The Data Gathering Process Used in this Research

The main goal of this research was to obtain information about the experiences, reflections and insights of people living in eco-developments and of people living in conventional communities in urban and rural settings. As an initial, exploratory study, the researchers sought to collect data to identify the commonalities and differences between the perceptions of QOL of the residents of eco-developments that are diverse in nature as well as from those living in conventional developments in the surrounding and outside areas. Therefore, the research was performed to gather details of eco-development residents from a variety of towns, cities and countries. Eco-village networks, eco-municipalities, eco-town residents as well as residents of intentional community networks were contacted to invite their members to fill in the questionnaire. Community officials were contacted, via telephone, to encourage them to invite their citizens to fill in the questionnaire and to invite others to do so, thereby creating a snowball effect (Goodman 1961). The same methods were used to obtain respondents from conventional developments.

In spite of the researcher's initial objective to obtain empirical evidence of the similarities and differences of QOL perceptions between both groups of residents, the authors performed qualitative analyses mainly because of the low variance in the number of *valid responses* and due to the differences between the *numbers of subjects* from each group of residents.

4.2. The Survey Procedure

In order to obtain insights into the perceptions of QOL of residents, several draft versions of the questionnaire were formulated, tested online and validated among academics and professionals who currently live either in eco-developments or in conventional developments. After revisions were made based upon the feedback obtained during the pre-test between October 2011 and January 2012, the final version of the questionnaire was put online, on February 1, 2012 to people/communities that were contacted by the lead author that were identified as eco-developments and conventional developments.

The potential participants, including community leaders and residents were sent an e-mail invitation with a cover letter, which explained the research outline and the objectives along with the web-link of the questionnaire provided by Survey Monkey® (http://www.surveymonkey.com/). Additionally, people who live in conventional developments were sent the same materials and similarly asked to forward to those living in their own respective communities.

The criteria used to identify the residents living in eco-developments included but were not limited to:

- The physical and social characteristics of the development, which were determined before the questionnaire was administered;
- The community's established identity;
- The respondent's perception as to how they defined the place in which they lived.

The authors worked through several eco-development networks such as GAIA, Global Eco Village Network (GEN), Donella Meadows Institute and Fellowship for Intentional Communities (FIC) and other similar groups. The countries of the residents who took the questionnaire from the member communities of these networks included but were not limited to Sweden, Denmark, Norway, UK, Ireland, Iceland, US, Switzerland, The Netherlands, Canada, New Zealand, Germany, Australia, Japan, India, South Africa. The exact geographical locations of the respondents however, were not further elaborated in this paper due to privacy concerns and due to the code of conduct that was made explicit in the cover letter.

Among the 300+ invitations, a total of 139 respondents fully or partially filled in the questionnaire between February 1 and June 9, 2012. Of the 139 responses, 130 were completely filled in, thus, they were included in the analytical procedures used in this research.

4.3. The Questionnaire Design

Based upon this research's primary objective to compare the relative QOL perceptions of respondents, a subjective or psychological approach to the data gathering process was found to be more useful than approaches of a more complex nature, which use objective and statistical information (Gandelman et al. 2011). Because of the goal to conduct people-centric research, the questionnaire was designed to evaluate the resident's perceived well-being based on the elements, which the literature review documented to influence one's perception of life satisfaction.

In brief, the questionnaire was comprised of the following sections: *i) demographic data, ii) residential quality, iii) neighborhood quality, iv) government services v) social cohesion & perceived QOL*. A total of 84 closed and open-ended questions were formulated. A five point Likert Scale was supplemented with a comment box for most of the questions. (*See the QOL questionnaire at the following, permanent web link; http://www.surveymonkey.com/s/TDZRCPM*)

For example, in order to determine the satisfaction of one's economic situation or income level, the respondents were asked; "How satisfied are you with your current annual income?" (Completely satisfied; Somewhat satisfied; Neither satisfied nor dissatisfied; Somewhat dissatisfied; Completely dissatisfied).

Additionally, in order to explore the dimensions of the respondent's perceptions about the affect of their economic situation, on their QOL, they were asked; "How important is your economic situation to your overall Quality of Life" (Not important at all; Somewhat not important; Neither important nor unimportant; Somewhat important; Very important).

Similar to the economic situation, other facets of the life domains such as their health situation, their satisfaction with home-life, public goods/governmental services and neighborhood satisfaction were evaluated in relation to their perceived QOL.

Finally, the respondents were asked to what extent they feel satisfied with their QOL in general. The results were compared based on residents who lived in eco-developments vs. those who lived in conventional developments.

4.4. Data Analyses

The data were first analyzed in raw text format to learn how the respondents elaborated on their personal feelings, experiences, recommendations and critiques for the questions. The valid responses were then exported to the statistical analysis software SPSS Version 20.0 after which normality checks and cross tabulations were performed to examine how the responses for the life domains were linked to the respondent's type of residence and to their perception of QOL, in general. Due to the nature of the research, the internal validation was sought rather than external validation (Sirgy and Cornwell, 2002- p.91). Also, due to the limitations of this research, explorative characteristics of the study were highlighted during evaluation through the comments and insights obtained from the comparison of respondent's perceived QOL of those who lived in eco or in conventional developments.

The questionnaire was administered within groups of residents from different geographical contexts and cultures. This helped the authors to gain valuable information on the perception of different facets of life and their subjective view of how these facets relate to their perceived QOL. In terms of the limitations of this study however, the low variance in the number of subjects (see Section 4.2) as well as the variety and types of developments from these different geographical contexts permitted the authors to conduct qualitative analyses rather than more rigorous quantitative statistical methods that would have made it more possible to generalize the results. Although the findings are neither **correlational nor conclusive,** qualitative analyses of the data together with cross tabulations among the responses to the questionnaire revealed notable differences in perceptions of QOL of residents in eco-developments and from residents of conventional developments.

The following sections present comparative insights into the daily lives and experiences of residents of eco-developments vs. residents of conventional developments.

5. Results

5.1. Characteristics of the Questionnaire Respondents

Of the 139 questionnaire respondents, 72% identified themselves as living in an eco-development and 28% as living in a conventional development. The gender distribution of the respondents was; 39% were male and 61% were female. They ranged in age 25 to 76+ (See Table 1). Approximately 13% of the participants completed high school, 37% held an "Associate's or a Bachelor's Degree", 41% held a Master's Degree and 8% had PhD, M.D. or LLD.

Table 1. The age distribution of the QOL questionnaire respondents for this research.

		Frequency	Percent
Valid	15-25	8	6.2
	26-35	24	18.5
	36-45	26	20.0
	46-55	30	23.1
	56-65	27	20.8
	66-75	8	6.2
	76+	6	4.6
	Total	129	99.2
Missing	System	1	.8
Total		130	100.0

The household structure was, 27% of the respondents were living on their own, 49% were living either with a partner or as a married couple, 16% were living with immediate family members and 7% shared an accommodation with flat-mate(s).

Of the 139 respondents, 106 were either employed (52%) or self-employed/business owner (48%). Of the remaining 33 respondents who filled in the questionnaire's text box, identified themselves as either unemployed, retired or as students.

With regards to the type of residential place, 53% of the respondents lived in rural settings and 47% lived in urban settings.

5.2. Data Analysis and Findings

The approach to the analyses included exploring the similarities and differences in resident responses with regard to the life domains discussed in Section 3. The frequencies on the different Likert categories per variable were analyzed. Due to the number of subjects, cross tabulation tests were performed in terms of evaluating the variables reported in Section 5.2

to 5.9, which were found to contribute to the overall perception of QOL of the residents based on the literature review conducted for this research.

In order to further explore these variations, relations and to clarify how the subjective views of residents relate to the statistical results, the following section was developed based upon qualitative analyses of the written answers that the respondents provided in the comment boxes.

5.3. Home-life satisfaction

Cross tabulation results revealed that 58 % of the respondents from eco-developments were "completely satisfied" with their home-life while only 30% of the residents from the conventional developments selected this option.

The respondents' written comments, revealed that most of the socially active 'home life' patterns, whether with a partner or with one or more other family members was essential for their positive QOL. However, the respondents stated that the size of their accommodation was becoming an issue especially after sharing it with more persons and that they would start to look for a bigger place in which to live, should they wish to keep their comfort as well as their privacy at a desired level.

The researchers found that eco-development residents perceived that they were leading more socially active lives within their communities and homes and that this improved QOL was directly influenced by their community's lifestyle.

The residents in conventional developments however, chose to comment more on the issues related with the lack of time to enjoy life at home with a partner or with other family members or the lack of anyone or a social circle to share their lives with as they reflected upon their home life situations.

> *"…but I spend too much time alone there. I want more of a social circle (when I cut back on my working hours). I intend to use my lovely space for more gatherings."* **(Quote from Respondent #15 – *resident from conventional development)***

> *"It would be nice to have more time to enjoy it with my partner!"***(Quote from Respondent #12 – resident *from conventional development)***

The key finding for home-life satisfaction was that the residents from both groups of developments mostly associated their home-lives with social aspects, their experiences with either the person(s) with whom to share their accommodation or their social lives as to whether it is active or not. Security with regard to accommodation, residential situation in

terms of physical aspects such as size, quality or comfort were less frequently mentioned among the residents living in eco-developments compared to the residents living in conventional developments.

5.4. Neighborhood Satisfaction

The geographical context in which this survey was conducted covered a variety of development types and areas some of which included neighborhood(s) or villages and sometimes they consisted of developments in the urban context or rural settings. Therefore, the 'Neighborhood' in its traditional meaning was interpreted as the immediate surrounding community in which the respondent lived and interacted on a daily basis.

With regards to satisfaction with the QOL in the neighborhood, the residents from both groups were found to have a positive QOL. For example, 84.4% of the eco-development residents indicated that they were satisfied with the place in which they lived, while 70.3% of the residents from conventional developments were satisfied.

Box 1. Quotes from respondents who expressed critical views on the physical aspects of their community and its location or amenities.

"I lived in an eco-village for two years. Since it was very rural, I was disappointed at how much time I spent in a car, since before I was used to only biking or using public transportation. It was also very hard to maintain all my community responsibilities and earn an income I was happy with" ***(Quote from response #45 on Question 65, former resident from eco- development)***

"I feel like there should be a middle point. Living in Eco Towns in the local variety, requires too many sacrifices regarding culture, technology, amenities, etc." ***(Quote from response # 22, Question 66 - resident from conventional development)***

"My community (is) very important. The surrounding community, however, is not so important as long as it is safe. I would prefer more entertainment within walking distance." ***(Quote from response #1 on Question 67- resident from eco-development)***

*"My neighborhood is located very close to the inner city, but it is planned to minimize traffic and to support an urban lifestyle with a focus on environmental friendliness plus its vicinity to nature"****(Quote from response #40 on Question 42 - resident from conventional development)***

"It is very much easier to be eco in a larger collective-village/town/region. So many more things are possible from arts to recycling, if more people are involved." ***(Quote from response # 53, Question 65- resident from eco-development)***

"I live in one right now, and this was one of the reasons why I moved there in the first place. It has become a little of the "identity" of my borough, being environmentally friendly, which has probably increased the popularity of the area (this said I do strongly believe a vast majority of the people living in the area do not care more for the environment than any other people)" ***(Quote from response #54 on Question 65 – resident from eco-development)***

The respondents from the conventional developments mostly reflected on the community's identity, security, environment and proximity to urban amenities in expressing their views on their satisfaction with life in the neighborhood positively or negatively. However, the residents from eco-developments chose to comment on both the social and the physical aspects with more emphasis on communities when they elaborated on their subjective views of well-being in their neighborhood.

The majority of residents of eco-developments stated that the sense of community was important for their higher perception of QOL in their neighborhood. The relations between neighbors or community members were perceived positively; this influenced their sense of belonging to both the residential space and the neighborhood. In some instances, the residents expressed the need to have their close-knit communities better integrated with the wider society and to be more connected to urban amenities.

5.5. Satisfaction with Health Situation

In general, the differences in perceptions of health status between the different groups of residents were minimal; only a few elaborated on why they experienced certain health problems or why they had to use health facilities in the past one-year. From the information gathered, 94% of the residents from eco-developments were satisfied with their health situation compared to 87% of the residents from conventional developments.

An interesting finding was that conventional development residents emphasized personal weight challenges because of their lack of access to physical fitness facilities. In contrast eco-development residents were almost always active in different ways, which compensated for their lack of physical training or sports facilities. Gardening, farming (rural and urban), choice of transport such as walking and cycling were highly popular among the eco-development residents, hence they expressed positive perception of their health status. However, some of the views from eco-developments in remote areas underscored their lack of adequate financial resources to use good health clinics or to not be able to find appropriate health-care facilities within a reasonable distance of their homes.

5.6. Satisfaction with their Economic Situation and Income Level

With regard to the economic situation, 66% of the eco-development residents felt satisfied while 51% of the residents from conventional developments expressed similar views. The findings suggested that there were considerable differences among the residents' perceptions in regard to how they felt about their income level and how financial matters affected their life depending on the context in which they lived. The residents from conventional developments expressed views on retirement plans, less free-time or having inadequate time due to the need to have second or additional part-time jobs or having to balance the budget from savings accounts while paying expenses such as mortgages, debts etc. The residents

from eco-developments mostly commented on how they planned to make improvements on the community projects, upgrading water-efficient, energy efficient systems and sometimes not having saved enough to contribute or were still working towards their community goals in ways that were related with their well-being as individuals in the community.

> *"Our annual income is 500,000 JPY (4,700 Euro)/ person. Which is 1/10 of my previous annual income. However, I am 10 times happier than before. Since we produce our own food organically, we do not purchase much food from outside. Also, we own our house, so we do not have to pay rent."* ***(Quote from response #31, Question 14 / eco-development resident)***

Some residents of eco-developments reported that the tasks and responsibilities of community life were somewhat overwhelming at times and it was difficult, sometimes to balance professional work with the community work. Some residents reflected upon the global, worsening of economic conditions and that being paid minimum wages did not make it possible to live as sustainably as they wished; this was especially true from residents in eco-developments in relatively remote areas.

5.7. Government Services

The cross tabulation results revealed that the residents' level of satisfaction with local government services were almost equally addressed with approximately 70% approval from respondents of both types of developments. The comments made by the residents of eco-developments reflected upon the lack of services in terms of maintenance and attention to community development, projects and services. Despite the relatively fewer resources with regards to these services, the residents from eco-developments were more engaged and participatory in matters that were related to their developments and in those in the surrounding areas.

Some respondents from these communities strongly emphasized their contribution individually and as a community in the way they co-work to build and improve their community conditions whether they were related to municipal services such as maintaining roads, maintenance of facilities, providing safety or to services such as healthcare, education and/or recreational facilities.

5.8. Sense of Community

Cross tabulations of data, revealed that more than 90% of the eco-development residents perceived that there was a strong "Sense of community" in their neighborhood while only 54% of the residents from conventional developments responded that way. Some of the comments made by the respondents are included in the text box (Box 2) demonstrating the extent to which they perceived a high "sense of community."

Box 2. Quotes from some respondents who shared their views on the "Sense of Community" within the area in which they live.

"I live in an Eco-city and it is fabulous! Doing the very best we can environmentally is extremely satisfying. Living in a caring community is great" ***(Quote from response #71, Question 65- resident from eco-development)***

"Great place to live with shared values, vision & responsibilities, community of help & support" ***(Quote from response #32, Question 65- resident from eco-development)***

"This 'eco village' is a small section of an urban centre. I LOVE living here. It provides deep satisfaction through opportunities to live more sustainably and share that with others" ***(Quote from response #89, Question 65- resident from eco-development)***

"I would never want to live anywhere else. Simply by being here where there are only composting toilets, no one can own a personal vehicle, all power is provided by the wind, sun and candles, more food is grown locally than anywhere else I've lived…simply by living here my carbon footprint is dramatically decreased. Also, there is nothing more special than walking out your front door and seeing so many people who truly care for you and who I truly care for in return" ***(Quote from response #99, Question 65- resident from eco-development)***

Besides these quotes, some respondents highlighted how the governance and decision-making can become challenging issues unless goals, objectives and visions are thoroughly and holistically established within the communities. Even though the majority of the respondents from eco-developments expressed their enthusiasm for living environmentally sound lifestyles, some issues such as self-imposed or "too strict" regulations were addressed in creating inward looking societies rather than 'sustainable' ones. Some of the comments included in Boxes 2 & 3 provided important insights on how inter-connected the social and physical aspects are in establishing and maintaining environmentally sound villages, towns or cities, at large.

Box 3. Quotes from respondents who expressed critical views on the social aspects of living in eco-developments.

"All good. Some governance issues i.e. many passionate people trying to do similar (eco friendly) things, but with slightly different opinions on critical things: lead to slow decision-making and some frustration. Hard to get the governance model right" ***(Quote from response #88, Question 65 - resident from eco-development)***

"People (are) *on top of each other. Tends to develop interpersonal problems. Strong personalities tend to dominate.* (It is) *difficult to get a decision"* ***(Quote from response #25, Question 66 - resident from conventional development)***

"I'm a member of a project trying to establish an eco-village: the most challenging factor is human interaction, perception and communication" ***(Quote from response #93, Question 65 – resident from conventional development)***

These and other similar statements provided valuable insights into how planning and design of developments, be they eco-developments or conventional developments require holistic, multi-disciplinary and inclusive approaches.

5.9. Perceived Level of QOL

In addition to the analyses, which focused on the residents' perceptions of various facets of life domains, additional evaluations were performed to gain insights into overall QOL perceptions of the respondents.

Initial cross tabulation results of responses to the questionnaire statement: "*I am/we are completely satisfied with our quality of life, in general*" were:

a. 95% of Eco-development residents selected this answer;
b. 76% of Conventional-development residents selected this answer.

These data provided an indication of differences between the residents' perception of QOL. However, in order to cross validate these findings, a subsequent test was performed to explore the level of perceived QOL of respondents, comparing the QOL of residents who identified their place of residence as "Environmentally-friendly" with the residents who did not (See Question No. 64). The findings revealed that 94% of the respondents who defined their place of residence as "Environmentally-friendly" (but may not be necessarily living in a place identified as an eco-development) agreed that they were satisfied with their QOL in general compared to 74% who defined their place of living as not so environmentally-friendly.

Based upon the differences of perceived QOL between the two groups, it was concluded that the perceived level of QOL was higher among the residents living in eco-developments than among the respondents from conventional developments.

6. Discussion

The findings from the respondents' insights suggest that most of those who chose to live in an eco-development, agreed that; among the factors that influenced their decision to move to that location included the, [1] *friendly and open people,* and [2] *the natural environment.* The respondent's statements supported those findings as they elaborated upon how they felt and experienced their place of living. In parallel with these findings, the community characteristics and 'sense of belonging' or 'local attachment' were strongly highlighted with regard to how they provided a greater sense of satisfaction of being part of a community that shared the same values, expectations and *'energy toward adopting a sustainable lifestyle.'*

> *"I live in cohousing and I can't imagine living in any other way now because of the high quality of life in so many ways. I feel a deep sense of acceptance and belonging that I have never felt in another neighborhood."* ***(Quote from response #42 on Question 65 / eco-development resident)***

With regards to the location of the place of residence, for those living in remote areas however, distance to work challenges were stated as a negative factor in terms of both financial expenses as well as for the need to use automobiles more frequently than the public transport, which is seldom adequately available (Box 2, Section 5). The location of the place of residence was chosen based on the proximity to work, schools, health and shopping facilities or alternatively, its "*convenience to several forms of public transport serving all nearby and distant locations*" ***(Quote from Response #66, Question 42 / eco-development resident).***

> *"We make plenty of money to do the things we want to do. The convenience and comfort brought by money is of course alluring, however, we prefer a simple lifestyle that is less consumer based, more self sufficient, and within the means of our global community. Any income generated above meeting our basic needs, we prioritize distributing to other projects and people over accumulating it to make our insular community more luxurious."* ***(Quote from response #4 on Question 14 / eco-development resident)***

Additionally, the quality and/or quantity of educational and healthcare services were perceived as being either inadequate or costly when the residents were located too far from the urban locations where the trained and experienced practitioners were available. The availability of educational facilities was found to play a key role in the choice of residential place if families had children or planned to have children in the near future. However, some respondents were happy to live in rural settings where they felt it was better suited because of what nature offers their families whether it is for their health or for their education. However, the proximity of reliable healthcare and educational services was found to be important in terms of planning communities especially, in rapidly urbanizing regions.

In line with these findings, the respondents who elaborated on the future of their village/ neighborhood, stated that it would be best if more people moved in sooner or in the next five years as the increased density in their village / town would make their place more vibrant and would provide improvements such as enhanced walkways, bikeways, frequent public transport, and more business opportunities. The economic aspect of living in communities that are more distant from their jobs in terms of commuting and time, were found to be one of the primary concerns, especially for families with young children. Such comments underlined the importance of social and physical connectedness within the communities and to the broader urban amenities.

The critical view of respondents on their home's size and quality revealed that environmentally sound attributes such as thermal insulation / passive house design, water and energy efficient systems and technologies were perceived to have higher initial cost implications for most, however they indicated that these attributes were more important than the size of their residence / accommodations. With regards to the costs of services and maintenance, it was found that the residents who pay rent or obtain their accommodations in exchange for work were less concerned about the costs than the respondents who had a shared accommodation or ownership and who expressed more genuine interest in the eco-friendly systems, technologies, their cost and maintenance. This underscored their higher sense of belonging in their community.

7. Conclusions and recommendations

The findings of this study underscored that challenges as well as opportunities exist for people who live within as well as outside of eco-developments in ways that are related to one's overall perception of QOL. Moreover, the lessons derived from this research based on the respondents' reflections, emphasized the importance of key social and physical aspects to consider in terms of creating truly sustainable developments both in rural and urban contexts.

Based upon the analyses, the authors concluded that: *Residents in eco-developments perceived a higher QOL than residents of developments in conventional settings*. The data revealed that, shared sense of purpose, values and principles in a community are key to sustainable and environmentally low impact developments. Moreover, the findings support those of earlier studies that people living in eco-developments have adopted relatively more sustainable lifestyles (Van Schyndel-Kasper 2008) by decreasing their per capita carbon and water footprints (Scheurer & Newman 2009; Williams 2013) and by increasing their recycling rates (Miller & Bentley 2012; Berg 2004; Baas et al. 2014). Many of the eco-development residents were engaged in hobbies, environmentally oriented activities and practices (such as urban gardening, car sharing/pooling etc) that create various dimensions of connectedness whether these occur between human and nature or through interactions in between inhabitants (Kirby 2003). These aspects can be replicated in larger scales and can be valuable for designers, planners and decision-makers of existing and/or of emerging cities.

Based on the report published by the United Nations (UN 2012), 67% of the world's population will become urban residents by the year 2050. It is also suggested that many cities in the world have already exceeded the recommended annual average of 2.2 tons of CO_2 equivalent value per capita (UN-Habitat 2011) and *by 2030, over 80% of the increase*

in global annual energy demand will come from the cities in developing countries where the highest expected rate of urbanization will occur. The implications of this phenomenal growth in urban population (UN-Habitat 2011; UN 2012) and the accompanying increases in consumption levels continue to threaten the social, physical and environmental capital on which present and future generations are dependent (de Oliveira et al. 2013; UNFPA 2012).

In order to transform cities into more circular urban systems, eco-developments in various contexts, offer valuable lessons and opportunities to understand perceptual, behavioral and cognitive dimensions of human interaction with nature.

It is essential to conduct in-depth research to document whether or how the quantitative and qualitative dimensions can be further explored to help urban planners to design and to implement better urban systems including the QOL perceptions of residents, which is an increasingly important measure to be used in establishing urban development policies. Future studies are needed with larger numbers of subjects in eco and conventional development groups so that more scientifically sound comparative analyses can be performed.

8. Acknowledgements

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4.3 Reflections on the findings of Chapter 4

The research on the QOL perceptions provided valuable insights into the resident's expectations, aspirations and subjective views of their lives in the eco-developments as well as how these findings compared to the residents that lived in conventional urban settings. The findings suggested that the eco-development residents were notably more satisfied with the quality of their life than those who lived in other contexts. The main factors found to influence these results included the sense of belonging, natural environment, local attachment and the satisfaction with home-life and neighborhood qualities, all of which contributed positively to one's overall satisfaction with life.

Although the study was neither correlational nor conclusive, the qualitative data gathered from the respondents supported the findings from the review of QOL aspects and furthermore, they suggested positive behavioral changes towards sustainable lifestyles (Van Schyndel-Kasper 2008) by decreasing their per capita carbon and water footprints (Scheurer & Newman 2009; Williams 2013) and by increasing their recycling rates (Miller & Bentley 2012; Berg 2004; Baas et al. 2014). The social interactions and cohesion among the community members was found to be among the essential elements, which helped to provide a higher sense of community and place as a result. Many of the eco-development residents were engaged in various environmentally oriented activities and practices (such as urban gardening, car sharing/pooling etc) while the residents from conventional urban settings underscored the lack of time and energy for similar personal activities.

With regards to the more specific findings of the study, the closeness and connectedness of the location of the residential place to the broader urban amenities, and the availability of services such as health, education or infrastructure were associated with the positive aspects, which contributed to the QOL of residents. These were found to be highly relevant aspects for the planning and development of new settlements especially in the context of sustainable urban transformations. In line with the physical characteristics of the developments, the size and quality of the housing was less emphasized compared to the environmentally sound features and building technologies despite the higher costs of installation and maintenance. Additionally, the property rights or the ownership of the place in which these attributes were found, contributed somewhat positively to the willingness to use and maintain such features compared to the residents who lived on some form of rental/social accommodation. It was found that the dwellers were relatively less enthusiastic to use or maintain the environmentally sound features if they perceived to be excluded from the potential financial or physical benefits. The authors associated this finding with the sense of belonging and sense of place or local attachment, which contributed strongly toward adopting sustainable lifestyles and pro-environmental behavior.

Based upon the analyses performed in this QOL research, the authors concluded that the shared sense of purpose, values and principles in a community are key elements for establishing sustainable and environmentally low impact developments. This study documented important aspects of the development processes and governance modalities of the eco-developments that can be replicated in larger scales and can be valuable for designers, planners and decision-makers of existing and/or emerging cities. For example, the participatory processes in planning and implementation were found to be essential for establishing developments around the common goals. Building consensus among the community members was found to have complexities, therefore, conflict resolution and commitment to collective action in the decision-making processes were key processes that helped to ensure long-term success, especially when the local attachment and sense of community are integral elements for attitudinal and behavioral changes towards sustainable lifestyles.

Although the research into the similarities and differences of the perceived QOL dimensions provided valuable insights into the eco-development residents' perceptions and behavioral contexts, the dissemination of positive lessons and experiences was not thoroughly understood in the context of large-scale urban initiatives. In order to investigate and analyze the successes and failures of the eco-town based developments, the author developed his case study methodology based on the findings drawn from the literature review as well as from the insights gained throughout the QOL research as presented in this chapter. In Chapter 5, the author discussed the framework through which the cases were selected and the case study research was conducted within five eco-developments in The Netherlands, Sweden and Germany.

Chapter 5

Introduction to Case Study Research

5.1. Method and Rationale

As addressed in Chapter 1, the comprehensive literature review helped this thesis author to underscore specific aspects of the development processes of eco-towns that potentially contributed to their varying outcomes. In order to be able to gain in-depth knowledge and to answer some of the research questions presented in Chapter 1 of this thesis, the case study approach was found to be appropriate for the next phase of this research.

Case studies have been used as tools in order for researchers to better understand certain phenomena (Dooley 2002). Case studies can be linked to an experiment, history or to a simulation (Yin 1981) or can provide '*detailed contextual analysis of events and / or conditions and their relationships in between'* (Dooley 2002). Case study research is also valuable because it provides context-dependent knowledge, which is pivotal for gaining intellectual and technical skills so that the researcher becomes an expert in that particular field.

Additionally, it has been found that case study research can contribute to theory building through observing not only one, but all of the known variables and these variables' inter-relatedness. Whether it is a single case study done independently or a cross-case analysis of multiple case studies, a theory can be formed and refined through ongoing comparisons of the data that were gathered and analyzed (Dooley 2002).

Flyvbjerg (2006) stated that case study research and its closeness to real-life situations helps in testing the views of the researcher prior to in-depth study of the phenomena. In most cases, after having conducted an intensive research study, the researcher often revises her/his preconceived ideas, hypotheses or assumptions. With regards to case study research as a method, therefore, he proposed that:

- *"The human behavior can be understood from context dependent knowledge rather than from the rule-governed acts," which he chose to define as the 'lowest level of the learning process,'*
- *Also, case study research is important for the researcher's learning processes in developing the necessary skills to conduct good research, because it provides great 'first-person-insights' gained through the context-dependent experiences.* (Flyvbjerg 2006)

Additionally, Dooley (2002) stated that case study research fulfills the following four roles in theory building:

1. It helps in '*putting the proposed theory into application or in practice during which the theory is refined revised and further developed.*'

2. It helps to either confirm or falsify the already conceptualized theory, which involves planning, design, implementation and evaluation.
3. It serves to advance the conceptualization and operationalization of a theory.
4. It facilitates, through a single case or multiple cases with continuous refinement of the theory or theories.

Eisenhardt (1989) addressed some of the key elements in theory-building process and how to integrate the case study approach during the theory construction or evaluation. For example, she identified that the first step toward the theory building is to define the research question(s). Well-defined research focus and questions will help the researcher(s) to collect specific types of data more systematically throughout the research process. Secondly, identifying the '*priori specification of constructs*' or the outline of the theory that is critical in terms of theory-building; essentially because the researcher will constantly measure and evaluate the constructs [5] (inductive) or variables (if the research is deductive) as the research progresses through interviews and questionnaires (Eisenhardt 1989). Later in this section, the distinction between these modes of reasoning is made explicit. However with regards to theory building, the case study approach and its design in general, the following steps were widely accepted for conducting case study research whether it is designed to test a theory or the theory is generated through the evaluation of the data gathered in the process.

The six steps of case study research as described by Dooley (2002) are:

- *Defining the research questions;*
- *Selecting cases and determining data gathering and analysis techniques;*
- *Preparation for data collection;*
- *Data gathering;*
- *Evaluation and analysis of the data gathered;*
- *Developing the report.*

As a complimentary approach to Dooley's stepwise process, the methodology adapted from Yin (1989)'s "*Case study research: Design and methods"* shows the process through which

5 In Eisenhardt's paper titled, '*Building Theories from Case Study Research* (1989), the case study design and methodology are described in relation to theory building as an inductive process. Although she expanded upon in her paper, the grounded theory building from case studies, the key issues regarding the methods are highly relevant with other types of case studies. One key point she underscored is that the researcher, in her / his case study should investigate the research problem with potentially key variables that were identified through the literature rather than focusing on specific relations between variables and theories. However Flyvbjerg cited Eckstein (1975) suggesting that the case studies are better for testing hypotheses than for producing them. He further expanded upon Eckstein's assertion that *"...case studies are valuable at all stages of the theory-building process, but most valuable at that stage of theory-building where least value is generally attached to them: the stage at which candidate theories are tested"* (Flyvbjerg, 2006).

the theory is developed, operationalized and tested. It is important to note that the feedback from the cross-case analysis, in cases of multiple-case study research and evaluation, the theory can be revised and further developed as a result of the continuous refinement (Flyvbjerg 2006; Dooley 2002).

As presented in Figure 5.1, the case study design in this thesis' research used a similar framework to the model proposed by Yin (1989) as well as Dooley (2002), where previous comprehensive literature reviews along with direct observations helped the author to develop the initial research questions.

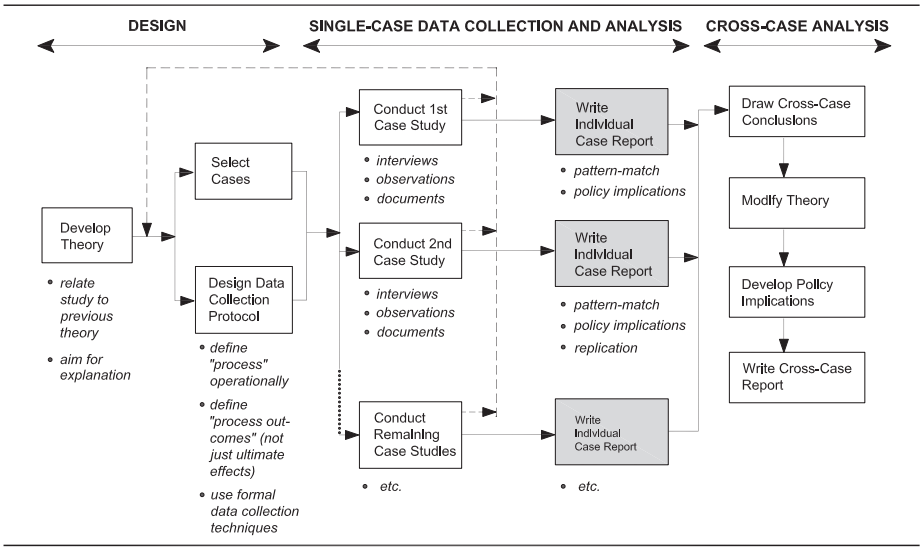

Figure 5.1 Process flowchart (Yin, 1989) for the case study method as excerpted from Dooley (2002)

Also, the exploratory and descriptive nature of the case study research strategy (Baxter & Jack 2008) provided the author with the necessary tools to be able to make cross-case comparisons within workable and manageable limits in terms of time and resources.

With regards to the case study methodology, three modes of generalization were found to be relevant within the context of this thesis research. These are: *abductive, inductive and deductive*.

- '**Abductive'** mode of reasoning is used when a case is synthesized from the gathered facts in the case and the theory in principle. It is also used *to compare* an actual problem with identified cases.
- '**Inductive'** mode of reasoning is used in *theory generating* from the facts in the case.

- '**Deductive'** mode of reasoning is employed in order *to validate or falsify* a theory (hypothesis) through testing in one or multiple cases. (Johansson 2003)

As Johansson (2003) described, the case study research in this thesis was designed to answer the research questions through comparing the expected findings with the empirical data, which either verifies or refutes the statements / propositions. However, with regards to distinguishing the research process and approaches, Femenias (2004)'s review of the modes of generalization, 'abduction' was found to be also relevant in terms of defining the type of approach for the research process in this thesis. According to (Femenias 2004, pp.105-106), abduction is somewhat found in between deduction and induction as it makes use of both the empirical evidence as well as some extent of theoretical pre-understanding of the field. In reviewing the eco-town developments (see Chapter 3) from a broader perspective, the author gained critical insights of the factors that impact their outcomes, hence the successes or failures. In Johansson's review, two types of abduction were described. The first type of abductive mode of reasoning referred to the cases reconstructed from a few facts, historical data and / or clues. The second type of abductive reasoning was explained when "*generalization was made from the cases and applied to an actual situation / problem by making appropriate comparisons*" (Johansson 2003, p.10). This iterative research process, as defined by Femenias (2004), involved in-depth data collection and evaluation of empirical material (p.106), which required case study research as expanded upon in this and in the following chapters.

In light of the review of the case study research methodology, cases that were found to be relevant were selected and the data gathering protocols were designed. Subsequent to performing the case studies (as shown in Figure 5.1), individual case study reports were developed. Together with the critical findings of individual case evaluations, cross-case analysis was performed in order to further clarify the research findings and also to answer the research questions that were formulated by this thesis author.

5.2. Validity and reliability

As McLachlin (1997) outlined the four crucial tests he used to ensure the validity and reliability based on Yin (1989)'s case study tactics; this thesis author also found it integral to include the same table (see Table 5.1) used by both authors in their respective papers.

With regard to these four steps, the author made use of the logical tests that were initially designed to judge a research design by Yin (McLachlin 1997) to ensure the reliability and validity of the overall process. However, as stated by McLachlin, using the findings or the generalizations, if there were any, would be somewhat difficult to replicate as the means

Table 5.1 Case study tactics for four design tests (Source: McLachlin, 1997 as excerpted from Yin, 1989)

Test	Case study tactic	Phase of research in which tactic occurs
Construct validity	Use multiple sources of evidence Establish chain of evidence Have key informants review draft case study report	Data collection Data collection Composition
Internal validity	Do pattern matching or explanation building or time-series analysis	Data analysis
External validity	Use replication logic in multiple-case studies	Research design
Reliability	Use case study protocol Develop case study data base	Data collection Data collection

of external validity (pp. 276-277) due to the fact that the large-scale developments such as eco-towns would be needed for this task. However, in terms of constructing reliability, the records of interviews, the sources of information (such as the official government websites, ex-post evaluations and all other materials from which the data were gathered) have been dated and saved for future reference and/or subsequent analyses.

5.3. Case selection and data collection

Case selection is one of the most critical phases of the research that determines the course through which the researcher will invest time and resources. Issues such as the purposive selection of the 'unit of analysis' by the researcher, hence the risk of selection bias requires careful attention in order to prevent credibility questions in later stages. It is important to be aware that random selection of the cases with very small sample sizes may pose a threat

Box 5.1. The seven techniques used to conduct good case study research (Yin 1994)

1. *The use of multiple sources of evidence, in a converging manner;*
2. *The explicit specification and testing of hypotheses and rival hypotheses, especially in lieu of controls or comparison groups;*
3. *The dominance of deductive strategies, whereby research starts with theorizing;*
4. *The use of program logic models as a standard way of initiating a program evaluation;*
5. *The use of pattern-matching as a common strategy for data analysis;*
6. *The use of portfolio analysis, using qualitative criteria to differentially weigh the outcomes from a project or the projects within a program; and*
7. *The use of replication logic, rather than aggregating data, when comparing the results from multiple sites or cases.*

(For further insights on these seven techniques, the following paper was found to be useful: Yin, R. K. (1994). Discovering the Future of the Case Study Method in Evaluation Research. Evaluation Practice, 15, pp.282–290.)

in terms of their relation to the theoretical model of the research in general. '*Purposive*' methods for selecting the most appropriate cases in relation to the research strategy are therefore, preferred because they have the potential to make a greater contribution to the quality and quantity of the findings as well as to contribute more effectively to theory building and theory testing (Seawright & Gerring 2008). Although these methods cannot totally eliminate the reliability questions, the many concerns can be avoided with the help of the techniques addressed by Yin (1994) as presented in Box 5.1.

With regards to the selection of the cases, the background of this research involved a two-fold process. First, systematic comprehensive review of the literature was conducted from two perspectives:

- *The published materials on the eco-town developments from around the world were reviewed;*
- *The collected data were then categorized according to relevance, type and quality.*

This review was conducted between 2008 and 2010 among the eco-town developments that were initiated after the 1990s. During this period, many initiatives were begun globally, however due to the relatively small amount of material with qualitative and quantitative information, the initial study was limited to fourteen eco-developments in eleven different locations that were comparatively evaluated. The data were subsequently analyzed and the findings were presented in the ERSCP-EMSU conference in Delft (2010) during which valuable feedback from the participants was obtained. The criteria for the selection of the case studies for this thesis were developed to ensure validity of the results and with regards to the research goals and objectives.

In the second phase, subsequent research was conducted between 2010 and 2013 that was specifically focused upon the examples from northwestern European countries. The cases with ex-post evaluations and reports were researched and peer-reviewed journal papers were studied. The criteria used prior to the case selection process were revised and re-developed/updated as a result of the comprehensive review of the literature with a refined problem statement and research agenda.

Consequently, the selection criteria included the eco-town developments that were designed and developed as part of the national policies or as demonstration urban development projects in the western and northern European context. This was mainly due to their relatively early introduction and completion dates compared with other developments that are still in the early development stages in other parts of the world. It was also important that the developments would be selected from within relative close proximities regionally, and temporally also because of the time and resources needed to exercise this extensive work on condition that they meet the requirements as stated above. Therefore the cases were selected

from Germany, The Netherlands and Sweden because they represent similar geographical context and were started in approximately the same timeframes in terms of integration of ecological modernization in their respective nation's urban development policies.

Table 5.2. Selection criteria for the case studies designed to evaluate multiple eco-town development processes.

Region	**North and Western Europe**
Countries	The Netherlands, Germany and Sweden
Location	Urban setting
Type of project	Mixed-use residential development
Size	In the scale of neighborhoods or districts
Current state of the development	Fully completed / if not, then occupied by residents where one or more phases of the development are completed

Based on the selection criteria (Table 5.2), the following five urban development cases (see, Table 5.3) were found to be potentially rich in terms of providing the amount and quality of data that may help this researcher to study their development processes in light of the research questions.

Table 5.3. The description of the selected eco-towns based on the selection criteria

Case number	**Eco-town's name**	**Location (City and country)**	**Beginning of occupancy / completion date**	**Planned number of housing units**
Case #1, #2 & #3	Kattenbroek, Nieuwland and Vathorst	Amersfoort, The Netherlands	Already inhabited	20,000 units when completed
Case #4	Hammarby Sjöstad	Stockholm, Sweden	Already inhabited and expected to be completed between 2015-2017	11,000 units when completed
Case #5	Vauban	Freiburg, Germany	Completed	2,000 units

The eco-town developments included in Table 5.3, were chosen among similar cases rather than contrasting in part due to:

- The geographical, historical and cultural contexts;
- The availability and the number of interviewees that were required;
- Budget and time limitations in conducting the case studies.

Another reason for the selection of these cases included the availability of the ex-post evaluations on aspects that would otherwise be too time consuming for data gathering, hence the resources to be allocated to finalize the case study research.

5.3.1. Data collection & methods

In eco-town development processes, a number of procedural and contextual elements were found to be relevant in terms of the case study research. As discussed in Section 5 of Chapter 3, the initiation, funding, design, development and governance were all found to have played important roles in the success of the eco-towns. In order to gain insight into how these aspects have influenced the environmental performances or the resident satisfaction, preliminary research was conducted among the literature that were published as well as the case studies that were conducted recently. It was concluded that due to the dynamic and constantly evolving nature of these large-scale development, a combination of methods (Eisenhardt 1989) were found to be useful in data gathering process.

Therefore, in order to conduct the case study research holistically and to achieve reliable collection of empirical data, multiple sources were used (Baxter & Jack 2008). These primarily included but were not limited to:

1. *Semi-structured interviews*
2. *Document analysis and literature review*
3. *Direct and participant observation and,*
4. *Surveys (where necessary)*

As a second unit of analysis, which Dooley (2002) cited as the actors / stakeholders in different roles in a case study, the actors (see, Table 5.4) were identified as potential sources for data collection.

As briefly discussed in Section 1.3 of Chapter 3, the procedural, contextual and conceptual aspects have been selected as the research foci based on the comprehensive literature conducted in 2012 and 2013. The semi-structured interview questions were designed to help the researcher to gather qualitative information from the type of actors as listed in Table 5.4. The topics included but were not limited to:

- *The background of the initial decision to develop the area;*
- *The vision and goals of the development;*
- *The funding as well as the financial model;*
- *The implementation framework, development (partnership) model;*
- *The environmental planning, implementation and regulation of the environmental measures and monitoring during and after the development;*
- *The formulation of the stakeholder involvement;*
- *The outcome of the development from the interviewee's perspective;*
- *The perceptions of the physical and social qualities of the eco-town.*

Table 5.4. The types of actors and their roles to be interviewed as one type of primary source of data.

Eco-town development phase	Roles of individuals to be interviewed
Initiation	Individuals who can provide insights at the political and institutional levels such as those working for the mayor's office, municipality and / or local administration who have first-hand knowledge as to how the dynamics played a role in the initiation of the project.
Design	Urban planners, architects, engineers / technical personnel who were directly involved after the projects were announced and the planning process was started. Also, interview people knowledgeable about how the environmental planning and the physical urban and architectural plans were developed and administered.
Development	Developers / building contractors / project managers who can provide insights into how the implementation of the project was handled, whether the codes and regulations helped to more efficiently develop the project or if they hindered the process in terms of time and resources. It is also important to understand whether the knowledge and practices employed during the development were disseminated / replicated after the project was finished.
Governance	City administration and management official(s) and NGOs may help the researcher to understand the overall management of the process in terms of coordination and interaction between the actors and to learn how issues such as funding and stakeholder involvement were managed.
Residents	Current and / or former residents will provide direct knowledge with regards to their experiences whether that may be from the initial stages of the development or after having moved in the area sometime after it was initially occupied. Such insights will help the researcher to gain insights in terms of user experiences of the neighborhood amenities, their sense of community / ownership and their perceived level of QOL.

Besides the overall background and the insights gained on the above fields of interest, based on the 'success factors' identified in Chapter 3; more specific questions were formulated for analytical purposes, which were further explored in the case studies in Chapters 6, 7 and 8. These specific sub-sets of elements mainly included the following (see Table 5.5):

Additionally, it must be noted that the six 'success factors,' were identified in result of the comprehensive research consisted of the literature review and the quality of life study, and were found to be necessary for further investigation by this thesis author via the case study research. Thus, the 'success factors' were not articulated further in the theory sections of this thesis as the author sought to identify whether they were relevant individually or in which configuration they functioned best synergistically and integratively. Therefore, the author elaborated on the 'success factors' in each of the case study chapters, in conjunction with their impacts of the studied development, and further elaborated on their roles in the cross-case analysis presented in Chapter 9 of this thesis.

Table 5.5 Evaluation chart for the six variables identified as the necessary conditions for success of eco-towns.

V1. Political commitment	
1.1	Local government supported the project from the initiation;
1.2	National or regional governments supported the project and were in consensus in terms of the goals of the development;
1.3	Constant monitoring of the established codes and standards existed;
1.4	The local government helped to facilitate the policy management in order to most efficiently achieve project goals and objectives.
V2. Timing	
2.1	The project was decided based upon, the anticipation of a great event, which could provide momentum and also popularity among stakeholders;
2.2	The project was a result of a national policy action plan
2.3	There was a housing shortage and demand at the time of the decision to develop;
2.4	The economic indicators looked positive in terms of mid and long-term affordability of the houses.
V3. Financial model	
3.1	Initially and also throughout the process, the funding of the project core management teams were provided;
3.2	The funds were allocated for the municipality's ownership of the land on which the development was built;
3.3	The funds for infrastructure and for the integration of innovative systems (such as energy, water, building technologies etc.) were made available through grants, long-term loans and / or subsidies;
3.4	Long-term financial plan was formulated and secured in order to ensure the planned delivery and occupancy of the units
V4. Physical qualities	
4.1	The development has an attractive design with distinctive architecture in general;
4.2	The building standards and the quality of the materials are relatively higher than the conventional developments around the city;
4.3	The amenities and facilities in the neighborhood and its vicinity are well thought and they satisfy day-to-day needs of residents;
4.4	Natural environment within the development and its surrounding area provide great potential for walking, cycling and exercising while enjoying outdoors;
4.5	The neighborhoods and the district are well connected through walk and bicycle lanes as well as with good public transport;
4.6	Eco-friendly energy, water, waste and transport systems are well embedded in the design of buildings and the urban spaces.
V5. Stakeholder involvement	
5.1	The multi-disciplinary approach / multi-actor involvement existed from the design stage of the project throughout the development;
5.2	The existing and future residents were included in the design process;
5.3	The existing and future residents influenced the decision-making process on issues effecting the outcome;
V6. Environmental plan	
6.1	The project had a clear environmental plan with realistic goals that were established from the beginning;
6.2	The environmental standards were monitored and ensured throughout the process;
6.3	The future residents and actors (developers, builders, architects etc_) were involved in the decision-making when the environmental plans were established;
6.4	There was a clear plan as to how to operationalize the environmental model and to achieve environmental goals and ambitions;

5.4. Analytical procedures

Based on the findings of the comprehensive literature review, six factors (see Section 5 of Chapter 3) were found to be important in terms of their role in the success or failure in achieving the desired eco-town goals. With regards to the methodology in the case study design and analytical procedures to validate or falsify these initial findings, further research was conducted in order to establish a road map with which the goals of the case study research could be operationalized and the six 'success factors' could be analyzed. During this process, a number of articles were found to offer useful approaches with regard to methodological techniques. Poole and McPhee (1985), for example, explored and discussed these 'methods', which they described as the procedures of design, data collection and analysis used by the researcher to investigate *[interpersonal]* phenomena. In their review of the most significant methods, the following modes of 'inquiry' and 'explanation' were emphasized (Table 5.6).

Table 5.6. Methodological approaches and techniques as explored and summarized by (Poole & McPhee 1985).

(For modes of inquiry)	**(For modes of explanation):**
1. Hypothetico-deductive	*1. Causal*
2. Modeling	*2. Conventional*
3. Grounded	*3. Dialectical*

The causal explanation, referred to here is the researcher's position or ability to give an adequate depiction of the world / problem area and thus, requires tests for the adequacy of the researcher's reasoning and procedures which Poole and McPhee (1985, p.46) explained as the '*validation of internal logic and richness of the researcher's explication of constructs*'. Conventional explanation, referred to demonstrating how subjects would act or react in a way that is understandable in the context of a 'pertinent convention'. They noted that an adequate conventional explanation did not have to be necessary or general or demonstrate temporal ordering of cause and effect (p.47). In other words, conventional explanations are grounded in the subject's point of view, whereby the researcher probes the subject's behaviors and cognitions. In dialectical explanations, beyond the conventional explanations, the causal context is also taken into consideration in explaining how one norm operates in a particular way and/or in any specific instance. In the context of this research, the review of the modes of explanation was found to be relevant because it offered, to some extent, distinctions in terminology and/or methods to be employed similar to the ones explained for interpersonal phenomena. It also helped this thesis author to define the research limitations and provided a wider perspective in answering the research questions,

which, to some degree, reflect upon social and psychological dimensions in explaining successes or failures of eco-towns.

With regards to the modes of inquiry, three distinctions were made by Poole & McPhee. In the hypothetico-deductive reasoning, theory is prior to data collection and testing of hypotheses. In 'modeling', according to Poole and McPhee, all of the theory building, operationalization of research and explanation of observed behavior of data are simultaneous. The grounded mode of inquiry was described as a bottom-up approach in which the researcher develops theory from direct observations, experiences and collection of data. In this mode of inquiry, Poole and McPhee further noted that the researcher becomes more sensitive to the details, nuances of that particular phenomenon and thus, avoids the 'blinders' established by a priori theory (Poole & McPhee 1985, pp.50-51).

In brief, as was also explained in Poole and McPhee's review, the hypotheses were developed prior to the data collection and hypothesis testing. However as Femenias (2004) also noted, the pre-knowledge in the field through previous research helped the author to gain insights, and thereby, to help in formulating the research questions. Johansson, in his lecture notes (Johansson 2004), referred to the problem formulation as the starting point within the body of available knowledge. Subsequently, the hypothesis is developed as a probable solution before and from which testable consequences are deduced theoretically. In order to test the hypothesis, *procedures* are *designed* and performed after which the evidence obtained from these tests are compared with testable consequences that were deduced previously.

Therefore, with regards to the mode of inquiry, the comprehensive review of the relevant material was useful in defining this thesis research process. However, in-depth study of the methodological techniques was conducted more specifically, in order to determine how to empirically link the selected cases and within which criteria the data should be gathered from the selected cases and subsequently analyzed. In other words, as Johansson (2004) explained, the procedures needed to be designed and the actual evidence needed to be produced. The following section explores the ways in which the evaluation of the six critical success factors (CSF) [6] has been planned and conducted through the five case studies. These factors were hereinafter, referred as the 'success factors.'

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6 The critical success factors (CSF) as a term, has been found to be widely used in the context of enterprise resource planning (ERP) and operational management explaining the factors that "*determine whether the implementation (of a project) will be successful*" (Dul et al. 2010). In their review, they refer to the CSFs as a necessary condition in helping an organization to achieve its mission. In this thesis context, the six factors that were identified to be integral in developing successful eco-town developments also constitute the necessary conditions and therefore the term "CSF" was used explicitly to acknowledge the link of the methodology that was employed to investigate their validity in this thesis.

5.4.1. Analyzing the 'success factors'

The 'success of eco-town' was identified as the dependent variable in Chapter 1, while the six 'success factors' that were found to contribute to the success (in Chapter 3) were defined as the independent variables or as the essential elements needed to establish successful eco-town developments. With regard to the term "Critical Success Factor" (CSF), which has been defined as the element that is necessary for achieving an organization's project mission (Dul et al. 2010, p.1174), Dul et al. (2010) suggested that the term was associated with the necessary condition hypothesis.

As highlighted by Dul et al. (2010) in their review of the necessary conditions analysis (NCA) methods, the theory-building research elements (the dependent and independent variables) were tested through case / cross-case analysis seeking to find '*similarities and differences that are further described as hypotheses*'. These elements were expanded upon in the previous sections of this chapter with emphasis on particularly the works of Yin (1981; 1994), Flyvberg (2006) and Eisenhardt (1989), on how to design and conduct good case study research.

Dul et al. (2010) further elaborated on the "necessary condition hypothesis" in order to establish a guideline for researchers with particular focus on theory building and testing through case studies. In their review of relevant models, they underscored a number of points to clarify the definitions including the empirical as well as the methodological issues regarding testing the necessary conditions. As a simple approach to explain the necessary condition hypothesis, the conditions of X and Y were used to explain how an outcome with many configurations, can occur. For example;

- "X is needed for Y" or "Y is unlikely to occur if X is absent" (Dul et al. 2010).

In this illustration X represents the condition, which can either be present (X=1) or absent (X=0). Similarly the values 1 and 0 can be used for Y, which represents the outcome. Dul et al. defined the single variable condition with the two possible outcomes (see Table 5.7). In their paper, they used this particular example: *"the change can only be successful if there is management commitment"*, whereas "change" is the dependent variable and the management commitment is the independent variable.

Table 5.7. Illustrative single variable condition adapted from Dul et al. (2010) demonstrating the scores for the X and Y variables.

Dependent variable	Absent (X=0)	Present (X=1)
Present (Y=1)	**Not possible**	**Possible**
Absent (Y=0)	**Possible**	**Possible**

Independent variable

Furthermore, the 'necessary condition' is suggested to often involve a single variable (Braumoeller & Goertz 2000). However Dul et al. (2010) acknowledged that the condition(s) can occur from a configuration of a set of variables (Fiss 2007) such as the following example that was excerpted from the same review article: "*success is only possible if both the management commitment and financial resources are present*" (Dul et al. 2010). The number of variables as well as the number of cases therefore can be more than one and that has been critically studied in the context of Qualitative Comparative Analysis (QCA) for testing necessary / sufficient conditions. First of all, QCA has been defined as a technique that is used to compare similarities and differences of variable sets / configurations of variables between a number of cases (Marx 2006, p.3). According to Marx (2006), the QCA technique consists of '*understanding how configurations of variables are linked to a certain outcome*' through comparing cases. In his study, Marx explained the number of cases and variables mattered in terms of conducting sound qualitative comparative analyses and concluded that there is an upper limit for variables for any given number of cases (p.18). For example, at least 12 cases for 4 variables or 50 cases with a maximum of eight variables.

In this thesis' case study research, it was found essential to include these particular examples because they are considered to represent the basic building blocks for the methodological approach that was designed to empirically test the hypotheses similar to those initially developed by the author based on the previous body of knowledge. However, due to the limitations in identifying the cases (in this case the eco-town developments) and conducting thorough research on their processes (which involved time and other resources), one can hardly expect inclusion of parameters such as those described by Marx (2006). Therefore, qualitative and exploratory research approach was found appropriate in terms of defining the methodology of this thesis author. In this context, the use of terms such as significant or necessary should be noted outside of the statistical sense in order to prevent any misinterpretation.

5.4.2. Qualitative and quantitative data

In a case study research especially with multiple responses gathered from semi-structured interviews and other sources, it is a complex task to derive results that can be measured and evaluated empirically. For the cross-case evaluation of eco-towns in this research, both the qualitative and the quantitative data gathering, hence the analyses were required on all procedural, contextual and conceptual aspects as mentioned in Section 1.3 of Chapter 3.

With regard to the qualitative data, the case studies involved, to a greater extent, research on the process; how they were designed, coordinated, conducted and the achieved results and/or if failed to achieve the envisioned outcomes. Therefore, face-to face interviews and research into the existing literature provided insights on the outcomes to achieve the research goals and objectives. Firstly, the body of knowledge that was gathered had to

be *"judged in context"* before including it as part of the evidence for the statement or proposition in question. [7]

Secondly, the research was focused on collecting quantitative (objective) data regarding the consumption levels and data indicative of user behavior, were measured temporally and spatially while conducting cross-case analysis of the overall success of eco-towns.

Based on the two-part process of data collection, the results were evaluated within the protocols that were further expanded upon in the following sections.

5.5 Case study research process

Based on the comprehensive review of relevant literature and the previous studies that were conducted on the eco-town developments; a number of elements were found to be important in terms of the successes and failures that played role in their processes. These were expanded upon with emphasis on the procedural, conceptual and contextual aspects. Subsequent to the in-depth research on these aspects, the six factors were found relevant to the success of eco-town. In order to comparatively assess and analyze the validity of these factors (the six 'success factors'), the case study research approach was found to be appropriate, as it helped this researcher to gather the much-needed qualitative and quantitative data.

Furthermore, this research also revealed that multiple subjective elements contributed to the successes and/or failures of eco-towns, such as the residents' perceived QOL, which in turn influenced the achievement of desired goals and objectives of eco-town initiatives and alike. In an effort to reflect upon these aspects, a semi-structured interview format was developed for the case studies including but not limited to the following topics:

1. *General*
2. *Political and Administrative Aspects*
3. *Funding and Development*
4. *Stakeholder Involvement*
5. *Environmental Plan*
6. *Physical Qualities*
7. *Timing*
8. *Concluding Questions*

7 McLachlin (1997) has contextualized his case study research and methodology mainly based on Robert Yin's work (1989), expanding upon the critical elements on just-in-time (JIT) approaches in manufacturing. His critical review of the qualitative data analysis and operationalization of the research goals were found to be similar to that of the case studies contextualized in this thesis work.

5.5.1 Data gathering processes

The data gathering processes firstly involved the desk research via going through the published papers and documents that were found on the Internet. This provided the initial body of knowledge about the development and reflections from others' research about the initiation, the motivation behind the decision, the size and scope as well as other relevant information whereby quantitative data could be obtained. However, in order to increase the validity of the research, the process of triangulating the evidence / data was necessary (Vernay 2013). In order to do so, the main actors / stakeholders that were involved in the process, were identified starting with the designers, politicians and/or developers. It was not always possible to obtain the information sought after from some individuals due to their unavailability or due to their being un-willing to reveal information that could have had value for the researcher. After the initial response from directly involved person(s), the "snowballing" approach was found to be effective for finding the most critical people that could provide information required to contribute to the case study research. As part of the author's experience, this provided greater access to documents, archives, official reports and papers that would have been missed.

The second step of data gathering involved the actual interviews, which were conducted through the semi-structured interview format developed and revised constantly based on the interviewee's role in the development or the process in general. This provided the information on how the processes worked, what were the challenges and drivers and what lessons were learned during the developments. While in some cases the interviews provided valuable information, others revealed the need for further data collection that was needed to achieve the research goals. Due to the nature and scope of the cases many relevant documents had to be studied to gain insights into the dynamic processes involved.

5.5.2 The data analysis processes

The data analyses involved a stepwise process. To achieve the goals of the empirical investigation initially, an individual report was developed for each case, briefly discussing the eco-town's initiation, design and development process including the drivers and challenges that were found to be important for the end-results. As stated in detail in the methodology section of this thesis, the second step focused on evaluation of the six 'success factors' based on each case's individual performance or outcome. Thirdly, the cross-case analysis was performed and the initially developed research questions were updated/revised, when it was found to be necessary. The final step in the case study research involved identifying the gaps in the initial concepts about what factors influence success of eco-town or what other elements should be present in order to provide long-term behavioral change in the eco-town community and help to disseminate the knowledge and experiences with positive policy changes.

5.5.3 Presentation of cases

Urban development processes involve numerous stages, actors and circumstances that define each one of them with their unique social and physical characteristics as a result. These processes offer much detail for helping to understand the set of conditions and events that played roles in their evolutionary timelines. Therefore, each report presented a brief background on the urban development highlighting the milestones toward the decision to initiate the particular case that was investigated. It then elaborated on the goals and objectives of each development in order to contextualize the eco-town and the rationale behind its design, evolution and relative successes. The framework employed for the overall development process was discussed and the 'success factors' were assessed. Additionally the documented outcomes were discussed.

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Chapter 6

Three cases of eco-town developments in Amersfoort, The Netherlands

6.1 Introduction

The case study research on Amersfoort's three developments of Kattenbroek, Nieuwland and Vathorst was decided upon as a result of the research on sustainable urban developments in the Netherlands, during which Vathorst, as the initially targeted case for in-depth studies was being explored. Additionally, during the research conducted on the eco-town developments, contextualized as part of the comprehensive literature review (see in Chapters 2 and 3), the author of this thesis found substantial amount of material on Vathorst, most of which were developed in conjunction with the environmental characteristics and qualities of the development. Therefore, as an initial step for the case study research, Mr. Paul Heistein, the Head of the 'One Planet Organization' (NGO based in Amersfoort, The Netherlands) was contacted to identify some of the relevant persons to be interviewed. He was also asked to provide an overview of the project during a meeting held on November 7, 2013 in Amersfoort. His views on the successes and the failures of Vathorst's development as well as the ways in which the preceding developments of Kattenbroek and Nieuwland had influenced the decisions that were made during the development process convinced this thesis author to include all three consecutive developments as part of the case study research in Amersfoort, The Netherlands.

As presented in Chapter 6, Kattenbroek, Nieuwland and Vathorst developments were investigated based on the conceptual framework, which was discussed in Chapter 5. The background history of the urban development in the city of Amersfoort was described and subsequently the context within which the decision to initiate and develop each location were explored. Based on the gathered data, evaluation of each development was presented building upon the potential roles of the 'success factors' on the outcome.

6.2 Background history of the urban development in Amersfoort

Amersfoort, founded in 1259, is the second largest city of the Province of Utrecht. It is a municipality situated approximately in the center of the Netherlands. It has a population of 149,661[8] inhabitants and covers a land area of approximately 63 sq. km with additional surface area of one sq. km of water. The city was originally developed on a south - eastward direction. Together with the post WWII expansion plans, the western and northern sections were developed with four additional districts, called: *de Koppel, Rustenburg, Kruiskamp* and *Liendert*. Since then the city has grown to include a total of 31 new quarters, towns and districts.

8 http://amersfoortincijfers.nl/Default.aspx?cat_open_code=c&var=bevtot&Mostrecentperiod=true&Geolevel=wijk&view=table Accessed on December 15, 2013

Especially after the WWII, urban planning and development policies were designed to resolve the housing shortage through acquiring undeveloped land. David Zuiderhoek (1911-1993) who was a Dutch architect, is known to have played a very active role in the regional urban planning and design, with his approach that mostly proposed concentric formations, with Amersfoort in the middle as the downtown and the new developments that would be established in the surrounding areas as suggested by his "petal theory". Especially during the 1950s, the two new areas, *de Koppel* and *Kruiskamp*, were developed based on the principles of 'modernist' era urban planning, where larger residential buildings were designed and built in the middle of green land portions. From the beginning of the 1960s through the second half of 1970s, *Liendert* and *Rustenburg*, the third and fourth areas were developed in parallel with Zuiderhoek's approach which marked the end of an era with his planning principles, also known as the "Main Expansion Plan" (in Dutch, referred as: 'Uitbreidingsplan in Hoofdzaak'). [9]

Post WWII urban development trends, mostly influenced by "modernism", which shaped the typology and character of cities significantly since the late 1940s globally, were discussed comprehensively in Chapter 2 of this thesis, analyzing the implications of the "international style" or "the machine aesthetics" socially, physically and environmentally. The Dutch cities also evolved within somewhat similar economic, demographic and political dynamics, which resulted in the use of rapid urban building technologies with repetitious planning and implementation models. However the Dutch nation's approach to urban design involved more environmentally conscious ways, primarily due to the water related challenges that existed historically. Together with the severe energy crises in the 70s, the need for different urban development models was addressed in the 1980s during which several small-scale developments as well as urban renewal projects were implemented. This, occurred, in part, as a result of the increasing demand for housing not only in Amersfoort and in the region of Eemland but in the Netherlands in general. As a result, among other areas in the country, the city of Amersfoort was designated as a development zone in 1982 (Gemeente Amersfoort 2006). Subsequently in 1988, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) released its policy briefing also known as the 'Fourth Memorandum Spatial Planning Extra,' (VINEX). In that brief, it was proposed to develop new urban areas including Amersfoort, in order to accommodate the rapidly increasing population of the Netherlands.

9 http://www.amersfoort.nl/ro-online/NL.IMRO.0307.BP00047-0201/t_NL.IMRO.0307.BP00047-0201_2.2.html was accessed on November 28, 2013

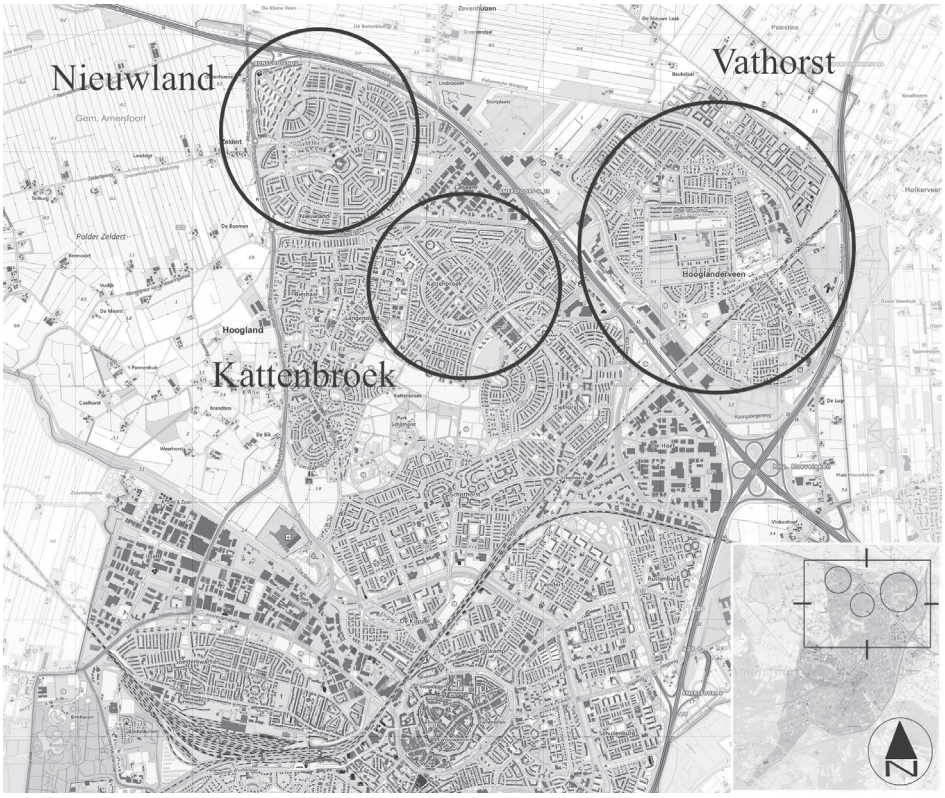

Figure 6.1 The map showing the three districts of Kattenbroek, Nieuwland and Vathorst on the northern Amersfoort city. *(This image is licensed under the 'Creative Commons Attribution-Share Alike 3.0 Unported license'. It was obtained and then modified for use in this thesis from the website in this link: http://commons.wikimedia.org/wiki/File:Gem-Amersfoort-2014Q1.jpg that was accessed on February 20, 2014)*

In spite of the several previous experiences based upon the early developments in this area, the conventional design and planning of the residential projects have become too repetitious and monotonous, which in turn created the need to implement new projects as more attractive places in which to live. Amersfoort's initiative to build new districts with distinctive urban characteristics began with the three recent developments of Kattenbroek, followed by Nieuwland and Vathorst respectively.

However these three developments in Amersfoort were selected as the first part of the three case studies, due to their wide international recognition for being relatively sustainable models of urban development in the Dutch as well as in the Northwestern European contexts. The study of these three developments revealed a number of procedural, conceptual and contextual differences from their initiation through their implementation and on-going usage and governance. They are important evolutionary examples that helped the

author to better understand the evolution of Dutch urban development trends in the last several decades. Because of their close geographic proximities and the sequential timeframes within which they were developed, they provide valuable insights into the changes or lack of changes that occurred in attitudes, procedures, technologies and policies for developing and implementing new urban developments in the Netherlands.

The following sections expand upon these three new urban developments in terms of their development processes, frameworks and the lessons that were gained based on the comprehensive literature reviews and the interviews that were conducted by this thesis author. The findings are then analyzed in line with the methods discussed in Chapter 5 of this thesis. It is important to clarify that the three nested districts of Amersfoort were selected, because each development was found to involve elements that had direct and indirect impacts on the initiation, planning and development of one another. The findings from the three sequential developments in this chapter were evaluated individually and then as a group. In the final section of this chapter, the lessons learned from the case study research on all of Amersfoort's three developments were highlighted.

The case of Kattenbroek in Amersfoort, The Netherlands

6.3 The development of Kattenbroek

Kattenbroek was the last phase of a series of developments that were initiated in the Amersfoort area as part of the expansion program to build 15,000 new residential units including affordable housing between 1982 and 1993. The decision to develop Kattenbroek was made in 1988 by the City of Amersfoort after having implemented a series of repetitious housing types and neighborhoods, which took place since the end of WWII. The overall development of Kattenbroek includes 4,700 dwellings with a population of 11,344 inhabitants. The density of dwellings is 29 units per hectare which is almost triple the average number of Amersfoort (Gemeente Amersfoort 2012a). With regards to the type of tenure, 26% of the residential units were found to be rental and/or social rental housing owned by housing associations.

Table 6.1 A descriptive outline of the Kattenbroek development in Amersfoort, The Netherlands.

Type of development	Mixed-use residential
Land size	154 hectares
# Of units	4,700 dwellings
Population	11,344 (11,494 inhabitants according to the 2011-2012 census *)
Construction period	1990-1994
Density	74 persons/ha compared to the average density of 25 persons/ha in Amersfoort
Initiation	Municipality level action
Development model	Public-only
Land ownership	Municipality-owned
Funding	Public funding
Governance	Top-down
Champion(s)	Architect(s) + Alderman
Goal(s)	Architectural diversity + inclusive design / social and economic aspects emphasized

* Wijkatlas Gemeente Amersfoort 2012

6.3.1 The context in which the development was initiated

Together with the partial allocation of 'Highlands' *(Hoogland)* town to Amersfoort city in 1974, the city had enough land for further expansion. In 1981, the government designated Amersfoort as one of the areas for new urban developments and proposed additional homes and new jobs in the area. The task to supervise the design and implementation of Kat-

tenbroek was given to the alderman, Fons Asselbergs whose vision involved more than just developing neighborhoods and houses but it was also to create a place in which people could feel a setting that was different and attractive with which to feel a greater sense of belonging.

The initial task to illustrate Asselbergs' vision was offered to the renowned architect Ashok Bhalotra whose inspiration has been attributed much to Vassily Kandinsky's [10] work in the early 1920's [11]. Based upon that influence, Bhalotra's preliminary sketches for the master plan (see Figure 6.2), contained the geometrical elements such as circles, intersecting straight lines and angular shapes or curves composed in abstract colors like those that were used by Kandinsky in his artwork between the years 1920 and 1925. These elements combined with Bhalotra's fantasy in which imaginary personae and their life expectations were elaborated,

Figure 6.2 The current master plan of Kattenbroek, also showing the thematic boundaries used in the conceptualization stage ***(Source**: Wijkwijzer Kattenbroek 2010, Gemeente Amersfoort)*

10 http://ru.wikipedia.org/wiki/Кандинский,_Василий_Васильевич accessed on December 16, 2013.

11 In this period, Kandinsky taught at the Bauhaus in Weimer, Germany from 1922 to 1925 followed by Dessau where the school operated until 1932. Kandinsky also moved to Berlin together with the school and stayed there until July 1933 when the Bauhaus had to close due to Nazi regime's negative campaign and pressures.

influenced the designs for Kattenbroek. Moreover, his visions of how living spaces should be vibrant and dynamic resulted in the thematic interpretations of the spatial structures which became to known as; 1- the Ring, 2- the Boulevard of Courtyards, 3- the Hidden Zone, 4- the Mask and 5- the Creek (Zoning plan "*Bestemmingsplan*" Kattenbroek, 2006).

This thematic approach used in the initial proposal for the master plan was found so novel and original at the time that Bhalotra's vision to create distinctive urban spaces with mixed-use residential areas was quickly accepted in a meeting held with the city council on September 05, 1988. Together with the strong support of Fons Asselbergs, the city council commissioned Bhalotra for developing and supervising Kattenbroek's urban development and architectural design processes. Subsequent to the preliminary approval of the concept, around 4,700 residential units were planned to be built on a land of 154 hectares between 1990 and 1994 (Gemeente Amersfoort 2006).

6.3.2 The goals and objectives

Despite the extent to which the core elements of eco-towns were investigated within this case study research, the design of the project in Kattenbroek was not conceptualized or contextualized based upon the sustainability concerns that are addressed today. At that time, sustainability was not considered as much or was not very prominent within the society and has only begun to evolve in the world of planning in the last decade or two. Instead, the planning and design were made to establish diverse and somewhat more vibrant communities and to offer new, affordable housing for the projected housing shortage at the time. As discussed in the previous section, the social aspects along with the physical qualities were the key elements in establishing the concept of Kattenbroek. In brief, the overarching themes of the development were identified as the "Home" and "Mobility" which are associated with the society's needs for both safe and secure shelter as well as for connectivity that are critical factors considered in the decision for choosing a home's location. In order to create the desired conditions for a new urban development that is feasible for all stakeholders, operational goals were primarily established among the elements addressed by F. Asselbergs and these consisted of the following three aspects:

- *Affordability;*
- *Architectural quality and diversity;*
- *Vibrant and attractive urban spaces.*

Fons Asselbergs' socially-driven approach to creative urban planning with affordable housing at any location as one of the primary goals, provided the impetus to plan various densities of accommodation units in different sizes that are rental and owner-occupied. This was increasingly becoming a necessity, which was different from the conventional planning requirements. In order to achieve this goal, alternating high and low-rise residential build-

ings were introduced, further influencing the planning of Kattenbroek in ways that laid the foundations for it's current architectural and urban characteristics. Therefore, it can be concluded that Kattenbroek had more impact on the planning and design thinking in the Netherlands rather than on the adoption of ecological modernization in the sense that the eco-town developments were contextualized in this research.

> *"…The social structure; minimum 30% should be affordable housing in every neighborhood. Mixed. Poor people and rich people would live there. This is the most important thing I could achieve in Holland. So Kattenbroek is not (only) architecture, it is the social structure. My ideal is that every street is a cross-section of the society. That is very important."* **(Quotes from the interview conducted with Mr. Ashok Bhalotra on November 13, 2013, Rotterdam)**

As a result of the work conducted by 40 designers and architects, 55% of the affordable residential units in Kattenbroek were planned to be available in almost all desired locations of the district surrounded by attractive and vibrant urban qualities within mixed-use residential neighborhoods that are now much celebrated.

- *The social (rental) housing was approximately 26% of the total in 2010 while owner-occupied dwellings were 64% of the overall residential development* (Gemeente Amersfoort 2009).

Despite the moderately high use and ownership of cars in the area then and today, the walkways as well as the cycling lanes were embedded into the plans to encourage walking and cycling by the residents which in some ways helped to create positive social interaction, hence the sense of community. Also, because public transportation was effectively integrated through provision of frequent bus services within the area as well as between the major nodes, connectivity to the Amersfoort train station was ensured.

6.4 The assessment of Kattenbroek through the six factors identified for developing successful eco-towns

6.4.1 Political Commitment

Kattenbroek was developed under the complete control of the municipality of Amersfoort. It was initiated with the support of local and central governments in response to the housing shortage, growing urban populations, hence the increasing need for new developments in future urban locations. As emphasized in Section 6.2, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) released the Fourth Memorandum Spatial Planning Extra (VINEX) in 1988, in which Amersfoort along with other Dutch cities were

designated as the potential urban development zones in the Netherlands. Kattenbroek was the first development that was initiated during this period, however the decision to develop the area has been attributed to the local housing development policy rather than the national level policy action that was followed in the next years.

With regard to the coordination of the project in developing Kattenbroek, the alderman Fons Asselbergs was one of the key persons who managed the whole process along with the appointed supervisor in charge of urban design and architectural work, Ashok Bhalotra. Besides Asselbergs' role of coordination between the development and the city council, he also led the policy team, which facilitated the planning and construction process in relation with the formulation and conduct of regulatory measures. The interviews revealed that the project groups and developers along with the policy team engaged in regular dialogues throughout the development process. This was found to be important in terms of facilitating both the design and implementation processes.

> *"In Kattenbroek, every Friday, the policy team and the project teams came together to discuss the progress or problems regardless to whether there was anything to discuss or not. ...*
>
> *"In the projects (in which) we were involved, if there was distance between the decision-makers and the design team, it didn't work because then there was a vacuum. Also commitment of the politicians was very important. Honesty and dedication was very important in achieving the (project) goals."* **(Quotes from the interview conducted with Mr. Ashok Bhalotra on November 13, 2013, Rotterdam)**

Based on the interviews, the political commitment, more specifically of the local administration, was found to exist from the initiation throughout the whole development process in Kattenbroek, which revealed a greater control over the standards and the quality of design and implementation.

6.4.2 Timing

With regards to the timing during which Kattenbroek development was initiated, the shortage of housing as well as the social and economic factors were taken into consideration rather than taking advantage of other particular events of opportunity toward building momentum or consensus. The population growth trends and firm data in terms of the anticipated needs for housing were found to be the most influential elements that led to the local politicians' decision to proceed with Kattenbroek. The ongoing national policy works and the subsequent release of Vinex Memorandum have also contributed to the initial decision.

The research conducted on the housing market in the Netherlands between 1965 and 1995, indicated three significant market phases of trend change between the years 1965-1973,

1974-1982 and 1983-1995. These phases were analyzed and characterized by Boelhouwer et al. (1996, pp.382-383) in which they found a gradual rebound of the housing market with improvements in the prices after 1986 (Boelhouwer et al. 1996) with stronger indicators compared to the previous two phases. Kattenbroek's decision for development (1988) with regards to timing was found to contribute positively toward the implementation and outcome.

6.4.3 Financial model

As briefly mentioned in Section 6.3.1, the land on which Kattenbroek was built, was a part of the additional area gained through the partial allocation of Hoogland town to Amersfoort City in 1974. Therefore, with regards to the land ownership, the municipality has acted as the landowner as was previously done in the Dutch urban planning and development practices traditionally.

With regards to the financial aspects, funding has been resolved through agencies that provided / facilitated funds to municipal projects in the Netherlands until public-private partnerships became more popular in the past three decades (Heurkens 2012, p.135). The finance for the development in Kattenbroek was formulated through the Bank Nederlandse Gemeenten (BNG)[12], which is a government-funding agency focused on local administrations and projects nationwide. Especially in projects with strong governmental support and commitment, the funding mechanisms were more effective because of the ensured guarantees remained relatively more operational compared with the projects initiated by private companies (from the interview with Trudy de Mooy)

With regard to the *financial model*, the project was introduced at a time during which the housing shortage was addressed as a priority, and this helped the leaders to formulate the funding mechanisms through the support from the national and regional governments. With little econometric complexity compared to the present eco-town or large-scale district developments, the financial model was found to be one of the factors that contributed to the project's success in terms of the resident perception of neighborhood and the housing quality in general. In Kattenbroek's development, some of the current market funding mechanisms therefore could not be detected, as the conventional nature of the planning vision and framework at that time required relatively linear model, which secured the implementation and delivery of housing.

6.4.4 Physical qualities

In Kattenbroek, due to its overarching goal to create distinctive architecture with relevant attributes in neighborhoods, much attention was given to the architectural design and urban planning. The physical qualities, despite the terminology's use for a broader context in this research, were perceived highly by those interviewed during research and by the

12 http://www.bng.nl/smartsite.shtml?id=51607 Accessed on December 16, 2013

information found in published reports. The creative use of the existing landscape and topographic characteristics helped to develop attractive neighborhoods. The initial goal to achieve a relatively higher quality of design in architecture and urban planning provided the much-needed distinctiveness that was sought by Fons Asselbergs (see Section 6.3.1). The philosophical and artistic approaches used in creating the neighborhoods helped to emphasize the (economic) diversity in the community structures as Ashok Bhalotra and Fons Asselbergs have envisioned.

Besides the residential use, the physical planning included business activities on the ground and first floor levels supported by a designated shopping street, which allowed the residents to locally obtain most of their needs and to help in creating business activities.

Due to the time during which the decision was made to initiate Kattenbroek development, the vision and goals of the overall project were limited to the immediate needs of the local municipality and the region to provide higher quality housing, affordable rental units that could accommodate residents from diverse cultures and income groups. Additionally with the alderman's own initiative to introduce aesthetic qualities and vibrant neighborhoods, Kattenbroek became an exemplary development simply because artistic notions were included more explicitly compared to the merely functionalist machine aesthetics as expanded upon in the literature review of modernist era design and planning doctrine. Therefore, the environmental aspects in Kattenbroek were limited to providing the physical communication of inhabitants with nature in place of living and not so much about energy efficiency or water and waste management.

The multi-modal, transportation system however, was found to have been well established despite the relatively higher rate of car-use (see Section 6.15, Table 6.6). Frequent bus services are available, which provide efficient connectivity to the main urban centers including the Amersfoort train station, which is a central hub for commuters traveling within the area or the country. The cycle lanes and walkways provide extensive mobility throughout the development and within the neighborhoods.

Despite the limitations of the development's goals and vision in regard of environmentally sound notions, the physical qualities of Kattenbroek were found to have positively impacted the residents' perceptions as well as the desirability of the development comparatively to the subsequent projects that took place in the city of Amersfoort.

6.4.5 Stakeholder involvement

Kattenbroek was developed within the traditional Dutch urban planning model, which is strongly led by the (local) government and followed a relatively top-down decision-making and governance. Therefore the stakeholder engagement consisted of the collaboration and

consultancy of the actors and power that were involved in the design and development of the project with lesser involvement of potential residents. The stakeholder involvement in terms of resident participation to the process was found to have been therefore very limited except some gatherings that were held to share opinions among potential inhabitants and the community members from the surrounding areas of Amersfoort.

During the interviews, the extent of the collaboration among actors was discussed and it was found to have contributed positively toward the development's perceived success. Due to the unconventional design approach of the development, the chief architect / supervisor Ashok Bhalotra kept strong communication with designers of various disciplines including the engineers in order to ensure the objectives of the vision to create distinct neighborhoods and buildings.

The decision-making process, to a certain extent, was inclusive but most especially with the actors that were directly involved in the design and development. With regards to citizen participation and engagement during the development of Kattenbroek however, it was limited to the random information sharing gatherings.

> *"…Proactive relations among the architects. In all the projects we did, we had full commitment from the beginning to the end.*
> *Even for* ***Kattenbroek*** *and also for Vathorst,* ***not the residents,*** *but with people from within Amersfoort and around, we had a lot of meetings on the basis of different teams. We came together and they contributed a lot on the development of 'Vathorst'."* **(Quotes from the interview conducted with Mr. Ashok Bhalotra on November 13, 2013, Rotterdam)**

The stakeholder involvement in the design and development occurred mostly among the actors such as the policy team, the developers, the design and technical teams, rather than with the community representatives or future residents who could provide more insights into the individual and societal needs within their immediate surroundings. This was mainly because the process was designed and implemented through a top-down central command within the boundaries of the traditional way of Dutch urban development model. In other words, citizen engagement in the whole process was limited or non-existent. To some extent, strong communication and collaboration between Bhalotra and Asselbergs provided the leadership from the design stage throughout the implementation of Kattenbroek. However, the development process was regarded as a groundbreaking, novel approach at the time, due to the major changes that were made in the planning and operationalization of the design goals in general.

The recent documents published by the municipality of Amersfoort indicated that, strong resident participation in the decision-making processes exists presently, through the hous-

ing associations and neighborhood gatherings on the issues that affect the quality of life and perception of neighborhood well-being including the issues that concern environmental standards. However, during the time, which the planning and development took place, stakeholder involvement was limited to officials and planners and the outcome's positive aspects can be attributed to the strong leadership of the alderman and the hands-on supervision of the chief architect.

6.4.6 Environmental model

As mentioned earlier in Section 6.3.2, Kattenbroek's vision involved social, physical and aesthetic values rather than comprehensive environmental or ecological ones per se. The goals were made very clear early in the process in terms of how they would be operationalized in the context of physical environment and social dimensions such as diversity, equal access to facilities and amenities regardless to where the houses were/would be located.

> *"There were also sustainable things (in Kattenbroek) of course, especially corporations (development companies) made some efforts to put in sustainable measures using better materials than otherwise. Not like the sun orientation yet. That wasn't done yet (in Kattenbroek) but more like how the land was (sub) divided / planned, where the ditches would be or determining where the dry land and the wetland should be; they preserved that as much as possible. This was also sort of sustainable thinking."* **(Quotes from the interview with Mrs. Trudy de Mooy on November 08, 2013 in Vathorst)**

With regard to the environmental planning in latter phases however, the local government has continuously updated the codes and regulations in energy, water efficiency measures as well as the building methods and technologies in Kattenbroek. In defense of the lack of environmentally sound design codes and planning principles initially, the interview with Ashok Bhalotra revealed that the integration of eco-friendly innovative urban systems could be achieved as long as the infrastructure was designed to accommodate future needs and requirements. However, he added that the goals at that time were to provide affordable housing in neighborhoods that had distinctive characteristics in which economically diverse residents would live.

6.5 Evaluation of Kattenbroek based on the 'success factors'

With regards to the overall goal achievement in Kattenbroek, the interviews revealed a great deal of satisfaction as to how the residents perceived their lives and the surroundings in which they live and experience. An earlier study conducted by *Bayulken & Huisingh* in 2012 provided much insight into the quality of life (QOL) perceptions of residents living in eco-developments around the world. In this study (see Chapter 4), the findings suggested

that the residents' subjective view of well-being was similarly related much with their 'neighborhood' and 'home-life' satisfactions as well as with the 'sense of community and attachment'. In light of this earlier study, in-depth research on Kattenbroek revealed that the overall impact of this development's procedural, contextual and conceptual elements had positive impacts on the perceived well-being of residents. Based on these gained insights, the success indicators that were previously addressed in three groups in Section 1.6 of Chapter 1, were summarized in the following sections.

6.5.1 Dissemination of positive results and experiences

With regards to the ***physical qualities***, the findings from the interviews were already elaborated in the above sections. Kattenbroek's design and development have provided much novelty for the Dutch urban development in the sense that the design practice and logic moved away from the traditional model into creating more "for-user" housing developments. This provided a more proactive design process that aimed to satisfy the present and future needs of communities in terms of both social and physical aspects rather than the housing alone.

In the annual report published by the Amersfoort Municipality, the resident satisfaction in terms of the 'perception / attachment to neighborhood' also supported these findings with 68% of the residents in Kattenbroek that were reported to still feel positively compared to 67% in average of the city of Amersfoort. Also the level of housing quality in Kattenbroek was scored 8.1 out of 10 while the neighborhood quality was scored 7.6 compared to 7.8 and 7.3 for Amersfoort respectively (Gemeente Amersfoort 2009).

As mentioned briefly in the previous section, Kattenbroek's most significant impacts have been to establish the diversity among residents in neighborhoods, provide affordable housing in almost all locations and to create attractive places with distinctive architecture.

6.5.2 Community's behavioral and cognitive adaptation

In terms of ***environmental performance***, the average electricity and gas consumption levels were monitored regularly and categorically by the Central Statistics Bureau (CBS) for almost each type of housing unit in Amersfoort and in the Netherlands. These included, the apartment units, townhouses, corner houses, semi-detached and freestanding units, which perform differently based on the quality of the building materials and technologies that were used as well as depending upon user behavior. The average numbers indicate how each development performed compared to the surrounding area and in comparison with country, as a whole. Based on this research, electricity consumption in Kattenbroek was 3550 kWh per year compared to 3200 kWh / year average in Amersfoort. Detailed breakdown of these figures were presented in the overall evaluations matrix in Table 6.7 in Section 6.15.1. Based on the study from the same years, the gas consumption used for heat-

ing and other uses; 1600 m3 per year / household consumption was measured compared to 1700 m3/year / household in average in Amersfoort.

In terms of the car use, based on the observations and the interviews; Kattenbroek was found to perform lower on the use of the public transport system existing in the development than average for that region. In Kattenbroek it was also found that there are 120 autos per each 100 households compared to 103 autos / 100 households in Amersfoort. The car ownership as an indicator may not be too relevant for the case study in Amersfoort as the averages in the Netherlands vary between 0.8 and 1.1 cars per household in the country. However in some others cases, the car ownership has been included in the environmental goal achievement if reduced. Therefore this particular notion per development has been included in the case study reports or each development in Amersfoort and the subsequent ones that were researched by this thesis author.

With regards to the water consumption and waste, the research conducted on the three developments in Amersfoort for the same year, the results included only averages of Amersfoort and the Netherlands without much specific information for the neighborhoods or the developments researched in this study individually. As discussed further in the summary section of this Chapter, the water and waste were analyzed based on other studies found during the literature review. However the initial findings suggested that the water consumption in the Netherlands was 109 liters per capita per day in 1970s. This number increased to approximately 150 liters per capita / day in 1990. Due to the increased awareness additional to the advancements in the technology such as the dish washers, washing machines or water-efficient household appliances, the consumption levels decreased in average to 128 liters per person / day in 2012 (CBS 2013). A report published by the association of water companies in the Netherlands (*Vewin*), suggested that the consumption of drinking water in the Netherlands was 120.1 liters per capita per day (van Thiel & Foekema 2011) based on their much-detailed study conducted to find out the water usage per each daily activities. These included water for hand washing, drinking, showering or water used by various home appliances as discussed above.

Information regarding the waste generation was reported as an average value per municipality rather than as specific data per each district in the Netherlands. For example, an average analysis was found for the Amersfoort area, which gives an indication comparatively within the Netherlands and also among other cities where the eco-town developments were investigated. These comparative analyses are summarized further in Table 6.7, Section 6.15.1. In brief, the waste generation in the Netherlands measured in 2009-2010 was 569 kg per capita / year compared to 555 kg per capita / year in Amersfoort in 2009.

Table 6.2 Total amount of household waste (kg) per capita per year in Amersfoort in years between 2001 and 2012

Topic	By type of waste / household waste											
	Total household waste											
Periods	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Area	*Weight in kilograms per inhabitant*											
Amersfoort	578	578	566	575	589	602	602	578	555	536	545	537

Source: Central Bureau for Statistics / Centraal Bureau voor Statistiek, the Netherlands (CBS.nl)

Table 6.2 shows the waste generated per person a year in Amersfoort since 2001, which is declining after 2007 onwards. As mentioned in the previous paragraph, the factors behind the level or rate of waste generation per person or household have not been fully reported as much as the water and energy in the context of sustainability. Therefore, in the case analysis presented in the summary section these issues are evaluated comparatively in order to clarify the extent to which the developments achieved their goals and objectives.

6.5.3 Policy change and adjustments

In the post WWII era, the Dutch spatial planning has been rather hierarchical in terms of planning and policy-making. Until the late 1980s the expert planners would establish designs after which the policies were made and the politicians determined the strategies. During this process, the spatial concepts and guidelines have become too rigid with little tolerance for change to accommodate the societal, economic or physical needs (Hajer & Zonneveld 2000). In Kattenbroek, similar pattern of planning and development was observed, however with more enthusiasm and commitment from the local politicians toward creating a unique development.

As a result, Kattenbroek's development has involved a number of new approaches regarding its design and implementation that were different than the previous urban developments in the Netherlands. As discussed in Section 6.2 of this chapter, Amersfoort's growth has been much influenced with the concentric development of the city with new residential projects placed in the outer skirts as the petal theory of Zuiderhoek until late 1970s and early 80s. The mass housing policies with mostly modernist approaches, which created the monotonous neighborhoods and districts were to some extent changed in Amersfoort. The policy management, which was led by the alderman and his team played an important role in making the necessary adjustments and changes to accommodate the designed features of Kattenbroek with diverse densities and themes. This influenced the future developments to be shaped somewhat more around the societal needs and aspirations.

6.6 The Kattenbroek case study summary

Amersfoort's decision to develop Kattenbroek was based on the projected housing shortage and the availability of the new land that was obtained from the Hoogland town. Due to the period during which the project was initiated, the vision and goals were established based on the parameters, which were found to be valuable to consider at the time, such as: affordability, urban distinctiveness, architectural quality and connectivity. With regards to achieving these initial goals, Kattenbroek was found to be successful not only because it was one of the first such developments but also because of the subsequent and current developments that were built, at least in part, upon the lessons learned.

Furthermore, the conceptualization and design process influenced the Dutch urban planning positively in terms of creating more attractive places compared to the monotonous and repetitious neighborhood models. In achieving this, strong collaboration between the alderman and architectural supervisor played significant roles. The synergy created with the involvement of the social housing corporation strengthened the management model that was used in developing Kattenbroek.

The most significant contribution of Kattenbroek was its novel approach to the urban design and architectural diversity compared to the traditional Dutch urban development models in that period. The developments that were initiated after Kattenbroek have increasingly made use of these qualities in order to build distinctive places in which to live. However with regards to the dissemination of sustainable building practices and sustainable lifestyles, Kattenbroek's contribution was found to be minor, if any, compared to the contributions of other developments due to the time in which the vision and goals of the development were developed.

The case of Nieuwland in Amersfoort, The Netherlands

6.7 The Development of Nieuwland

Nieuwland was built on a land covering an area of 209 hectares, 70 hectares of which are used for industrial purposes in the north of Amersfoort. It is situated between the A1 Highway in the north and N199 road in the west. There are currently over 15,000 inhabitants living in over 5,500 [13] dwellings. Nearly 80% of the dwellings are family homes. In total, 77,5% of the dwellings is owner-occupied and 17,8% is owned by housing corporations (Gemeente Amersfoort 2011, p.102). Similar to Kattenbroek, the density of the built area is almost three times the average size of Amersfoort city.

Table 6.3 A descriptive outline of the Nieuwland development in the city of Amersfoort.

Type of development	Predominantly Residential
Land size	209 hectares
# Of units [a]	5,537 dwellings
Population [a]	15,185
Construction period	1995-2002
Density	72 persons/ha
Initiation	Municipality and provincial level
Development model	Public-Private Partnership (PPP)
Land ownership	Municipality owned
Funding	Public-private + subsidies from national & international agencies
Governance	Top-down with multi-actor involvement
Champion(s)	Environmental planner(s)
Goal(s)	Sustainable energy & water management + environmentally sound urban design and development

a- Source: Gemeente Amersfoort, Amersfoort in cijfers (2011).

Despite the development's strong affiliation with the VINEX program as one of the designated locations, the initial decision to proceed with the development and its subsequent vision were attributed to the municipal policy to experiment with sustainable urban planning and implementation in district-size developments.

13 www.cbs.nl/NR/rdonlyres/…2970…/Wijkennaarhuishoudensinkomen.xls accessed on December 04, 2013; www.cbs.nl/NR/rdonlyres/B94AFAE8-0D52…/Amersfoort.pdf accessed on December 04, 2013; http://www.oozo.nl/cijfers/amersfoort/nieuwland/bosgebied accessed on December 04, 2013

"Because it was the 1990s - it was even before the so called 'Vinex'- and it (Nieuwland) was not officially Vinex, the market was so willing that it was no problem to build and develop." **(Quotes from the interview conducted with Prof. Kees Duijvestein on November 15, 2013 in Den Haag)**

6.7.1 The context in which Nieuwland was initiated

After the development of Kattenbroek's relatively successful results, the central and provincial governments were encouraged to implement new housing projects, much like the Amersfoort Municipality's decision to proceed with new projects in vacant land. The decision to build Nieuwland provided the opportunity for Amersfoort's municipality to implement and test environmentally sound planning and design with a particular focus on integrated renewable energy systems at the neighborhood and district levels. However, the prospective developers then, owned approximately two thirds of the land on which Nieuwland would be planned and built. After the full ownership of the land was granted to the Amersfoort City in exchange for the developers' 50% partnership in the development, the project was initiated in 1995 with the overarching goal to build a full district size mixed-use residential development in which building-integrated energy systems would be implemented and tested.

6.7.2 The goals and objectives

The five-year national photovoltaic (PV) program was initiated by the Netherlands Agency for Energy and the Environment (NOVEM) in 1996, with the mission to encourage and create the awareness to use building-integrated energy systems in the country. The program also sought to create market conditions for the installation and promotion of stand-alone systems while gaining experience and further knowledge within the built-environment (Schoen et al. 1997). In developing Nieuwland, both the NOVEM and the EU's program for the promotion of energy technology in Europe (THERMIE) [14] provided support for The Regional Energy Company of Utrecht (REMU), which was in charge of the energy systems integration. Together with a consultant firm (Ecofys) specialized in renewable energy and a powerful energy company (ENEL) from Italy, REMU played an integral role in Amersfoort's vision to promote building integrated energy systems in the Nieuwland development.

...In Nieuwland (however) there was a complete difference in thinking. It was a higher step, higher level of sustainable thinking." **(Quotes from the interview with Mrs. Trudy de Mooy on November 08, 2013 in Vathorst)**

While the initial vision in developing Nieuwland evolved much around the experimental process of integrating standalone energy systems in district size residential projects, the overarching environmental theme has become more comprehensive than the energy issue alone. The planning

14 http://cordis.europa.eu/programme/rcn/168_en.html Accessed on December 06, 2013

and implementation processes of Nieuwland were structured more holistically as a result, which included the architectural and urban design with additional emphasis on also the social aspects.

> *"One of the important things we should realize is that when we started the Nieuwland (project), it was a bit bigger part of town (Amersfoort). We had Ecolonia (in Alphen aan den Rijn), Ecodus (in Delft) and others. All of those projects consisted of 100-150 houses. There was more or less the urban plan there already in those cases. Or it was so small that you couldn't speak of any urban plan at all. But in Nieuwland, we had that area and there should be a completely new urban plan. So it was the first time that there was a larger urban planning / urban design level in which we also had to deal with the environment. And that gave all the people new power for what we were going to do. Additionally, the municipality, the board, the mayor and the alderman were very proud (…) after Kattenbroek that was more on the design part as the starting point.*
> *… And in Nieuwland the starting point (the overarching theme) was all social, design and environment. That was very new."* **(Quotes from the interview conducted with Prof. Kees Duijvestein on November 15, 2013 in Den Haag)**

Together with this multi-disciplinary / multi-dimensional vision building, the overarching goals of the development were established and these included but were not limited to the following:

1. *The integration of the existing landscape;*
2. *Establishing a closed water system;*
3. *Integrating solar energy into building design and orientation;*
4. *The use of sustainable building materials;*
5. *Encouraging and enabling walking and cycling;*
6. *Encouraging the use of easily accessible public transport.*

Furthermore the preliminary design concept of Nieuwland was inspired by the Garden Cities *(see Section 2.2. of Chapter 2)* which became popular in the beginning of the 20th century with their courtyards, green belts and water as the dominant elements (Duijvestein 2005). These developments were planned to contain sufficient areas dedicated for social, recreational, physical and agricultural activities in order to avoid the industrialized city's negative impact on human health. They were initially built in the U.K and were followed by examples in other countries in Europe and internationally. Despite their short-lived successes due to WWII and subsequent urban development trends, they were inspirational to many environmentally conscious designers and developers.

Kees Duijvestein (BOOM), who was the environmental supervisor then and has been a central figure in terms of influencing the architectural and urban designs of the development, had similar aspirations. He helped to introduce a number of novel attributes such as

the water concept, the design of the transportation system / connectivity, the integration of renewable energy systems. More importantly, one of his most significant contributions was the environmental criteria list that was used in the design and development stages of Nieuwland, also known as the D-C-B-A list (see Box 6.1).

Box 6.1. The D-C-B-A checklist used in evaluating design and building of Nieuwland.

The environmental criteria that were used to assess and evaluate the level of sustainable approaches whether in the design of buildings or the materials used in the development were gathered in a checklist called and also known as the "D-C-B-A" tool. This name was given by Prof. Duijvestein in reference to the American academic grading system in which the letter "D" represented the least satisfactory design or choice of material and "A" used for the most satisfactory design and implementation attributes in order for achieving the environmental goals in the Nieuwland development.

As translated and interpreted from the original Dutch version of the DCBA list's user guidelines section, obtained from Kees Duijvestein; the integral DCBA list is suitable for use in various situations whether for the building of a house or development of a large number of homes. This applies to large-scale housing projects or a series of smaller projects within a municipality. The users can be the client and / or the architect as well as the review body such as the municipality itself. The checklist (tool) is used for determining the environmental ambitions, the level of information on sustainable building measures, making the choices (material, design etc) and also for reviewing the compliance of the building methods / specs and designs in terms of the level of sustainability of the development.

The "D-C-B-A" list and its various versions were developed and used by Kees Duijvestein in order to evaluate and assess the quality of a wide variety of developments, neighborhoods and buildings through a method with which social, physical, environmental and spatial aspects can be scored. For example, it was used in the design of Nieuwland, and included 1880 items in total. This was too extensive and was found to be time-consuming for developers with which to deal.

The other versions of the list were also developed somewhat in simpler forms based on whichever critical aspect (such as the water efficiency, energy-efficiency, efficient transport system etc.) was emphasized in their respective visions. Duijvestein explains the effort to produce more than one single version due to the developers' diverse needs and also the unwillingness to become exposed to rigorous assessment procedures that caused delays in design process. However, the D-C-B-A list, according to Prof. Duijvestein, provided a flexible and adaptable platform with which social, physical and environmental aspects could be configured to evaluate, thus achieve the operational goals in designing and developing eco-towns / developments.

While the context around which Nieuwland's development evolved, was primarily the renewable building integrated energy systems, the planning and design of the urban structure had to be systemically resolved before physical plans could be made. In order to do so, the water system, which is a primary concern in the Netherlands, was first examined and the most feasible way(s) to integrate waterways in the planning were identified. The topographic data were collected and analyzed, after which the landscape as well as the overall development were conceptualized. As a result, the water concept was established based on the natural flow of water throughout the land simply by creating different surface levels relative to the sea.

Topographic characteristics of the land allowed in some parts for the water level to be kept at 50 cm below the sea level while in other parts of the land which was relatively lower, it was designed to be held 100 cm below sea level. This helped to create the so-called "closed water system" that could be monitored and improved periodically in order to enhance the natural habitat within and around Nieuwland.

Figure 6.3 The current master plan of Nieuwland. *(Source: Wijkwijzer 2009-2010 Nieuwland, obtained from Gemeente Amersfoort on November 25, 2013)*

With regards to the topographic subdivision of the land, it was developed in four main parts. These included; 1- "The Water Quarter", 2- "The High Courts", 3- "The City Quarter" and 4- "The Lower Courts", all of which were named after the physical qualities of the existing landscape. These sectional qualities were used to establish the preliminary outlines of the master plan. In addition to these four quarters, in the second phase of the development, the "City Garden" (5) was introduced on the northwestern edge. This green neighborhood was

designed to have no private gardens, but to provide extensive green surroundings where the residents could work collectively to maintain the area. This new part was planned as the transitional zone due to its closeness to farmlands.

In light of the preliminary decisions on the design / outline, the environmental team along with the urban planners began working to resolve the mobility and connectivity issues. With regards to the transport system, the following operational goals were developed:

- Promote the use of bicycles;
- Promote the use of public transport;
- Restrict the use of cars.

Subsequently, the preliminary designs of the transport routes were established based on the initial analyses[15], which included:

1. The vehicle routes:
   - o *Main arteries;*
   - o *Slow traffic lanes;*
   - o *Bus routes;*
   - o *Vehicle roads (autos).*
2. Walkways and cycling routes:
   - o *1st degree: Cross roads (diagonal axes);*
   - o *2nd degree: Links between the quarters;*
   - o *3rd degree: Links between the neighborhoods;*
   - o *The existing (old) roads*

Together with the initial draft of the environmental plan, the bicycle lanes and walkways were analyzed within and in-between the quarters linking all sections focusing on the user-safety first. Secondly, a bus line was introduced ensuring every resident to find a bus station within a distance of 350 meters. In order to reduce the traffic significantly, vehicle access to certain parts of the quarters was restricted. Moreover, the speed limit has been set for 30 km/h in the majority of the development while 50 km/h is allowed only in access points to the district. Additionally, noise barrier walls that were made from recycled bricks reduced the noise generated from the traffic on A1 motorway.

15 https://www.dbu.de/media/240506031703da6f.pdf accessed on November 09, 2013; http://www.dbu.de/media/31050610453575b1.pdf accessed on December 06, 2013.

With regard to the energy systems and energy management of the development, three elements were found to stand out in the design concept. These included:

1. *The solar energy from building integrated PV panels;*
2. *Thermal solar heaters for hot water;*
3. *Building design with south-north orientation and high thermal insulation with natural ventilation.*

Together with the support from REMU, initially fifty houses were built with solar energy elements in order to test and gain experience prior to the wider scale implementation. Due to the positive feedback and enthusiasm of both the developers and the architects, the total number was increased to over 550 dwellings with integrated energy systems. As a result, achieving a total of 1.3 MW-capacity exceeded the initial 1MW goal.

6.8 The assessment of Nieuwland through the six factors identified for developing successful eco-towns.

6.8.1 Political Commitment

The development of Nieuwland was supported by the local and regional administrations with clear understanding of the principles under which the actors / parties engaged with one another to achieve the project goals. Nieuwland has been marked as the next phase of PV integrated developments in larger scales after the successful implementation of Nieuw Sloten in Amsterdam as part of the experimental projects during which various aspects of real estate development were tested. Regional Energy Corporation of Utrecht (REMU), the Netherlands Agency for Energy and Environment (NOVEM) and the European Union's THERMIE program have been the supporting actors behind the initiation and the commitment both economically and politically (Schoen et al. 1997).

The local administration of Amersfoort as well as the regional government of Utrecht supported the project and provided necessary means to allocate resources and expertise one of which was the environmental supervisor. Despite the top-down approach in terms of the structure of decision-making and governance, the multi-actor/multi-modal project development framework was implemented to achieve the project's technical/technological and environmental ambitions.

With regards to the monitoring, the local government gave the authority to the environmental supervisors during the planning and design stages. Their criteria also known as the DCBA list, was used in evaluating the building plans, the measures and standards proposed by the developers. With regards to the data on performance levels and the user behavior,

there was both independent research as well as the studies conducted by the companies that were involved in the development. The gathered information was then used to assess the viability of the systems, and the development framework through which Nieuwland was built. In future developments, the planners and the decision-makers made extensive use of these evaluations and research conducted on Nieuwland's development processes.

6.8.2 Timing

The Dutch housing program known as the Fourth Memorandum on Spatial Planning "VINEX" aimed to tackle the housing shortage, which became in effect in 1991. The positive market conditions upon which the project was established and the VINEX [16] policy initiative as a factor, helped to create the momentum, which in turn provided the much-needed political commitment from the start of the project. As also discussed by de Zeeuw et al. (2010), the government policy has been to motivate commercial developers and the municipalities to working together especially in the VINEX locations. This was firstly, due to the increasing decentralization of the urban development projects and secondly, they sought to create more compact cities to address the rapid population growth and interrelated other challenges (de Zeeuw et al. 2010). Therefore the timing with regards to the national and local policy levels has been a significant factor contributing to the development of Nieuwland.

Besides the policy aspects, the technological and economic factors were also found to influence the decision with respect to the timing of the project (van Mierlo 2002, pp.132-134). Among these, the Regional Energy Corporation of Utrecht (REMU: Regionale Energie Maatschappij Utrecht) has been instrumental in terms of exploring ways in which renewable energy sources could be utilized in integrated ways to the building of large urban developments (van Mierlo 2002).

16 The Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) developed a policy brief titled, Vierde Nota Ruimtelijke Ordening Extra (VINEX) which aimed to reduce the housing shortage and the growth of car use nationwide. It was initially developed in 1988, known as the 'De Vierde Nota over de Ruimtelijke Ordening' (VINO) and further developed in the following three years as a broader plan to develop mixed-use housing projects in the designated locations that started after 1993.

The program, which was initially designed to end in 2005, was extended until 2010 for further planning and the building process to end in 2020. The overarching goals were: to establish planned housing developments near town centers in order to strengthen the existing hubs financially and socially. Furthermore, it was designed to limit car use between the residential place and place of work through promoting public transport, walking and cycling. Another goal was to provide affordable housing for those with lower income and to prevent the higher income groups from occupying the existing social housing through tax incentives. (http://nl.wikipedia.org/wiki/Vinex accessed on March 31, 2014)

6.8.3 Financial model

Nieuwland was developed through a public-private partnership (PPP) that was formulated through establishing a commercial company (VOF) [17] in which the municipality had 50% ownership equaling to the developers' combined shares. The majority of the land (2/3) was originally owned by the prospective developers who agreed to exchange the titles for the rights to grant development rights. Therefore the City of Amersfoort gained full ownership of the land on which to build Nieuwland.

According to the research conducted on the finances, the Municipality employed the environmental supervisors BOOM, and further contributed to the environmental plan with an additional €1.8 million. In order to give an example of the unit costs; 50 homes were studied by van Mierlo (2002) and was documented that 22.5 m2 PV panels and 5.66 m2 of solar collectors for each dwelling were fitted. For the overall systems including the building integrated PV panels, inverters, solar heaters/collectors, half of the cost of €1.1 million (2.4 million guilders) was provided by REMU and Novem. Furthermore, Shell Solar Energy provided around €1 million (2.1 guilders) and approximately €100.000 (215.000 guilders) was spent on building alterations (van Mierlo 2002, pp.129-132). The total cost of the 1.3 MW energy systems was found to be around €9 million (Jadranca & Horst 2008; SECURE 2008).

With regards to the funding mechanisms, the funds from EU's Thermie Program and the Netherlands Agency for Energy and Environment (Novem)'s NOZ-PV program were used, and additional subsidies were deployed in achieving the goals while leasing the installed energy systems to the energy company for a period of ten years in their initial operations (IEA 2013). Moreover the Energy premium program was used as an incentive to promote and disseminate the use of energy efficient systems and installation of PV modules (SECURE 2008).

With regards to the financial plan and funding, the project has been initiated on relatively strong economic indicators due to the housing market conditions and the demand in the Netherlands during early 90s. As mentioned in previous sections, the consortium of developers (*Overeem*) was in charge of the whole funding and financial planning, yet also developed Nieuwland in partnership with the municipality. The adoption of public-private partnership (PPP) as a new model has been tested as a first, compared to the traditional Dutch model of municipality's full control of urban development projects. The local authorities increasingly used PPPs as a model since the mid 1990s, in order to '*materialize public works without committing funds from the public budgets'* (Kyvelou & Karaiskou 2006).

17 Vennootschap onder firma (VOF) is the legal partnership entered between two or more entities.

6.8.4 Physical qualities

There are a number of positive and negative aspects that resulted from the fact that Nieuwland was the first extensive urban development project in which such high environmental ambitions were addressed. Despite the relatively successful integration of the environmental plan in the urban design process, the architectural / aesthetic distinctiveness of the development was less emphasized. This was primarily due to the experiential nature of the project during which the architects had to work through a number of novelties, which required adaptations and improvements to meet the requirements set by the environmental agenda.

With regards to the overall building standards, Nieuwland was found to demonstrate exceptional qualities due to the exemplary approach to create the world's largest PV integrated development in the size of a district. A number of new approaches were used to create the combined effect for energy, water efficiencies and furthermore create an effective transport system in which public transportation, walking and cycling would be encouraged (Duijvestein 2005). Due to the complex (or unconventional) nature of the building technologies used for its time of implementation (1999-2002), the designers were found to be less expressive in their designs even though they were given much freedom to do so. As was discussed in the "lessons learned" (Section 6.17) of this case study report, this also resulted in relatively less efficient use of the solar and PV systems (Jadranca & Horst 2008).

Consequently, the "***physical qualities***" in terms of the architectural character were found relatively less highlighted in Nieuwland's list of achievements. But the building standards, green space design and the natural habitat in which the water concept played a significant role were found to be highly positive attributes among many other features that demonstrated successfully, the use of building integrated PV in large scale developments.

6.8.5 Stakeholder involvement

The Municipality of Amersfoort adopted a different approach in terms of the whole development framework in order to achieve the ambitious project goals to create a sustainable urban model, which was very new at the time. A relatively more multi-disciplinary and collaborative / participatory approach was adopted from the very beginning throughout the implementation. The process has been coordinated through a project manager employed by the consortium also known as the "*Overeem*".[18] The urban planning and design as well as the environmental planning and supervision were handled externally, all of which were coordinated through the municipality of Amersfoort. The governance provided by the local

18 The development of Nieuwland followed a relatively more inclusive and participatory governance and management style than the traditional Dutch urban development examples of its time. In the development of Nieuwland, the consortium of developers, which had 50% of the shares in the venture, was responsible for the urban development, infrastructure, the financial planning and the project management.

administration mostly consisted of ensuring the progress of the development and the policy management [19].

In Nieuwland, the interviews revealed that stakeholder involvement existed strongly among these actors in the design, development and administration sectors with more across-the-board cooperation and decision-making (see Figure 6.4). The way, in which the project evaluation process was managed, according to the interview with Kees Duijvestein, was the result of collaborative work of the developers and designers together with the supervisors, which built a sense of community work and attachment among the stakeholders.

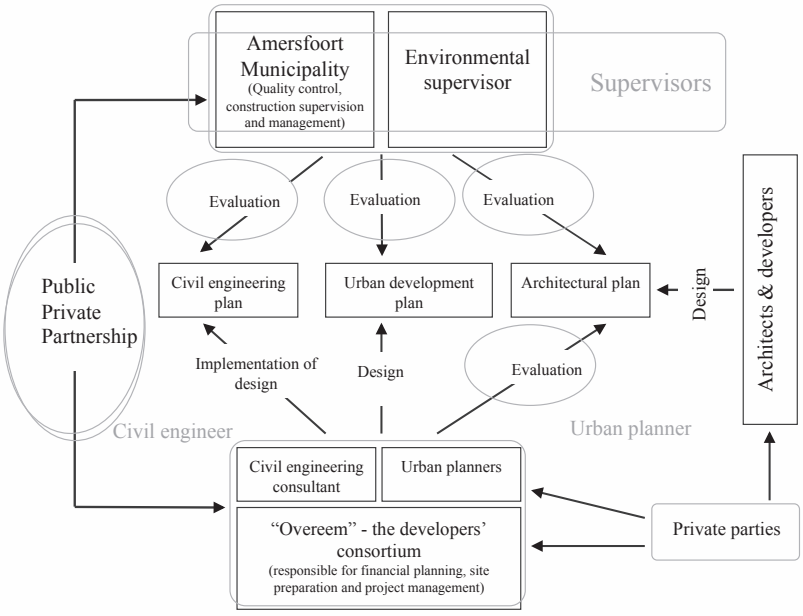

Figure 6.4 The development framework of Nieuwland *(Excerpted and adapted from Prof. Kees Duijvestein's file titled "Projektvorstellung Waterkwartier Nieuwland in Amersfoort, NL" obtained on November 09, 2013)*

Furthermore, it was found that a higher degree of communication and brainstorming sessions were performed among the actors, exchanging knowledge and lessons learned from early experiences such as in the Ecolonia and Ecodus developments. This provided an analytical approach in resolving the challenges of achieving the goals on all environmental, social and physical levels. Therefore, "***stakeholder involvement***" should be rated as relatively higher than other developments of that time in the Netherlands, which contributed

19 http://www.eukn.org/E_library/Housing/Housing/Integrated_Development_Nieuwland_Amersfoort_the_Netherlands/Reference_material/Integrated_Development_Nieuwland accessed on December 7, 2013

positively to the design and implementation of the Nieuwland development. Despite the novel approach compared to previous examples of urban development practices in the Netherlands, Nieuwland was also found to lack input that could be gained through future residents' participation in the process. It was however documented that some participation was done experimentally with a small number of residents (de Vries & Rashevskaya 2009) whereby a social monitoring project was conducted by Ger de Vries and Sacha Silvester (see Section 6.9.2).

6.8.6 Environmental model

The firm in charge of the environmental supervision (BOOM) worked with the master planners (Bureau Wissing), on the environmental criteria list for the urban planning before the urban designs were developed. In fact the DCBA checklist, (see Box 6.1) was previously developed and used by Prof. Kees Duijvestein in the experimental eco-development ***Ecolonia*** [20] in Alphen aan den Rijn in order to establish a comparative system with which the level of environmental quality could be assessed. This system's comprehensive version was used in the urban and architectural design as well as throughout the development in Nieuwland. This integral checklist contained a large collection of sustainable building measures with various environmental themes coded as in the following:

- E *Energy*
- W *Water*
- G *Green*
- BM *Building*
- BV *Indoor environment and (Social) Security*
- BS *Construction and Demolition Waste*
- H *Household Waste*
- FA *Flexible and Adaptable Building*
- V *Information*

In order to ensure the quality of the work conducted by the architects and engineers, the projects submitted by the developers had to go through an approval process that was monitored by the environmental supervisors prior to proceeding with the building work. In this

20 "***Ecolonia"*** is a demonstration project designed and developed in *Alphen aan den Rijn* in the Netherlands. The main driver was to build and test environmentally sound ways of construction and its feasibility, challenges and the lessons that could be learned from the experimental process. The project included 101 dwellings that were built with energy saving measures, innovative heating and cooling systems and design principles with financial support from BNG and Ministry of Economic Relations. The construction began in June 1991 and the houses were completed in December 1992. The Ecolonia development was monitored systematically in terms of the performance levels in water, gas and energy consumption. The development's overall electricity, water and gas consumption levels were found 10%, 20% and 40% lower, respectively, compared to the consumption in developments in the surrounding area (ICLEI 1996). Ecolonia was one of the first developments in which Kees Duijvestein and his team used the 'DCBA' list.

approval process, the level "D" represented the minimum quality allowed legally as per the traditionally used design and building codes / regulations. The level "A" represented the least environmental impact that was the desired level of design and practice. In order for the developers to obtain building rights, the projects had to be graded with a minimum level "C". For example, all materials and other aspects such as transport, water and energy systems had to meet the requirements represented with "C" level while some other elements required a minimum level of "B" that also allowed a certain degree of flexibility for both the architects and the developers.

This overall evaluation process consisted of four steps. In the first step of evaluation, the preliminary draft versions of the plans were studied with regards to the materials, the interior design / planning principles and thermal insulation. In this phase, the projects were either permitted to proceed or requirements were made for further improvements. During the second step, the projects were reviewed for the choice of materials, the energy-saving measures and the energy consumption levels based on the D-C-B-A checklist. As a result of the evaluation, decisions were made which included a preliminary approval, an approval with extra measures or no approval at all. In the third phase of the evaluation, the submitted set of final projects was checked based on all of the above measures, again through the D-C-B-A list. The fourth and final stage of the evaluation process occurred at the construction site, which assessed the building process as to whether the implementation has met the requirements and the guidelines.

According to Kees Duijvestein, the environmental standards by which the developers and architects proposed and worked throughout the long and exhausting evaluation processes, heavily influenced the implementation processes. He added that very few interventions were made in the actual implementation stage due to the collaboration among all parties under clear guidelines. Secondly, the quality that was achieved by the developers also stemmed from their willingness to participate in this project, which was due to becoming the first largest residential development with innovative urban systems and building integrated technologies. Furthermore, the contractors were encouraged to perform better in their building practices through a reward system. As an incentive to perform higher environmental standards, each developer was asked to pay 1000 NLG (Dutch currency equivalent of circa 620 USD in 1995 [21]) in advance per house or dwelling. This amount was used in promoting developers for each project that met the acceptable level of rating or higher. In most cases the developers benefited from the incentive program rather than the architects, which was an issue pointed out during the interview conducted with Prof. Duijvestein. However this contributed positively to the overall process in terms of motivating the project teams as well as the developers and at the same time, created an environment in which the actors competed to perform better. As a result, Nieuwland became known as

21 http://www.ny.frb.org/markets/fxrates/historical/fx.cfm accessed on December 7, 2013.

the first large project that was built based upon the integration of environmental planning in design and building integrated PV systems in the world at that time.

6.9 Evaluation of Nieuwland based on the 'success factors'

In Nieuwland, significantly more studies were conducted with regards to the environmental performance levels, the social and physical qualities of the development, and for the QOL of residents due to its importance in terms of the novelties that were introduced in size and scope. The success indicators as discussed in Section 1.6 of Chapter 1, included some of these elements, which consisted of three main categories. The data that were gathered from these documents as well as from the interviews were summarized in the following groups:

- *Dissemination of positive results and experiences;*
- *Community's behavioral and cognitive adaptations;*
- *Policy change and adjustments.*

In the annual report published by Amersfoort Municipality, the resident satisfaction in terms of the 'perception / attachment to neighborhood' in Nieuwland; only 52% of the residents perceived a high level of attachment compared to 67% of the residents in Amersfoort felt this way. Despite the relatively lower level of resident '*sense of neighborhood attachment'*, the level of housing quality in Nieuwland was scored 8.0 (out of 10 points) compared to 7.8 in Amersfoort while the neighborhood quality scored 7.4 compared to 7.3 for Amersfoort (Gemeente Amersfoort 2009). Although the findings of the Amersfoort Municipality's study revealed somewhat conflicting messages with regard to the housing quality and the perceptions of members of the neighborhood, factors were found, which explained the results.

During the interviews, it was found that the residents living in Nieuwland appreciated the environmental features and technological improvements in general. It became apparent that some residents chose to move back to Kattenbroek for its physical characteristics that were found to be more attractive than Nieuwland. Due to the ambitious environmental goals to install over 1 MW capacity PV panels, the building plans, heights and the subdivisions / plot allocations were all developed in ways to make best use of the roof space and sun-orientation. This in turn may have created constraints for the designers to achieve the dynamic structures that are necessary with which visually attractive places and functional photovoltaic roof structures could be made.

Furthermore, some residents or potential buyers chose to purchase new dwellings in the upcoming Vathorst development with relatively more affordable home prices. In brief, with

regards to the initial perception toward the "neighborhood attachment" in Nieuwland, it was found that both the perceived aesthetic qualities and the residents' investment prospects were influential in terms of how they initially felt toward Nieuwland. However besides the aesthetic qualities, neighborhood attachment was affected by various other elements such as the social, economic and environmental features of the neighborhood (Sirgy & Cornwell 2002) and these aspects for Nieuwland were found to be highly positive. Their impacts were further discussed in Section 6.15 of this chapter.

6.9.1 Dissemination of positive results and experiences

Nieuwland's development has been much analyzed and discussed due to its bold initiative to build a district size urban development with over 1MW peak capacity building integrated photovoltaics. Although similar developments were built and experimented in the Netherlands previously in smaller developments of 100-150 houses, the lessons gained from these developments were used to make further improvements in holistically envisioned development of Nieuwland. With regards to the dissemination of positive results and experiences, Nieuwland provided not only new insights into the design and development with more sophisticated environmental measures but also made good use of lessons learned from the experimental projects such as the **Ecolonia** and **Ecodus**.

Furthermore, the experiences and guiding insights from the energy company REMU and its initial fifty-house experimental development within Nieuwland resulted in the expansion of the PV installed buildings with additional 500 houses. This provided the space for the initially targeted capacity of 1 MW peak capacity and in fact exceeded the output with over 1.3 MW in total.

The experiences with regards to the technologies in energy systems, there were a number of problems encountered during the implementation and operation. These were found to be due to the technical detailing and design related and also user-related problems most of which have been investigated and reported by *Jadranca & Horst (2008)*. Most significant issues were found to include the following:

- *The after-care of the systems was time-consuming and costly for the energy company to perform and this caused feasibility concerns for other new projects in the area;*
- *Performance problems, which occurred due to the connectors that were placed under the PV panels, were found to be too difficult to replace as this task required major panel removals;*
- *System monitoring was somewhat unsatisfactory for which the energy company offered either a tool to be installed in each home or through the Internet service, which could be used by the residents to check and report the performance of their home's system. This has not yet been successful at the desired levels due to the lack of residents' willingness*

and participation. The lack of responsibility / sense of ownership and financial reasons were found to be the two causes of this particular problem. (de Keizer et al. 2008)

In spite of the positive and the negative experiences, the project was highly successful in terms of providing valuable lessons for designers, developers and for administrations that would further implement similar projects. Compared to the size and scope of the project and its highly ambitious environmental goals relative to the time during which it was built, Nieuwland was experimentally and experientially, unique.

6.9.2 Community's behavioral and cognitive adaptation

With regards to the consumption levels in Nieuwland according to the data found in CBS; average electricity consumption was 3700 kWh per year compared to 3200 kWh / year average in Amersfoort. The average natural gas consumption for heating and other uses was 1250 m3 per year / household compared to 1700 m3/year / household in Amersfoort. In contrast with these averages, studies conducted particularly in households with high environmental standards and participation revealed significant improvements in consumption levels and user behavior such as those documented by V&L Consultants.

Research conducted by V&L Consultants (2009) on aspects such as the livability, consumption levels, satisfaction with social and physical elements within and around various eco-neighborhoods / eco-districts compared to the conventional urban locations in the Netherlands, provided valuable insights. According to their report, the electricity, gas and water consumption in the households with environmental measures revealed somewhat different data based on whether or not the residents had participated in the process of their development. Their findings were presented comparatively with the reference homes that were selected within the close proximities of the eco-towns in order to understand the extent to which the residents' behavior played a role in the use of energy, water and other aspects in cases where the residents were involved in the process and those who were not involved.

The study included 4485 homes from 56 projects within the Netherlands, among which were Ecolonia, Nieuwland, Kattenbroek, GWL and EVA Lanxmeer. Among the selected homes that had environmental measures integrated, 1232 dwellings were built with the residents involved in the development's process and 1393 were built without the resident's participation in the development process. Separately, 1860 homes were included in the study as the reference units, which were from conventional developments. Among their valid cases, 320 homes with participation in the process that had environmental measures, 313 without participation and 402 reference homes were used in the evaluation.

Their findings revealed that participation in the development process (*whether it was the design phase or in establishing the environmental measures that were integrated in the development)*, significantly helped to reduce the consumption levels of the residents compared to consumption in the other two categories.

Table 6.4 Comparative consumption levels per household and / or person from three categories of homes selected for the V&L Survey.

Average consumption per household	Average Persons per family / household	Gas Consumption M3 / year	Electricity consumption kWh / year	Water consumption	
				M3 / household / year	lt / capita per day *
Units with participation	2.52	830	2261	109	118
Units without participation	2.83	1159	3162	104	100
Reference homes	2.53	1291	3039	115	124

The data in the above table were excerpted and adapted from the V&L Consultants' report (de Vries & Rashevskaya 2009)

* Water consumption in cubic meters per year, was converted to per capita per day consumption in order to more clearly compare the findings with the previously presented data obtained from the CBS and Amersfoort Municipality. This conversion was performed through the following exercise:
For water, 1 m3 = 1000 liters; Therefore, the water consumption per person a day can be found with the following formula using the values in the table above.
[(M3 per year) x (1000)] / [(average person per household) x (365 days)] = liters / capita / day

In contrast with the study conducted based upon the data gathered from the Amersfoort municipality and the central bureau of statistics (CBS) in the Netherlands, the electricity and gas consumption levels were found to be less than in the reference houses. This can be explained due to the methodology used through which the average consumption levels were measured and reported for each district. For example, the values included in Table 6.4, were obtained from CBS, which reported the average of all buildings within the area of this research. The study conducted by *de Vries & Rashevskaya (2009)* however, focused on specific types of residential housing units with and without the integrated environmental measures, thus their data provided more relevant information for this and for future research (see Table 6.4).

In conclusion, the buildings with integrated energy, water and other environmental management systems and technologies, performed significantly better than the conventional houses in the same area or in close urban proximities. The water consumption levels were found to be close to the averages reported for the Netherlands at 120 liters per person/day.

This value is already 40% less than the water consumption found in areas without the high environmental measures or awareness, in general.

The findings from this study are highly relevant because they revealed that the consumption levels of residents for electricity, gas and water focusing on three categories of households comparatively. The overall findings suggest that the resident's behavior and perception were positively influenced through living in environmentally sound neighborhoods, one of which is Nieuwland. Additionally, with the participation and engagement in the decision-making, whether it was in the design related issues or on the environmental agenda and related measures, the residents who participated in the process, were found to be more sensitive towards their surroundings, which in turn helped them to reduce their consumption in these three categories.

In terms of the car ownership in Nieuwland, it was found that there were 137 autos per 100 households compared to 103 autos per 100 households in Amersfoort.

6.9.3 Policy changes and adjustments

In response to the lessons learned from the Nieuwland case, a number of new policies, and changes in design and implementation models in the Netherlands were observed to play a role. The interviews revealed that the initiative to build district size demonstration projects required innovative approaches, at the time of the development, in terms of planning, design and coordination as well as in governance of the development process. Environmental supervisors and the involvement of other disciplines before and during the design stages helped to establish a policy model where multi-actor / multi-disciplinary engagement became rather pivotal in establishing environmentally sound urban developments. However more in-depth research on the Dutch urban development policies and its evolution from the mid 1980s until early 2000s revealed that a more systematic shift from the *"hierarchically operating government toward more cooperative approach of governance"* (Heurkens 2012) has occurred and this was associated with the market economy and its impact on the urban policies in the Netherlands and Europe during this period. According to Heurkens (2012), the spatial decision-making has involved more regional and local governments with market sector engagement compared to previously centralized system of the Dutch government's domination. Vinex, to a certain extent, has been the milestone in this shift from centralization to decentralization. Therefore Nieuwland's development has been initiated and implemented in this transitional time for the Dutch urban planning policy. Gerrits et al. (2012) reflects on this period as *the shift from the content planning to the process of planning with emphasis on "governance" rather than "government"*(Gerrits et al. 2012).

This period in Dutch planning and development was found to offer numerous opportunities in terms of demonstrating more multi-disciplinary, participatory and holistic way of design, implementation and governance, most of which Nieuwland has successfully seized.

6.10 Summary of the Nieuwland case study

Nieuwland is the first district-size development that was built with environmental planning and measures implemented during its design stage in the Netherlands. Due to its ambitious goal to implement and test building integrated PV systems, there was valuable research conducted on the process and the resident satisfaction with respect to the performance of the systems.

> *- Among the 5,500 units, 500 houses were designed and installed with integrated PV systems that were planned to generate over 1MW of electricity in total. The total PV power that was measured between 2001 and 2006 was found in average of 1.2 MWp from a total of 486 systems with a capacity of 1.321 MWp (de Keizer et al. 2008). It was further found that more than 550 buildings (including commercial) in Nieuwland have been equipped with over 12,500 m2 of PV surface area (Jadranca & Horst 2008).*

The installed peak capacity of 1.3 MW photovoltaics was achieved together with an impressive closed water management system. As stated in Section 6.7.2, the transport system was analyzed in detail prior to design of the network and the subdivision of the land. In this process, a multi-disciplinary and holistic approach was employed to achieve the operational goals of the project. In spite of the well-orchestrated and coordinated design and management process, there were number of technical problems with the PV technology and metering devices. For example, the energy company REMU (now owned by ENECO) found that the systems were not feasible due to the following reasons:

- The architectural restrictions in the design of PV installed houses, the criteria and limitations in roof, style, colors;
- Urban design restrictions regarding the street orientation, hence the subdivisions of plots;
- Installation and maintenance issues during and after the development;
- Costs incurred by the extensive detailing of the PV modules in order to achieve waterproofing;
- Electrical, connection and performance / efficiency issues;
- Uncertainties regarding the ownership between the tenants and the energy company or in between the neighbors where the roof space was not divided. (Jadranca & Horst 2008)

These and other similar concerns stemmed from the earlier applications of innovative systems were found to normally exist and almost all issues have been resolved with clear communication, training and making information available to public, designers and relevant disciplines. According to the research conducted recently in this area, the residents of homes with solar panels are satisfied with the performance level and also with other green features in their homes as well as in their surrounding environment as a whole (de Vries 2012).

With regards to the environmental planning and supervision, Nieuwland set a new approach in the Dutch urban planning culture. During an interview with Kees Duijvestein, it was revealed that the rigorous process through which the designers, architects and developers were put in order to achieve the desired goals of the project has affected the processes in subsequent developments, one of which is Vathorst. The DCBA checklist that was used in Nieuwland was found to be too extensive and the developers in Vathorst were not willing to go through that long process. As a result, briefer versions of the list were developed, which were tailored for other developments and for each project's overarching goals/objectives whether they were focused upon water, energy, waste or transport system as priorities in their visions (interview with Prof. Duijvestein on November 15, 2013 in Den Haag).

The case of Vathorst in Amersfoort, The Netherlands

6.11 The Development of Vathorst

Upon being designated as a *Vinex* location in 1994, a cooperation agreement between the consortium of six developers and the municipality was signed in August 1997, to develop Vathorst as the third consecutive project after the developments of Kattenbroek and Nieuwland in Amersfoort. The land is situated towards the northeastern section of A1 motorway and the development will cover a total area of approximately 500 hectares[22] when completed [23]. Currently about 5200 of the planned 11,000 units have been built (Gemeente Amersfoort 2012b). In 2011, the population in Vathorst was claimed to be around 14,300 including the approximately 3,500 inhabitants with those living in Hooglanderveen (Gemeente Amersfoort 2011). The number of residents is expected to reach 30,000 with 5,000 jobs (Kort & Staffhorst 2005), by the year 2021.

Table 6.5 A descriptive outline of the Vathorst development in Amersfoort, The Netherlands.

Type of development	Mixed-use residential
Land size	550-722 ha when completed
# Of units	11,000 when completed
Population (Current)	16,799 and estimated to reach 30,000 inhabitants when completed
Construction period	2002-2018 (extended until 2021)
Density	Varying levels of density (Interview w/ Trudy de Mooy)
Initiation	Central government, local and provincial levels
Development model	Public-Private Partnership (PPP)
Land ownership	Developer-owned
Funding	Private funding
Governance	Top-down corporate / developer-oriented approach
Champion(s)	Developers
Goal(s)	Sustainable mixed-use housing development – (specific goals - not clear) / market oriented / architectural and urban aspects emphasized

22 The data regarding the size of Vathorst have been found inconsistent based on the date in which the reviewed documents were published. Some sources suggested that Vathorst is being built on a land cover of 500 hectares while the latest information obtained from the Amersfoort Municipality indicated a total of 722 ha.

23 http://www.amersfoort.nl/4/vathorst-hooglanderveen/Vathorst-Hooglanderveen-Blik-op-de-wijk/Vathorst-Hooglanderveen-Blik-op-de-wijk-Historie/Historie-Vathorst.html?highlight=Vathorst accessed on November 23, 2013

Due to the recent economic crises in the housing market (Heijmans 2013) and the subsequent slowdown in construction industry, the development and the realization of sales have been slower than initially planned. Despite the revisions in the completion plans, the development has already become a popular destination and it is frequently visited as one of the most researched mixed-use residential developments in the Netherlands for its sustainable building and urban planning features.

In the next sections, the Vathorst development's brief history, design and development processes are evaluated based on the review of literature and the interviews conducted. Furthermore the development is assessed with particular emphasis on the 'success factors' that were developed by this thesis author. As a subsequent step, the overall success of the development process for Vathorst was investigated.

6.11.1 The context in which Vathorst's development was initiated

Vathorst was designated as a Vinex location in 1994 after which the provincial government of Utrecht became increasingly interested in the area for its development. Despite the very low approval rate of the Amersfoort citizens for the project initially, the consensus was reached after a year of discussions and consultations. However the Amersfoort Municipality and the landowners, as the developers, agreed on a public-private partnership (PPP) structure in order to develop Vathorst with 11,000 homes that would house 30,000 residents with additional 5,000 jobs in the area.

After the agreement was finalized between the Amersfoort Municipality and the consortium of developers in 1997, the Vathorst Development Company (OBV)[24] was formed (1998) as part of a public-private partnership (PPP). The PPP consisted of the 'City of Amersfoort' with 50% share [25] together with a group of private developers. These included Heijmans Property Funds, Bouwfonds, AM, Dura Vermeer and SCW/Alliantie [26] with Amersfoort city, which took part in the project as a developer partially in charge of the housing development in the commercial sections, the social sector and all non-commercial provisions (Kort & Staffhorst 2005). [27]

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24 Ontwikkelingsbedrijf Vathorst (OBV) is translated in English as the Development Company of Vathorst and has two shareholders. These are 1- The Amersfoort Municipality and 2- Vathorst Management Company (Vathorst Beheer BV). Vathorst Beheer BV is a joint venture between (in full official commercial names) AM Grondbedrijf BV, Bouwfonds Ontwikkeling BV, Heijmans Vastgoed Participaties BV, Holding De Alliantie PO Huizen BV en Dura Vermeer Hengelo BV.

25 http://www.gebiedsontwikkeling.nu/artikel/9679-wat-zijn-de-sleutels-van-de-succesvolle-doorstart-van-vathorst-amersfoort-en-stadshart-zoetermeer accessed on March 05, 2014

26 http://www.heijmans.nl/projecten/bekijk/index/zoek/Vathorst/id/365 accessed on December 10, 2013

27 In conventional housing development projects, municipalities have been funding the design, planning, infrastructure services and the construction through the finance corporation that was set up for this specific activity also known as the 'Bank Nederlandse Gemeenten' (BNG) (SUNN 2011). In Vathorst, the OBV had managed to borrow 250 million Euros with an interest rate of 5% payable in a period of 15 years as part of the 750 million Euros that was potentially required for the finance of the complete development.

6.11.2 The goals and objectives

> *"How do we make a community out of diversity? That was the motto of Vathorst. The whole idea was celebrating diversity."* **(Quotes from the interview with Mr. Ashok Bhalotra on November 13, 2013 in Rotterdam)**

Subsequent to the decision for the development of Vathorst in Amersfoort, the master plans were developed by the collective work of Ashok Bhalotra (Kuiper Compagnons) and Adriaan Geuze from 'West8'. The project's goals were to provide sustainable housing for all income groups and to provide diversity as the central theme. Vathorst was envisioned to become the 21st century urban model for the city of Amersfoort in which distinctive architecture, innovative urban design, social and physical qualities for the residents would be key elements.

> "*…and it is also the 21st century (approaching) at the same time. So they made peer groups and those groups were involved in sustainability and environmental thinking. And living in 21st century, how to regulate traffic etc, and also the quality of architecture. So I suppose those were the main issues (in envisioning Vathorst). And of course those groups and the city planners, they learned from the experiences of Kattenbroek and Nieuwland, and Ashok (Bhalotra) was involved in Kattenbroek and also in Vathorst. So he had history and the municipality also had history about sustainable building. Since 1980 they were working with the same developers, private partners. So there were long lines of history as to how to work with one another, there was a lot of chemistry and synergy that are very important. And so this is how it worked."* **(Quotes from the interview with Mrs. Trudy de Mooy on November 08, 2013 in Vathorst)**

6.11.3 The design features of Vathorst's development

With regards to the urban and landscape design in Vathorst; initially three main themes were used to create a sense of distinctive identity with their own sub-elements, each with different physical qualities and characteristics. The first theme, "De Laak" (1 in Figure 6.5), is the section where the water element was integrated into the planning of the entire residential area features slightly elevated canal houses, bays and natural landscape. The existing farms and the natural habitat have also been preserved and enriched through integration of waterways and canals. This area of neighborhoods was conceptualized to project a life for the residents living by a city canal. Additionally, it was planned to accommodate a wide spectrum of income groups in rental or owner-occupied dwellings.

The second thematic part, "De Bron" (2 in Figure 6.5) was designed to include lush green landscape with as much natural habitat as possible. This green neighborhood has a centrally located water feature and includes educational facilities and other urban amenities planned for Vathorst. With regards to the tenure options, De Bron was planned to accommodate almost all income groups, wishing to live in rental or in owner-occupied dwellings.

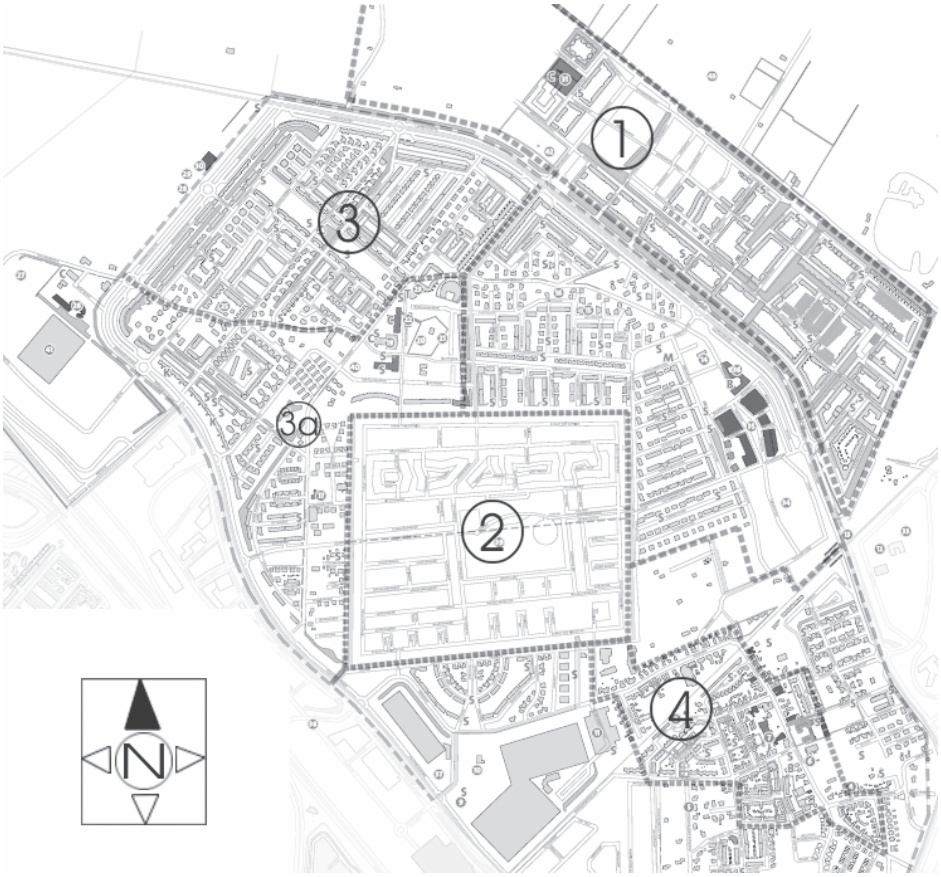

Figure 6.5 The current master plan of Vathorst *(Source: Wijk Wijzer Hooglanderveen-Vathorst_2010, obtained from Gemeente Amersfoort on December 09, 2013)*

This centrally situated part of Vathorst consists of the following neighborhoods:

- *Lanen en Hoven (Avenues and Courts)*
- *Waterhart (The water heart)*
- *Eilandenrijk (The island kingdom)*
- *Omlijsting (The frame)*

The amenities / facilities planned within 'De Bron' area was planned to serve the residents of Hooglanderveen (4) with additional 2775 inhabitants (CBS 2010). Although Hooglanderveen is known as a separate settlement, it has its own unique urban characteristics and it is synergistically growing with Vathorst further enriching the diversity and distinctiveness of this area as a whole. The third theme, "De Velden" (3&3a in Figure 6.5) has more than

4,600 dwellings. This part was specifically designed to promote environmentally friendly lifestyles enriched with the natural landscape that contributes to the physical character of the surroundings. The whole neighborhood was designed to attract those willing to live in rural settings.

> *The color schemes used in the design of Vathorst to help to establish the housing types, densities and the demographic approximation of the resident type:*

The types of housing, the densities and attributes of the neighborhoods were established through illustrating future residents' lifestyles and their potential needs and interaction with others from within their communities. In order to establish these categories, theme groups were established and workshops were organized involving architects and the urban design teams (SUNN 2011) seeking to learn how the future residents would like to live now and to help them to envision their place of living in the 21st century.

For example, the higher income group's visions were associated with more luxury and privacy, hence the choice of quality and the location. Alternatively, the mid-income family group's visions were associated with the community lifestyle in which gatherings would be frequent over a barbeque in the weekends. Therefore, these families were identified as one of the target groups for potentially selecting to live in stand-alone houses with gardens and spacious green surroundings. These illustrative scenarios were made for various demographic contexts and a color chart that included various housing options was developed.

In this chart;

- The blue color represented the housing units that were associated with higher income groups;
- The yellow color represented the housing for families who would require gardens and large houses for extra family members or kids located in a neighborhood with green environment / surroundings;
- The red color was associated with the "cultural group" that would prefer to have an individual lifestyle, rather more anonymously and in higher density residential areas;
- The green color represented the housing for the elderly that required safety and healthcare services nearby. (Interview with Trudy de Mooy)

These colors were then used to create different models to achieve diverse densities and housing types during the urban and architectural planning. (The number of dwelling types and color representations can be further obtained from this link: http://amersfoortincijfers.nl/Default.aspx?cat_open_code=c&var=bevtot&Mostrecentperiod=true&Geolevel=wijk&view=table)

In the overall master plan, the residential, commercial and other facilities such as schools, healthcare centers and other facilities were found to consist of but not limited to the following:

- 10,700 residential units (4,400 in De Velden, 4500 in De Laak and 1800 in De Bron);
- 100-125,000 m2 of commercial space;
- 8 schools and colleges;
- 2 healthcare centers;
- A library, a theater and other sports and recreational amenities

Additionally, a future development is planned to include a business park situated on 45 hectares of land. With regard to the transportation system, the mobility in the district is provided through approximately 15 km of walkways/bicycle lanes and 5 km of bus routes in and around the development. As a result of this comprehensive design and planning phase, the building started with the initially planned date for completion by 2014.

> *"And of course we developed a (commercial) area here in Vathorst, an office area for 5000 working places but it's not necessary so that people in Vathorst work only in Vathorst. No, they can easily work in Amsterdam, Groningen or in southern part of the Netherlands.*
>
> *My experience is that people travel an hour from their home and back. And also marketing wise, if you want people to buy a house here, first we have the people from here. Now that the demand here is decreasing, we are focusing on locations at one hour away (for marketing).*
>
> *There is a decrease in demand. The crisis is going on, and we are making a big effort to sell our last houses. And we are at 70% (completion) of the development so we still need to sell some 2,500 houses. We need to have (find) families to buy those houses."* **(Quotes from the interview with Mrs. Trudy de Mooy on November 08, 2013 in Vathorst)**

The first houses were built in 2001 and resident occupation was started in 2002. Despite a relatively rapid delivery of housing units (600-700 annually) until recently, due to the housing market crisis, the construction as well as the sales rate slowed down significantly. Therefore, currently the estimated completion date has been revised to sometime in 2025 (Gemeente Amersfoort 2013b) [28] even though in some instances the completion date was announced to be 2021.

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28 Due to the economic slowdown and housing crisis, the Amersfoort Municipality and the Vathorst Development Company had to revise plans and timeline for the completion of the development. In the Board decision of the Amersfoort Municipality dated November 13, 2013 with file registration number 4538430, it was suggested that the foreseen construction rate to be in the average of 150 homes per year, which would gradually increase to 250-300 homes annual delivery. With the estimated rate of construction, the completion of the project is expected to become in the year 2025 with an additional cost of € 50.9 million incurred from

6.11.4 The framework that was employed for the overall development process

Vathorst has a development model that is similar to that used in Nieuwland whereby the private developers and the City of Amersfoort had equal shares in both the profits and the risks. The development company (OBV) was in charge of the: a. *Land acquisition;* b. *Urban planning;* c. *Engineering;* d. *Commissioning infrastructure; and,* e. *Allocating sites.*

In order to increase the land value and marketability for future residents, the development company contributed to the funds that were required to connect Vathorst to the main hub through the rail system before the project gained momentum. With regards to the energy provision, the current energy company was granted a 44% reduction of the taxable profit for co-generation energy investment (EIA, EnergieinvesteringsAftrek) and additionally they acquired funds from OBV, an amount of 4.3 million Euros to set up a CHP plant in Vathorst. [29]

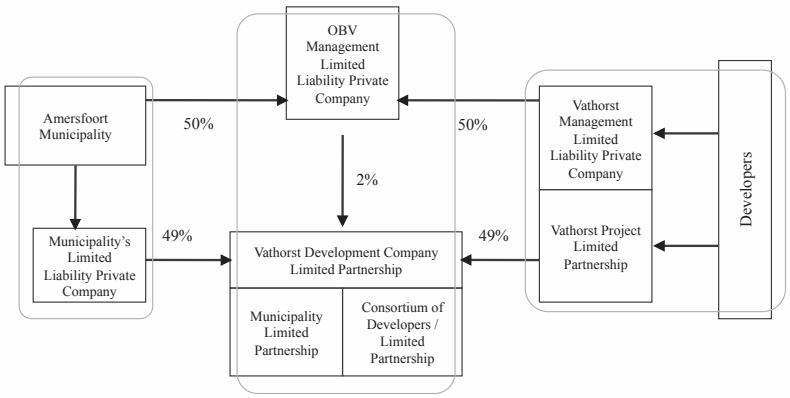

Figure 6.6 Vathorst Development Company – Shareholder / partnership structure as adapted from **Lastdrager (2008),** explaining the "*Land development and realization arrangement of Vathorst"*

With regards to the governance model in Vathorst, the overall structure was found similar to the conventional *corporate / developer type market-oriented* approach. The PPP model (see Figure 6.6) had a top-down structure through which the development process was governed (see Figure 6.7). In this process, the City of Amersfoort and its role in the decision-making has been found rather too little and not all the decisions made by the OBV needed to go through the City Council for their approval. According to the reviewed reports, this aspect was made explicit during the formation of the partnership between the municipality and the private par-

the interest rates and operational costs. (Gemeente Amersfoort, 2013) http://www.binnenlandsbestuur.nl/Uploads/2013/11/Onderhandelingsresultaat-Vathorst.pdf Accessed on April 6, 2014

29 http://www.burgerpartijamersfoort.nl/oud/BR_20080829_BPA%20vragen%20Duurzame%20energie%20Vathorst%20is%20Duurkoop.htm accessed on December 12, 2013

ties (Kort & Staffhorst 2005) and it was then considered to have positive implications due to the anticipation of less bureaucracy. The interviews revealed that there were negative aspects in terms of the municipality's decreased level of administrative power in the decision-making concerning the development of Vathorst. Most significant one was the planning approval process during which the developers chose to interact with the alderman rather than the town council. According to Heurkens (2012), the aldermen in the Netherlands are '*somewhat more reluctant'* (Heurkens 2012, pp.361-362) to let the private party actors to have control over the process, due to concerns of public opposition or even '*loss of democratic legitimacy.'* In the cases that were studied in this research however, the interviews suggested that the aldermen were very strong characters, yet more approachable and friendly to work with despite their acknowledged authorities over the design and development processes.

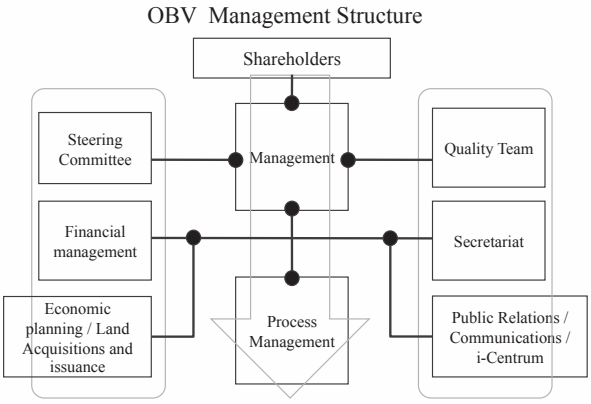

Figure 6.7 Vathorst Development Company (OBV) Process Management Structure: adapted from - the document titled *"Ontwikkelingsbedrijf Vathorst" obtained from Vathorst i-Centrum on November 8, 2013.*

Despite the contested views of this approach in terms of maintaining the standards physically and environmentally, the findings also suggested that there were relatively more consultations with current residents and interest groups that influenced the decision-making processes.

> *[The PPP models were investigated with respect to their positive contributions to the urban development practices whereby, the shift from sectoral to more integrative policy making and implementation helped to optimize the benefits for all parties through creating social capital and empowerment of communities via participation in the decision-making (Andersen & van Kempen 2003; Kyvelou & Karaiskou 2006).]*

In the following sections, the author addressed the research findings on the six 'success factors' as presented in Section 5 of Chapter 3. The Vathorst development was evaluated based on the six factors identified for developing successful eco-towns. Subsequently the author assessed the gathered data with respect to the indicators derived from previous research to determine the level of success of Vathorst.

6.12 The assessment of Vathorst through the six 'success factors,' essential for developing successful eco-towns

6.12.1 Political commitment

The in-depth interviews as well as the literature reviewed on Vathorst revealed a typical development model that was implemented increasingly since the mid 1990s (Kyvelou & Karaiskou 2006; Andersen & van Kempen 2003) also known as the public-private partnerships (PPP). With regard to the local authority's involvement, this model naturally requires political commitment as the municipality enters into a long-term development agreement with the selected private parties within the Vinex program's framework.

The political commitment from the provincial level (Utrecht) was found to exist due to the location being designated for the Vinex program in 1994. The central government was involved in the development only due to basic responsibilities regarding the spatial planning provisions.

With regards to the partnership formation process (see Figure 6.6), the PPP arrangement formulated between the Amersfoort Municipality and the developers was found to raise numerous questions. One of those issues was the partnership model and the way in which it was entered and conducted between the City and the shareholders. This was said to be in conflict with the European Union (EU) tender regulations (Groetelaers 2006; Kort & Staffhorst 2005). Secondly, there were criticisms that the Municipality and the developers acted too soon without involving the provincial government of Utrecht. These and other issues that were found through the review of relevant documents and literature may have occurred with or without substantial impact on the outcome. However more market involvement in the urban planning and the increased role of local administrations in the decision-making regarding spatial development in the Netherlands, resulted in the land acquisitions by private developers in Vinex designated locations (Heurkens 2012). In the case of Vathorst, similar dynamics were observed as a result of political and economic interests. These were found to influence the decision-making; hence the development processes procedurally and contextually.

The conflicting arguments in terms of the initial role of the local and provincial government's involvement in Vathorst that require further clarification:

- The provincial government of Utrecht was the dominant party behind promoting Vathorst as a new extension in the first place because they thought that expansion was required for housing and this should take place within the urban district of Utrecht and Amersfoort (Kort & Staffhorst 2005).

"If the City of Amersfoort would not act soon to initiate and formulate the Vathorst development, the Province of Utrecht might" (SUNN 2011);(interview with Trudy de Mooy). What were the implications if the provincial government took the initiative? Who would be affected and how?

The Ministry of Spatial Planning and the Ministry of Transport & Public Works had a disagreement on the development of Vathorst with regards to the infrastructural issues (Kort & Staffhorst 2005). Also, the provincial government of Utrecht and the City of Amersfoort disagreed as to whether there should be a new development planned in Amersfoort (Kort & Staffhorst 2005).

The specific request made by the City for the developers to acquire land in specific locations (Groetelaers 2006) and the Municipality's partnership with developers without following EU tender regulations, also need further clarification so that the extent to which the level of commitment from different levels of government agencies could be found for Vathorst. With the existing data gathered from the interviews and from the literature reviewed, political commitment at least at local administration level was found to exist significantly.

6.12.2 Timing

The research showed that the decision to develop Vathorst was made based on the anticipated political dynamics and without having enough municipal resources at the time.

The decision to develop Vathorst was made during which the development of Nieuwland was still under way. As an initial reaction, the citizens of Amersfoort critically addressed this decision and called unnecessary until a year later when the City administration succeeded to create consensus to proceed with the plans. The interviews revealed that the decision to develop Vathorst caused a shift of attention and political commitment from the Nieuwland development, to some extent.

With regards to the conditions of the financial and housing markets however, both the initiation as well as the implementation reflected a relatively positive outlook in terms of potentially achieving the project goals and the desired turnover results. It was also the

Vinex program, which provided the much-needed impetus for undertaking of a development of the size and scope of Vathorst.

Therefore, in the context of this research, ***"timing"*** was found to be a positive contributor to the initiation of the development but not so much for the overall development's construction period and with respect to the size and time that were required to keep up the much-needed momentum.

6.12.3 Financial model

The financial plan was found to be efficiently formulated through both the political commitment and the timing, primarily as a result of Vinex, and secondly due to the potential housing demand in the Netherlands. As discussed in the previous section, the initial funds were provided through mostly the bank loans and additionally by a very small subsidy from the national government. The loan of €250 million with 5% interest for a 15-year period provided the initial support for project teams, infrastructure, services and the development's initial phase(s). The land acquisition was finalized at a cost of nearly € 200 million and the infrastructure costs were initially estimated to be around € 380 million. The sites were allocated to shareholders (developers) to proceed with the development on subdivided plots of land. The overall sales of the plots, housing units and commercial properties were estimated to yield around € 740 million, 20% of which was realized through the sales of offices and amenities (Falk 2010). [30]

> *The realizable value of the plot is estimated to be around 25-30% of the value of a completed house (Falk 2010; SUNN 2011).*

In light of these cost data, relatively sound financial planning was found to have been a major factor in establishing the basis for the overall development scheme in Vathorst, considering that minimum contribution was made from the national and local governments. However, the size and the period through which the development was planned proved to have risks due to the economic fluctuations that occurred since 2008. As discussed in Section 6.11.3, the housing crisis slowed down the home sales and the construction rate dropped considerably, which left the developers with 70% completion rate. The Municipality's decision to extend the completion deadline of the project to the year 2025 was calculated to add another € 50.9 million to the costs of the project due to operational costs and interest payments (Gemeente Amersfoort 2013b).

30 The estimated value of the plots were accounted for €590 million with an additional €150 million allocated for commercial spaces and amenities to be built by the project's planned completion in 2014 (Falk 2010).

6.12.4 Physical qualities

With regard to the architectural character and urban qualities, Vathorst was found to provide a combination of distinctive neighborhoods and an urban feel, which has become valuable in creating a sense of belonging for the place in which to live.

Vathorst was planned to accommodate more businesses, commercial spaces and the mixed density residential uses that are integral for creating sustainable urban development models. The overall size of the development for the planned 11,000 units caused delays and routine revisions in the anticipated completion time of development. Furthermore these extensions made the development plan vulnerable to the changes in the economic conditions and the resultant fluctuations in the housing markets. This caused unintentional delays in owner occupancy with visible undeveloped lots of land that created the perception of stagnation and a deeper sense of uncertainty. Such elements were found to have financial implications as both the potential residents and the businesses may select other locations in which to live and work.

With regards to the architectural and physical qualities of Vathorst, the emphasis was given more into the feasibility and marketability aspects of the project due to the market-based / developer-led framework within which it was developed. This was found to help the creation of distinctive architectural designs and neighborhood qualities.

Consequently, the "***physical qualities"*** were found to have positive impacts in terms of contributing to the perceived success of the development so far. It is considered that physical qualities and characteristics will evolve for the better in anticipation of the finished development that would deliver its initial goals on all social and environmental levels.

6.12.5 Stakeholder involvement

The stakeholder involvement in Vathorst was relatively different compared to the previous developments of Kattenbroek and Nieuwland especially with regards to the multi actor involvement in the design and development stages. The developer / local administration dynamics as well as the dominant role of the development company in the decision-making created a sense of alienation rather than a sense of collaborative and collective action for a common cause, which is considered to be a result of structural change in development framework. As Heurkens (2010, p.362) discussed, it was common for the Dutch governance culture (until at least the mid 1990s) that the local authorities were more likely to be the ones to have control over the development process. In Vathorst, the strong developer influence in the decision-making and development could have resulted in the change of dynamics, hence the perceptions.

"Almost every plan was presented to the board (town council), the "Gemmenteraad", There

was a special committee; the city councils have all kinds of committees (such as) the social committee, the building committees, justice committees; and the building committee that was part of the council, … We presented them those plans and everybody was enthusiastic. In Vathorst the politics changed. Because until 2000, we had a system that was kind of collaboration between the council, the mayor and the alderman. They had a new system (in Vathorst). They said there should be [a kind of] two sides. You have the council and you have the alderman. They have to check them (the projects). So the idea of presenting, for instance, you put the plans in front of them and it was much more strict. It was not so familiar, it was not so friendly any longer and therefore, in Vathorst, they never presented (the projects) to the council, almost never.

And in Nieuwland, they (the developers) were proud of the process and of me checking everything and a whole group of people was checking everything, and giving presents (such as the) 1000 NLG. There was a kind of 'proudness' in the fact that we were developing in such a way. Participation of the council." **(Quotes from the interview conducted with Prof. Kees Duijvestein on November 15, 2013 in Den Haag)**

As highlighted in the above section, Vathorst's designs were strongly influenced by its branding, its marketability, hence the feasibility all of which can be attributed to the strong corporate structure found in the development process. This in turn influenced the decision-making toward the public perceptions with regards to the needs and requirements in this newly planned urban area. In order to achieve this, focus groups and workshop sessions were organized to communicate with the communities of interest / the future residents, and build consensus as a result.

In fact, the residents of Amersfoort initially criticized Vathorst as "unnecessary", especially after having developed Kattenbroek and Nieuwland, totaling almost 10,000 new homes in the area. The discussions and early citizen involvement in the decision-making was a strong sign of stakeholder engagement in the process for Vathorst. Further review of the literature revealed that the development company (OBV) organized workshops involving also the architects and urban planners in order to more efficiently identify the needs and requirements of future residents. During the initial meetings of the City Council held in 1996, the following preliminary goals of the development were identified:

- Diversity;
- Protecting the natural habitat and the existing landscape of the area;
- Special focus on the transport system with increased availability of public transport, cycling lanes and measures to reduce car use;
- High quality in planning and building of housing and the surroundings;
- Also, sustainable use of energy and building methods / materials in developing Vathorst.

However after the citizen engagement, these initial goals were revised with the following five overarching themes:

1. The cultural diversity;
2. Emphasis on traffic and transport;
3. Sustainability;
4. Working in the 21st century;
5. Living in the 21st century. (Jacobs 2002)

During an interview conducted in Vathorst, the technological advancements and the Internet's role to the social networking and its impact on the decision-making on issues affecting the residents' well-being were highlighted as some of the positive developments. Vathorst was initiated and is being built during times in which communication tools have been more effectively used among the interest groups concerning subjects that affect their lives. This has been experienced especially when the 'Smink' factory's operations were extended until 2037 (Gemeente Amersfoort 2013a). This decision attracted much criticism by both the community of Vathorst as well as the residents and action groups from Nieuwland due to the potential environmental risks. A similar type of collaboration among the residents occurred when the respiratory related health issues were discovered after the Heat Recovery and Ventilation (HRV) systems in well-insulated houses failed to function to provide clean indoor air quality. Subsequently, the housing development companies had to take necessary measures.

Box 6.2 The findings of a study conducted on the indoor air-quality of buildings in Vathorst

The houses in the Netherlands have been built increasingly with Heat Recovery Ventilation (HRV) systems compared to the previously used Conventional Mechanical Ventilation (CMV) due to their high efficiency in heating and ventilation of well insulated (airtight) dwellings. In 2007, an investigation and research conducted on the air quality of new houses in Vathorst after a series of health complaints received by the Health Board in Eemland. It was found that poor system design and building standards caused a number of both quality and user-related issues, which in turn resulted in the poor air quality with higher than normal CO2 and formaldehyde levels (Hady et al. 2008). [31]

As a result, despite the significant level of top-down approach in the planning and implementation, the level of ***"stakeholder involvement***" and with respect to the residents' power to influence the decision-making were found to be relatively high compared to the development processes in the Netherlands initiated before Vinex. Yet the involvement of multi-actor / multi-disciplinary approach in the decision-making processes was found to be

31 http://forum.vathorst.nu/index.php/topic,8051.0.html accessed on December 12, 2013

somewhat limited with the exception of current and potential residents' involvement in the affairs concerning the development's future.

6.12.6 Environmental plan

The effective formulation of environmental goals in Vathorst was found to have been less emphasized in the documents that were studied for this research, including the data gathered during the interviews conducted with experts in the area. According to in-depth interviews, the environmental concerns as well as the sustainable development aspects were addressed during the initial phases of the project. The environmental supervisor was briefly involved in providing a version of the DCBA tool as expanded upon in Box 6.1 in Section 6.7.2, which was used extensively in Nieuwland. Instead, the tool was used as a guideline rather than a list of criteria (checklist) for which to implement and administer rigorously. The environmental supervisor in charge of environmental quality in the design, control / monitoring was, to some extent, avoided due to concerns for potential delays in the design and construction. The lack of these elements was found to have negative impacts in establishing a clear environmental agenda, and for achieving sustainability goals in general.

> "*In the Nieuwland period, we developed the checklist, and we did that together with the municipality. I suggested that they should also use the checklist officially in Vathorst.*
>
> *... in Vathorst [we were asked for a shorter version of the DCBA list], then we made a short version with the things we thought that were the most important. But the short version became even stricter. Then they wanted the long list because they could choose (among different items on which to focus) themselves."* **(Quotes from the interview conducted with Prof. Kees Duijvestein on November 15, 2013 in Den Haag)**

An interesting outcome found in this study was the current energy company (Eneco)'s decision to opt out the building integrated PV systems due to feasibility concerns. With regards to the lessons learned during and after the Nieuwland development, the findings suggested that over 70% of the residents were happy with the integrated energy systems that were used despite some residents reported technical issues and not being able to find a contact person at the energy company for their complaints (Jadranca & Horst 2008). While most of the problems encountered in Nieuwland were resolved through communication and experience over time. This includes the feasibility of the systems and technologies that were innovative then. In spite of the positive experiences gained in Nieuwland, the developers were convinced to develop conventionally in Vathorst.

> *"The idea for the implementation of the biomass plant (where green power is extracted from wood chips) originally came from the former energy company REMU, which has now been acquired by Eneco. Eneco stated that the plant is not profitable. Now that the housing in VINEX is behind schedule, the government has adjusted (revised) its environmental subsidy.*

The energy company is proposing to build a small cogeneration plant for 2000 homes and the rest of the power will be produced by three windmills placed in Rotterdam." [32] (Volkskrant, 2003)

Currently the renewable energy use in Vathorst is limited to the biomass and district heating providing electricity for the residents [33] (BTG-biomass technology group BV 2010). Also with regard to the Smink factory, the large wood gasification activities for producing bio-energy have been terminated. The company is extracting gas from the landfill, which is being used in a recently built cogeneration unit.

These issues as well as the developers' unwillingness to employ clear environmental planning and measures are considered to be due to the feasibility concerns as well as the commercial and financial interests. The current market trends in housing and the economic slowdown have also been critically and negatively affecting Vathorst's vision to become a sustainable development. Therefore, the relative success of the developed sections of Vathorst was found to have little to do with the '***environmental plan'*** or agenda and even seemed to almost totally lack such focus.

6.13 Evaluation of Vathorst based on the 'success factors'

In the annual report published by Amersfoort Municipality, the resident satisfaction in terms of the 'perceived attachment to neighborhood' in Vathorst; 68% of the residents perceived a high level of attachment compared to 67% of the residents in Amersfoort. Besides the relatively high level of resident '*sense of neighborhood attachment'*, the level of housing quality in Vathorst was scored 8.2 (out of 10 points) compared to 7.8 in Amersfoort while the neighborhood quality scored 7.5 compared to 7.3 for Amersfoort (Wijkwijzer 2009-2010 Hooglanderveen en Vathorst) [34]. These figures reported by the Municipality of Amersfoort indicate a great sense of satisfaction with the development in general. With regards to the success as defined in the context of this research, the following three groups of aspects were evaluated. Based on the interviews and the review of documents gathered during the literature review, the following assessments were made.

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32 http://www.volkskrant.nl/vk/nl/2824/Politiek/archief/article/detail/746306/2003/12/13/Vathorst-krijgt-geen-houtmassacentrale.dhtml accessed on March 21, 2014

33 http://www.amersfoort.nl/4/milieu/Milieuthemas/Energie-en-klimaat/Energie-en-klimaat-voor-inwoners/Duurzame-energie-opwekking/Energie-uit-biomassa.html?highlight=Vathorst%2c%20energie accessed on December 14, 2013

34 http://www.amersfoort.nl/4/vathorst-hooglanderveen/Vathorst-Hooglanderveen-Blik-op-de-wijk/Vathorst-Hooglanderveen-Blik-op-de-wijk-Wijkwijzer-2009/Wijkwijzer-Vathorst-Hooglanderveen.pdf Accessed on April 7, 2014

6.13.1 Dissemination of positive results and experiences;

As discussed in Section 6.12.5 in detail, the initial goals that were set for the Vathorst development by the city council of Amersfoort had been revised into broader themes after numerous consultations were made with the residents and the stakeholders. These included: *The cultural diversity; Emphasis on traffic and transport; Sustainability; Envisioning working and living in the 21st century.* In-depth research and the interviews revealed that within this thematic framework for the development of Vathorst, the environmental planning integration has lacked focus. Furthermore, environmental supervision, which is integral for the holistic design and implementation was found to have been less emphasized. This included the use of the environmental tool, which was given much credit for its positive contribution to previously built eco-developments in the Netherlands and more exclusively in the development of Nieuwland.

Moreover, as a result of the energy company's feasibility concerns, the building-integrated PV systems were opted out. Based on the issues that were found to have affected the performance levels of the installed systems and the previously experienced design related constraints, the developers agreed upon using rather more conventional methods for power generation. With regards to the overall building quality however, the studies suggested a high level of satisfaction among the residents except that of the failed heat recovery and ventilation (HVR) systems, causing respiratory health problems in well-insulated dwellings. Additionally the firm "Smink" which currently runs the landfill site, has extended its (biogas extraction) operations until 2037. This was found to raise serious concerns over the nearby residential site, 'Velden 1F' [35] which was to be developed as the final stage of the Vathorst development (Gemeente Amersfoort 2013a). These and other findings suggested that the Vathorst development has been conceptualized as a development of conventional means rather than a truly planned sustainable development.

As a result of the evaluation performed based on the overall research on Vathorst, neither the developers nor the residents were too willing to invest in environmentally sound measures, design or implementation within the factors defined for establishing successful eco-towns.

6.13.2 Community's behavioral and cognitive adaptations;

During the interviews and observations on site, neither of the developments including Vathorst was found to have significantly reduced car-use. Although the use of public transport in the Netherlands is increasing, the car ownership was found to have increased as well.

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35 http://www.amersfoort.nl/4/Amersfoort/Bestuur-en-organisatie/College-van-B-en-W/Besluitenlijsten-college/Vanaf-mei-2013/Besluitenlijst/Besluitenlijst-B-ampamp-W-dd-23-april-2013/4373666-Beantwoording-raadsvragen-van-GVV-over-alternatieve-functie-voor-Vathorst-velden-1F.pdf accessed on December 12, 2013. Furthermore, the recent discussion paper obtained from the Amersfoort Municipality suggested that the housing development in "Velden 1F" is being reconsidered for relocation or the current planned area may even be used for alternative activities such as sport facilities.

One cause for this was the increase in the number of people contributing to the household income and working in multiple jobs and places. Moreover the residents were found to choose socializing in or near the city center more frequently than in Vathorst. In terms of the car ownership in Vathorst, it was found that there were 148 autos per 100 households compared to 103 autos / 100 households in Amersfoort.

The public transport network and services however, were found highly efficient with regards to availability and frequencies. The bus routes connecting almost every location in the development to the train station provide easy access for all. Furthermore, the bicycle / walking lanes were made available within and among neighborhoods.

With regards to the consumption levels in Vathorst (combined) according to the data found in CBS; average electricity consumption was 3650 kWh per year compared to 3200 kWh per household / year average in Amersfoort. The average natural gas consumption for heating and other uses was 900 m3 per year / household compared to 1700 m3/year / household in Amersfoort. Especially with regard to the gas consumption in Vathorst, the apartments were found to achieve significant reductions measured with 600 m3 per household per year.

6.13.3 Policy change and adjustments

Vinex program, in the Netherlands, has changed much about the ways in which the Dutch urban planning and development had been conducted since the WWII. First of all, the spatial planning and decision-making has become more local and regional rather than central-command and control under the government agencies. It was also new that the market actors had increasingly involved in the development processes through public-private partnerships. During this time, land acquisition by the developers in Vinex-designated locations increased and the role of the private sector in the previously government-led urban development projects, became integral due to the size and cost of these projects.

Vathorst is one of the Vinex-locations in which these transformative implications from government to more market-oriented planning and development framework were observed both positively and negatively.

For example one of the most significant changes in the policy implementations was the land acquisition model. Although the PPP arrangements were exercised before the development of Vathorst, the land ownership was resolved through a joint account and with shared risk of the parties until a formal public-private agreement was formulated between the municipality and the developers (who were the landowners then) (Groetelaers 2004). On the one hand this was found as a relatively novel approach in terms of the progressive way of cooperation between the public parties with private entrepreneurs. On the other hand, the way the agreements were handled was criticized for not following proper tender regulations

such as the EU's. Additionally, the use of risk-sharing model was found more attractive especially for the municipality due to the future challenges posed by the rehabilitation of the landfill sites, building extensive infrastructure and also the potential future fluctuations in the housing market. As a result, the municipality decided to make use of the partnership structure, the public knowledge and previous experiences in order to minimize these risks and the challenges in the development of Vathorst.

With regards to the negative aspects however, the goals, standards and the quality of the development (building design and implementation) are among some of the elements that were affected whereby the private parties were given the lead and power in the decision-making processes. As Heurkens (2012) addressed, the Dutch governance culture has traditionally been toward keeping the control over the management of complex urban development projects within the local authorities. In Vathorst, the private actors were more involved in managing issues regarding the development's progress while the local authority was involved in the policy management and adjustments in order to accommodate the project's needs and requirements rather than ensuring the achievement of the operational goals and objectives.

6.14 Case study summary

The research conducted on Vathorst revealed important lessons and valuable data to evaluate the effectiveness of PPP model used in the development of Vathorst. The joint venture formed between the municipality and the developers was found pivotal in the analysis on decision-making from the design throughout implementation. With regards to the formation of the development company formed between the municipality and the developers; more in-depth studies revealed that the development company played a highly proactive role in terms of influencing the issues affecting the process, somewhat distancing the local authority from the leading role, which used to be the norm traditionally in the Netherlands. It was gathered from the interviews that this in some ways facilitated the bureaucratic process while also caused a less rigorous evaluation / implementation of the environmental agenda.

The most surprising finding in the research in Vathorst was that there was less integration of environmental planning and supervision than in the other projects [36], which offered valuable lessons and experiences already. This was found to be mostly consistent with the

36 With regards to the integration of environmental planning / supervision in the design and development of residential urban developments, the Dutch government and the local / regional governments in the Netherlands have built several experimental developments. These ranged from 100-150 houses to over 5000 dwellings in order to understand the social, economic and environmental implications of using various eco-friendly features and planning principles. Ecolonia in Alphen aan den Rijn, Ecodus in Delft, Nieuw Sloten

developments that projected feasibility concerns due to their size, scope that had fewer interventions of government agencies in the process to ensure the environmental standards and quality.

One of the key reasons for this conclusion is the formulation of the development process through which the land ownership model and developer-led approach in decision-making was employed without setting clear environmental goals and agenda. In this case, Vathorst should be regarded as a mixed-use residential development with attractive physical qualities (architectural characteristics, urban amenities, commercial and social facilities etc) that are provided but needed further improvements on the building integrated energy systems and building standards or environmental measures.

Despite the general satisfaction with the area, there were found health and environment related issues in Vathorst, which were reported mainly due to the norms and standards of the newly built dwellings (see Box 6.2). Some discussions among the Internet based forums revealed a greater amount of local authority and developer collaboration that may be interpreted as a "conflict of interest", in cases, which have negatively influenced the development process (at least implicitly). Thus, the level of environmental measures was compromised to a greater extent. In this context, the Vathorst development requires further research on issues regarding governance and the implications on environmental, physical health, quality of life aspects before seeking to find causality among these elements.

With regards to the stakeholder involvement however, Vathorst revealed a relatively greater level of participation of the residents during the implementation phase and occupancy than in other developments researched in Amersfoort. In some cases this was found to have caused delays or revisions in the ongoing developments. It was also found that some positive results were achieved due to the proactive involvement of the current or potential inhabitants in the developmental processes.

The data gathered from the interviews and the review of the relevant literature revealed that the perception and wide publicity of the development as an eco-town was inconsistent with the findings on the environmental qualities as well as the sustainability goals operationalized in this development or the lack thereof.

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in Amsterdam, Nieuwland in Amersfoort are only some of these projects from which valuable procedural, contextual and conceptual lessons were gained.

6.15 Analysis of the case studies of the Kattenbroek, Nieuwland and Vathorst developments in Amersfoort, The Netherlands

As a result of the case study research in Amersfoort, designed to evaluate the factors that effect the goal achievement and assess the level of success in each eco-town case; Kattenbroek, Nieuwland and Vathorst were found to represent sequential events, which in turn were important to investigate to understand the *cause and effect* [37] of the evolution of urban development approaches in Amersfoort and the Netherlands more broadly.

As an illustrative study, Amersfoort Municipality's findings with regards to the resident satisfaction of their properties and their neighborhoods revealed that the physical qualities in all three developments of Kattenbroek, Nieuwland and Vathorst scored better than the average of Amersfoort city. With regards to the sense of attachment to the place in which the residents live, Nieuwland was found to score worse among the three developments. Also, the level of safety concerns in Nieuwland was reported (see Table 6.6) highest among these developments (but below Amersfoort city), which in turn raises a set of different socio-economical and perhaps governance related questions, which were not studied in this research.

With regards to the car ownership, the number of double-income households as well as the level of urban decay; the data included in Table 6.6 supported the findings of the case study research including the data collected during the interviews. In light of these preliminary findings and through the research on the three of the selected cases, each development process was analyzed and evaluated individually based on the six 'success factors.' Due to the context in which the three districts were chosen as part of one case study in Amersfoort, the results were firstly presented individually in the previous sections of this chapter and subsequently as an integrated whole in the following sections.

6.15.1 Dissemination of positive results and experience

Kattenbroek, which is the earliest development built among the three projects, was found to contribute neither to the adoption nor to the dissemination of eco-friendly building

37 During the interviews conducted in the three nested developments of Amersfoort, it was found by this thesis author that each district has been planned and implemented to answer different needs and policy goals and as a result, they contributed much to the evolving urban planning and development of Amersfoort during its transitioning period into becoming a relatively more sustainable city. However, within the context of this research, the eco-town successes and failures were being investigated; Kattenbroek, in spite of its rather conventional design and implementation model compared to the eco-towns as defined in Section 3 of Chapter 3 of this thesis, has been included as part of the research on Amersfoort due to its important contribution to the urban design through social and physical aspects as well as due to the actors that were involved and found to be pivotal in the subsequent two developments of the Nieuwland and Vathorst districts. The terms 'cause and effect', have been used in the sentence in order to emphasize the above-mentioned implications apart from the quantitative results that are discussed in detail later in Section 6.15.2.

Table 6.6 Evaluation matrix of resident situation & perception of life among the Kattenbroek, Nieuwland and Vathorst districts, compared to the City of Amersfoort

Life situation	**AF**	**KB**	**NW**	**VV**	**VC**	**VL**
Neighborhood livability & safety						
% residents feeling unsafe in the neighborhood	23.3	12.7	17.9	15	16	2
% residents feeling attached to their neighborhood	66.7	67.9	52.2	60	68	67
Level of urban decay - 0 (min) & 10 (max)	4.4	4.5	3.6	3.7	3.0	3.0
Property (housing) quality	7.8	8.1	8.0	8.3	8.2	8.4
Neighborhood quality	7.3	7.6	7.4	7.6	7.5	7.5
Wealth						
Number of autos per 100 households *	103	120	137	153	137	154
Disposable income per household	33,500	36,300	38,800	38,600	-	-
% of double-income households	39	46	54	75	55	78

Source: Wijkwijzer 2009-2010 Kattenbroek; Wijkwijzer 2009-2010 Nieuwland;
Wijkwijzer 2009-2010 Hooglanderveen en Vathorst (Amersfoort Municipality)
AF – Amersfoort; KB – Kattenbroek; NW – Nieuwland
VV – Vathorst Velden; VC – Vathorst Centrum; VL – Vathorst Laak
* *The list of findings regarding the resident satisfaction / perception of the issues concerning their home and neighborhood are shown in Table 6.6. An interesting finding in the Amersfoort municipality's study suggested that the car ownership in Kattenbroek, Nieuwland and Vathorst, are all above the Amersfoort's average. The interviews revealed that these developments are increasingly occupied by residents / families who work in multiple jobs and are becoming double-income households. Therefore, the number of cars owned and used per household is increasing.*

practices except that of the urban design approach and planning principles that helped the community socially and physically rather than making direct environmental contributions.

Nieuwland, as the subsequent development was found to be truly an exemplary case among the three districts due to the extent of the integration of environmental planning and measures. The holistic approach in sustainable urban planning, the level of innovation and the environmental assessment tool (DCBA checklist) were found to be some of the many positive contributions. Another significant impact attributed to Nieuwland was the experimental nature during which implementation of building integrated PV systems and feasibilities were assessed in large scale.

> *"In Kattenbroek, you find different kinds of architecture; like affordable housing close to very expensive houses. And there was a sort of conflict. People do not connect to one another. And we learned from this. In Vathorst, we tried to make a sort of gliding movement in order to have better cohesion between categories. That is financial (income) categories. Because in every 500 houses (there exist) all the financial categories within themselves. People connect easily, more easily.*

...However sustainability (was) no marketing issue as yet. Well it is getting more and more important as to how much energy you use because it is getting more and more expensive, that is of course a good incentive for people to (buy sustainable houses)."

(Quotes from the interview with Mrs. Trudy de Mooy on November 08, 2013 in Vathorst)

In Vathorst, the use of many experiences gained in Nieuwland was found to be relatively less or even none despite the positive outcomes.[38] These included but were not limited to the environmental supervision, building integrated PV systems or the holistic planning principles as were experimented with in the Nieuwland's development. Due to the market-oriented approach however, there was more citizen involvement in Vathorst, at least on the issues affecting the quality of life of residents.

6.15.2 Community's behavioral and cognitive adaptations

The study conducted on Amersfoort revealed conflicting results with regards to the consumption levels and for the characteristics of environmentally sound developments. These include the energy and water efficiency, waste reduction, car (ownership) use and overall user behavior and adaptation to eco-friendly lifestyles. More in-depth research suggested that within and among the communities that were planned and further participated in the design and governance achieved better results. Some of these studies were expanded upon in the Nieuwland case study section and were further elaborated in the Vathorst case.

With regards to the "community's behavior and the residents' cognitive adaptations", Kattenbroek residents were not found to perform much differently from those of conventional developments. This finding was supported by the consumption levels as well as by the finding of comparative study done to assess the residents' perceptions on various aspects including their quality of life among conventional and eco-developments in the Netherlands by Sacha Silvester and Ger de Vries as documented by de Vries et al. (2009; 2012).

In this study, housing units were studied including those from Kattenbroek and Nieuwland districts. In Nieuwland, the data gathered on the electricity, water and gas consumption per

38 The environmental supervision that was used in Nieuwland, was not thoroughly employed during the design and development of Vathorst in terms of controlling the process as extensively except for making use of the "DCBA" list, which was developed by BOOM. An interview with Prof. Duijvestein revealed that the development board of Vathorst had diverse opinions as to whether the full list should be adopted in the design and development stages. According to Duijvestein, during Nieuwland's development, the contractors and the architects made 'smart' use of the environmental criteria depending on which aspect or elements to emphasize in their building designs/practices. Prof. Duijvestein further mentioned that the trade offs could be made due to the way the rating system was designed, thus could help to achieve compatible projects with the environmental codes and standards. In Vathorst, despite the initial reactions toward the comprehensive version of the list, the developers eventually agreed to use it because they found the original one somewhat more flexible and feasible *(Interview with Prof Kees Duijvestein in Den Haag, The Netherlands, November 15, 2013)*.

household varied depending on whether the studies were conducted in those with higher level of participation in the process compared to those that were occupied by residents that did not participated at all. While the initial study through the National Statistics Bureau (CBS) revealed close values in consumption levels compared to those in conventional developments in this research, *de Vries et al.'s* observations found significant reductions in the consumption levels in households with participation in the planning of developments. These results were also expanded upon in the Nieuwland case study report. Furthermore their findings suggested that the occupants of projects with community participation in the development process were observed to have the highest levels of environmental awareness, efficiency rates in household water, energy or waste management. Despite the strong public perception of Nieuwland and Vathorst as eco-developments, such empirical evidence to suggest this was found neither qualitatively nor quantitatively.

Table 6.7 The electricity consumption levels of the eco-developments, Kattenbroek, Nieuwland and Vathorst, compared with the average consumption of Amersfoort and the Netherlands for 2010.

(Average) (2010)	The Netherlands	Amersfoort	Kattenbroek	Nieuwland	Vathorst (combined)
Electricity consumption per household / year	3250 kWh [a]	3200 kWh [a]	3550 kWh	3700 kWh [g]	3650 kWh g
Apartment	2250 kWh	2350 kWh	2350 kWh	2900 kWh	2250 kWh
Townhouse	3350 kWh	3400 kWh	3550 kWh	3950 kWh	3650 kWh
Corner house	3500 kWh	3500 kWh	3650 kWh	4100 kWh	3850 kWh
Semi-detached	3950 kWh	3950 kWh	4950 kWh	4750 kWh	4650 kWh
Freestanding	4550 kWh	4550 kWh	5350 kWh	5550 kWh	5500 kWh
Unknown type	2900 kWh	2900 kWh	-	-	2600 kWh
Water consumption per capita per day	120.1 Liter [b] (128 Liter) [i]	125 Liter [h]	Between 100 and 124 Liters per capita / day		
Waste generation per capita / year	569 kg [a]	555 kg [a] (536 kg [c])	Around 536 kg per capita / year according to the Amersfoort Municipality		
Gas consumption per household / year	1850 m3 [a]	1700 m3 [a]	1600 m3	1250 m3	900 m3
Apartment	1250 m3	1250 m3	1250 m3	750 m3	600 m3
Townhouse	1700 m3	1600 m3	1500 m3	1400 m3	800 m3
Corner house	2000 m3	2000 m3	1750 m3	1650 m3	900 m3
Semi-detached	2400 m3	2700 m3	2350 m3	1950 m3	1250 m3
Freestanding	3100 m3	3600 m3	2900 m3	2250 m3	2150 m3
Unknown type	1700 m3	1450 m3	-	-	700 m3
Cars ownership (per 100 hh) [d]	1.0 [f]	103 autos 1.1 [f]	120 autos 1.0 [f]	137 autos 1.1 [f]	148 autos 1.1 [f]

a, c, d & h – Amersfoort Municipality
b – Vewin (Association of Dutch water companies)
e, f & g, i – CBS / Statline (Central Bureau for Statistics)

In Table 6.7, the differences in average consumption rates among the types of accommodations in three developments were presented comparatively to the Amersfoort area and the Netherlands more broadly. For example, the apartment units were found to be the most efficient in electricity use while the consumption rates increased in the dwellings classified as townhouse, semi-detached and freestanding units. The same pattern in the gas consumption levels was also found in more compact dwelling types suggesting that the number of inhabitants per household as well as the physical planning and characteristics of the dwelling may affect these results.

With regards to the waste generation and water consumption levels per district, no specific study was found per each development except that of the report developed by V&L Consultants on household groups and their behavior depending on whether they were involved in the development process compared with those who were not and also compared to the reference houses selected in close proximity to the selected eco-developments. These findings were highlighted in Section 6.9.2 (see Table 6.4).

With regards to the development of Vathorst:

"And of course, they have had statistics about traffic, movements etc, assumptions also on so many people are using their cars and so many people use public transport. Indeed today, we discovered, especially since we are far away from town, some 10km away, people use their cars. And it is not so much that people in affordable housing don't have cars. NO, on the contrary they have mostly two cars because they have several jobs. And even more people in families are working so they all need a car to go from A to B." **(Quotes from the interview with Mrs. Trudy de Mooy on November 08, 2013 in Vathorst)**

Based on these qualitative and quantitative data, the evaluation of the community's behavioral and cognitive adaptation in their residential developments for Kattenbroek, Nieuwland and Vathorst suggested that no significant changes were observed unless the community participation in the process was provided. Participatory approach in planning and development was found to raise awareness and further strengthened the sense of belonging to the residential place.

6.15.3 Policy change and adjustments

In the research conducted on Amersfoort, the evolution of urban development and policies were briefly explored. The developments of Kattenbroek, Nieuwland and Vathorst were all found to be important milestones exhibiting the transitional period in urban planning and development in the Dutch context, including the experimental and demonstration projects such as the Ecolonia, GWL, Stad van de Zon and others. They have all contributed to the relatively early adoption of environmental planning integration in the design of the new developments. They influenced architects, urban planners and city administrations to create distinctive

places in which to live. Kattenbroek was the first breakthrough development among the three cases, which as a result became an exemplar with its dynamic characteristics, social and physical features. Nieuwland was found to be exemplary due to the rigorous environmental measures and tools introduced before the development took place. Moreover, Nieuwland demonstrated that holistic planning could be achieved along with extensive use of technology and innovation in the mixed-use residential developments of similar size and scope.

In spite of the many lessons gained from these two developments, Vathorst's development was found to have made use of a relatively few of the innovative features but not the important ones such as the building integrated PV technology, and the closed-loop water systems. However, other new developments in the Netherlands were found to have increasingly adopted these approaches with successful results.

6.16 Conclusions

The overall research conducted on Kattenbroek, Nieuwland and Vathorst revealed valuable information into the processes and frameworks that were employed during these developments in Amersfoort. The roles of the actors and the elements that affected the decision-making processes were explored whereby, the six 'success factors' in establishing successful eco-towns were evaluated.

The research on Kattenbroek, Nieuwland and Vathorst developments demonstrated the change from the traditional model of urban planning and development with top-down governance and decision-making, into more public-private partnerships with multi-actor involvement and participation in their processes. It was found that the government-led projects increasingly involved urban planner inputs that resulted in more 'for-user' planning and 'with-user' design processes, which were also observed in Amersfoort during that time.

In the context of this research however, Amersfoort's three developments were selected due to their wide recognition for eco-friendly features and in most cases accepted among the most discussed eco-towns in the northwestern Europe. As a result of the in-depth review of literature and interviews conducted so far, it was found that each development's process revealed different evidence as to whether they met the requirements for the term "eco-town" and furthermore provided useful lessons and insights into what works and what does not in terms of managing these processes.

With regards to their individual qualities and characteristics, within and among the three developments, only Nieuwland was found to be similar to the eco-town developments in the region conceptually, contextually and to some extent procedurally. However each

individual development provided specific lessons with regard to their initiation, design and developmental processes and how they impacted user perceptions and behaviors.

6.17 Lessons Learned

The research conducted on Kattenbroek, Nieuwland and Vathorst, provided key lessons on their design and developmental models. Furthermore, the author gained insights into their outcomes with subjective and objective findings that are relevant for future developments locally and beyond the Netherlands. In this section, some of the most significant lessons learned from this, multi-development case study research in Amersfoort was presented.

Kattenbroek's overarching theme was to create characteristically distinctive and economically diverse places in which to live. This provided much emphasis on design and planning that brought a relatively new approach into the Dutch context. The vision evolved around diversity, the resident and community life and their social interactions at the neighborhood scale. Together with the objective to build affordable housing in mixed-use developments, Kattenbroek became known as the milestone toward transformation of monotonous Dutch urban planning to more vibrant and dynamic design practices.

In this context, the 'collaboration' between the alderman and the master planner/architect positively contributed to achieving the operational goals. Thus, the municipality played a key role in terms of facilitating policy management and funding. Together with the ownership of the land by the municipality, the full authority provided the project champions the support and foundation upon which to achieve the project goals and objectives. The project champions and their potential to create the necessary momentum were found valuable in order to create the synergies among actors and within the community.

In Nieuwland's development, the land ownership was formulated through involving developers (shareholders who owned the land previously) through which the local authority remained in power, establishing and ensuring the codes and regulations from the initiation throughout the whole process. Similar to Kattenbroek, the full ownership provided the authority remained with the local government. Due to the overarching theme to create the largest housing development with building integrated renewable energy systems, the environmental planning has been identified as the central element. Together with multi-actor / stakeholder involvement in the process, environmental planning was integrated in the urban and architectural design and implementation processes within a public-private partnership model.

With regards to the performance levels however, an important aspect was found in terms of the resident participation and its contribution to the outcome. The data gathered from

the national statistics bureau revealed that the consumption levels of electricity and gas were relatively higher than the expected averages although in Nieuwland, far greater environmental measures and standards were implemented than in the surrounding areas. The households with participation in the process were found to have significantly reduced consumption of water, electricity and gas compared to the Kattenbroek and Vathorst developments as well as those that were built in Nieuwland. Despite the strong environmental planning and monitoring, the participation of the residents in the planning and development (if possible) was found to be pivotal in achieving the environmental goals.

In Vathorst, the development was formulated through a PPP model in which the developers were in power, influencing the overall process based on market indicators. A dominant corporate structure with less authority and influence of the municipality on the processes was found to be due to the development framework in which the land ownership and the funding structure were arranged in partnership with the City. In contrast with Kattenbroek and the Nieuwland districts in which the land had been either owned or purchased 'fully' by the local government, Vathorst was developed with the municipality acting as a partner rather than as the controller of the process. This was found to have resulted in them having less control over quality and standards. Therefore, even though the local authorities increasingly engaged in PPP models, the leverages were needed to maintain control over the process in order to ensure fulfillment of quality and standards expectations.

Some of the significant insights from the research conducted on these three developments provided the following highlights:

- Clear formulation of the landownership deals between the local authorities and the development companies (consortium of companies) are essential;

- Multi-actor involvement with increased level of resident participation in the design and development processes are important;

- Physical qualities and the impact on the end-user perception toward the success of the development in general are integral and essential;

- Integration of the environmental planning and supervision with clear goals and concise operationalization of these goals are crucial to potential success;

- The clear definition of the roles among the actors especially for the authorities and the power in the evolving nature of public-private partnerships is essential and can be crucial to the potential success or failure.

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Chapter 7

Eco-town development in Sweden: the case of Hammarby Sjöstad in Stockholm

7.1 Introduction

Hammarby Sjöstad has been one of the most widely publicized developments among the eco-town developments in the Northwestern European context. The earlier research, upon which Chapter 3 was built, helped to identify Hammarby Sjöstad as one of the successful urban development models that combined technology and innovation and built upon the lessons and experiences of the Swedish environmental movement after the oil crisis of the early 1970s.

However, during this author's presentation of an earlier review of the eco-towns in the ERSCP-EMSU (Knowledge Collaboration & Learning for Sustainable Innovation) conference held in Delft, The Netherlands in October 2010, one of the expert researchers on Hammarby Sjöstad in Stockholm, *Sofie Pandis Iveroth,* underlined the lack of sound scientific studies and analyses regarding the actual performances of the urban systems and/or the level of goal achievements. She further emphasized that there were questions as to whether or how the results presented on this particular development in general would be credible based on only the theoretical calculations. Since then, her and others' in-depth research on many aspects of the Hammarby Sjöstad development, including the scientific analyses, were published and provided this thesis author the motivation to consider Hammarby Sjöstad as one of the potential cases to be studied in the context of this thesis.

In contrast to those early reports reviewed for the ERSCP-EMSU conference in 2010, the analyses and evaluations of the data gathered since then, revealed valuable insights and lessons most of which were found to positively contribute to the urban development initiatives both in Stockholm area and in other parts of Sweden.

In this chapter, the author gave a brief description of the development of Hammarby Lake area. He then provided his research findings on the vision, goals and objectives upon which the development was contextualized. As performed in the previous case studies, the evaluation of the development process was presented building upon the potential role of the 'success factors' on the outcome. Also, the author provided additional information with regard to the development process in Appendix I & II, which was considered to be relevant in conjunction with the critical results found in this case study.

7.2 The development of Hammarby Sjöstad

Hammarby Sjöstad is a part of the administrative district of Södermalm (see Appendix II, Figure 1) (Bylund 2006) and built on an area of approximately 200 hectares, 20% of which consists of water (Cederquist 2010). The overall development includes 11,500 apartments and

250,000 m^2 of commercial space for light industrial and retail use (City of Stockholm 2013). According to the report published by the City of Stockholm (2013) [39], the average density in residential areas in Hammarby Sjöstad is 125 apartments (approximately 270 inhabitants) per hectare (see Table 7.1) similar to some inner-city locations with slight variations throughout the Stockholm area. With regards to the type of tenure, 32% of the residential units are rented and 68% is owner-occupied or owned by the (housing) body corporate.

Table 7.1 A descriptive outline of the Hammarby Sjöstad development in Stockholm, Sweden.

Type of development	Mix-used residential
Land size	200 ha (40 hectares of water)
# Of units	11,500
Population	20,000 (26,500 residents are expected to live in HS in 2019) Over 33,000 people are expected to live and work in the area when it is expected to be finished in 2019
Construction period	Development was started in 1990 / 1994-2019 (Construction period)
Density *	270 persons/ha (125 residential units / ha) (2013)
Initiation	Central, local and county level political consensus
Development model	Public-Private Partnership (PPP)
Land ownership	City + Developer-owned
Funding	Public-private + subsidies from national agencies
Governance	Top-down corporate / developer-oriented approach
Champion(s)	City of Stockholm
Goal(s)	Rehabilitation of brownfield site / densification of urban built-up locations, reduction of waste and CO2 emissions / demonstration of circular urban system model (Hammarby model)

* The density in Stockholm's suburban areas are claimed to be 34 inhabitants per hectare while the density of the inner urban areas varies between 163 and 273 persons/ha according to Vestbro (2005).
- The data presented in Table 7.1 were updated based on the information provided by the City of Stockholm, which can be accessed on this link: http://bygg.stockholm.se/Alla-projekt/hammarby-sjostad/In-english/Facts-and-figures/ Accessed on July 22, 2014.

In Hammarby Sjöstad, the green spaces of parks and public spaces utilize an area of approximately 28 hectares excluding the inner yards and small gardens in the residential areas. The composition of the development is 'mixed-use' and consists of commercial spaces for businesses that provide over 6500 jobs (2010). With regards to amenities, it was found that much emphasis was given to sufficiently accommodate the educational, healthcare, social and physical needs of the inhabitants from a variety of age groups [40] (Cederquist 2010). In other words, the development was initially contextualized as an ordinary district

39 http://bygg.stockholm.se/Alla-projekt/hammarby-sjostad/In-english/Facts-and-figures/ Accessed on July 22, 2014

40 The facts and figures report published by the City of Stockholm also included the demographic formation of the residents living in Hammarby Sjöstad and these were: [0-5 year 13.5%; 6-15 y 7.6%; 16-19 y 2.6%; 20-64 y 69.8%; 65- y 6.6%]

of Stockholm and only after the decision was made to bid for the Olympic Games, the environmental program was introduced with the further objective to create a demonstration eco-town (Svane et al. 2011). As Rutherford (2013) suggested, contrary to the popular belief and publicity of the press articles, the politicians never had a vision for establishing a fully autonomous district or part of the city when they initially decided to develop the Hammarby Lake area (Rutherford 2013).

7.3 The context in which the development was initiated

Hammarby Sjöstad [41] is situated on the Hammarby Lake area in Stockholm, which was formerly used as an industrial harbor and accommodated small and large-scale facilities, office buildings

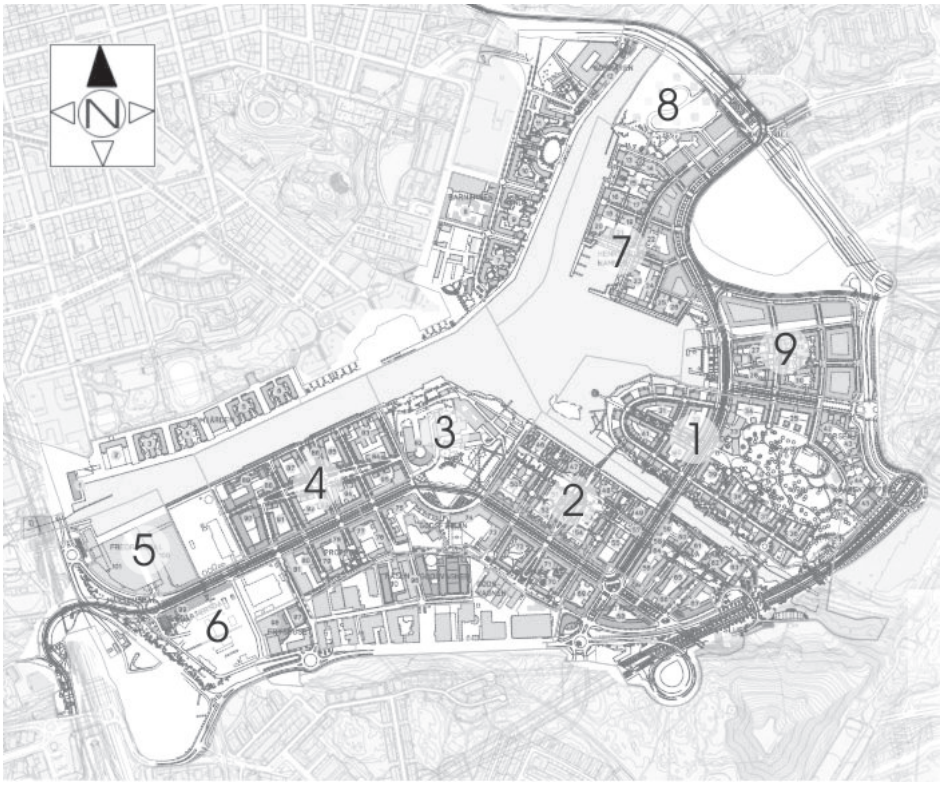

Figure 7.1 The master plan of Hammarby Sjöstad in Stockholm, Sweden. (Different images were superimposed by the author to provide a better representation of its quarters and neighborhoods obtained from these sources: *Stockholm City Planning Administration, Map of Architects and Developers in the area, dated March 2013; and the map dated November 2003, titled 'Hammarby Sjöstad översiktsplan').* The quarters included in the Figure 7.1 are: 1- Sickla Udde, 2- Sickla Kaj, 3- Luma, 4- Hammarby Gård, 5- Fredriksdal, 6- Mårtensdal, 7- Henriksdalshamnen, 8- Danvikstull and, 9- Lugnet

41 In Swedish, 'Sjö' means 'Lake' and 'Stad' refers to 'Town' and also it is used, in some cases, for 'City'. Sjöstad therefore, can be interpreted as the 'lake town' or 'town by the lake'.

and activities related to the harbor operations since early 1900s throughout the 20th century (Vestbro 2005). Among these, there were also semi-legal or even illegal industrial operations with storage facilities that later became to known as the 'shantytown' (Vernay 2013). Due to poor waste management and dumping of toxic materials in water and soil, the area became heavily polluted (Vernay 2013) as in many other brownfield sites in this region. As discussed in Appendix II, Stockholm's history of urban development policies reveals a great deal of change through which a number of governmental decisions were implemented in terms of land exploitation for both commercial and residential developments. In the early 1990s, together with the renewed political and economic commitments toward improving city's image with large-scale developments, emphasis was given into promoting densification of the built-up urban centers in order to protect the natural habitat in the urban peripheries. As noted by Vestbro (2005), the renewed urban development strategy was to 'build inwards' rather than promoting '*further sprawl and encroachment of green spaces*'.

> *The architecture and urban design in the Hammarby Sjöstad followed a relatively modernistic style in terms of the material choices, style and design principles that were synergistically used with much contemporary characteristics in order to create the unique style sought in the society at that time. The use of stone, steel, wood and large pieces of glass combined with simplistic approach to compliment the natural surroundings instead of overstating the design resulted in the much appreciated architecture quality and the urban style. In order to achieve these however, the architects made use of large terraces, flat roofs, wide window openings and recessed penthouses that also received criticism due to the conflicting environmental design measures which are further discussed in Section 7.4.6.*
>
> *The Hammarby Lake and the surrounding natural habitat were used as central themes around which the subdivided portions of the development were planned. While varying densities and building types / heights created dynamic built-environment, the diversity and distinctive qualities were achieved in much serenity as well. For example, Sickla Udde around the canal has more intimate character in building designs and landscape, which also included natural beaches and walkways along the parks. Sickla Kaj area on the other hand was designed to reflect more urban style with large-scale, multi-functional buildings closer to the main road, yet also with smaller buildings with courtyards between the quays. Gradually, increased densities with parks and more urban environment were developed in Hammarby Gård in contrast to Lugnet with waterfront terraces, green nature with pergolas and jetties alongside. The Henriksdalshamnen area accommodates the restaurants and small boats along the harbor where a large number of quays were built* **(GlashusEtt 2011).**

The density or densification of urban areas in Stockholm became one of the influencing planning decisions as a reaction against the zoning and functional separation established along with the modernist era approach (Bylund 2006), which dominated a significant part of the 20th century urban planning realm globally. Together with the political will in place,

the urban areas in Stockholm, including most plots around the Hammarby Lake became prime real estate locations in part due to their potential value for mixed-use residential developments. The work on the comprehensive urban plans in this area began [42] in the early 1990s, more specifically as a result of the encouragement by a major landowner, a company called Sickla, Stockholm Saltsjön AB (Bylund 2006).

Other factors were also found to influence the decision for initiating the planning and contextualization of the Hammarby Sjöstad development. The Swedish government had been working toward the integration of sustainable urban policy approaches after the Rio Earth Summit in 1992. Since the mid 1990s, almost half of the Swedish municipalities including Stockholm have adopted Local Agenda 21 (LA21) action plans after which the environmental goals and the vision for Hammarby Sjöstad were formulated (Lundqvist 2004). Furthermore, in order to pursue a successful bidding process in 1996-1997 for the '2004 Olympic Games,' the City of Stockholm decided to include the environmental vision synergistically to the design of the athletes' village. In fact, according to Rutherford (2013), the Environmental Vision / Program was developed most significantly because of the Olympic Games. The successful bidding process of Sydney (2000) was attributed to their strong environmental vision and this was claimed to be the driver behind the environmental ambitions of Hammarby Sjöstad as well (Rutherford 2013, p.4). With regards to the significant elements that influenced the decision to develop Hammarby Sjöstad were found to include:

- *The rapid growth and economic recovery after the downturn in 1992 and the subsequent need for housing in the urban centers;*
- *The political consensus for a new urban development policy for building / rehabilitating the previously exploited inner urban areas rather than the green spaces outside;*
- *Rehabilitating brownfield sites, one of which was the Hammarby Lake area;*
- *Reinventing the image of Stockholm through promoting various programs / urban events;*
- *Integrating ecological modernization into the urban policies, development projects promoting political and economic commitment in implementing LA21 action plans.*

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42 The initial design process of Hammarby Sjöstad was led by Jan Inghe-Hangström, the architect who was in charge of the development of master plans of South Station area at the Stockholm City's Planning Department. *(More information can be accessed in this link: http://sv.wikipedia.org/wiki/Jan_Inghe-Hagström that was accessed on July 23, 2014)*. The master plan of Hammarby Sjöstad was divided into twelve subsections / sub-districts. These subsections were further designed via a method called "parallel sketches", which allowed three to four different selected private firms of architects / urban planners that worked separately in order to test the validity of the strategic master plan that was later developed into more detailed designs. *(Commission for Architecture and the Built Environment / CABE 2011, http://webarchive.nationalarchives.gov.uk/20110118095356/http://www.cabe.org.uk/case-studies/hammarby-sjostad/design Accessed on July 23, 2014)*

As a result, the local policy makers proposed Hammarby Sjöstad as the potential site for the Olympic Village and decided that the planning principles should reflect environmental commitments adopted after the Brundtland Report of 1987 and the Rio Earth Summit in 1992 (Pandis Iveroth & Brandt 2011).

7.3.1 The goals and objectives

Subsequent to the consensus among policy-makers and city officials to initiate the Hammarby Sjöstad development, the location and the specifics about the development were further elaborated in part due to the application for the Olympic Games that were much anticipated since the mid 1990s. With regards to the initial approach towards establishing the overarching environmental program, according to Bylund (2006), the new district was to help the residents to develop new lifestyles and businesses within an environmental way of thinking. Furthermore, the development was to serve as a living model for '*ecological planning, building and living*' while it could offer technologically, socially and physically applicable / replicable methods for both the European and the developing nations (Bylund 2006). Additionally, the compact city concept as stated by the European Union (EU) Program for Sustainable Cities (1990), was adopted (Bylund 2006; CEC 1990) in order to increase efficiency in environmental performance, provide social and economic equity and fair opportunities within high-density mixed-use urban morphology (Bylund 2006).

The evolution of the goals and objectives are further discussed in Appendix I & II. Additionally the implications of the decision-making around the environmental plan and goals are reviewed in Section 7.4.6, with much emphasis given to the implementation model and in terms of the level of environmental performances. In brief, the initial objectives around which the Hammarby Lake area was developed, included: the land use, soil decontamination, technical supply (energy, waste, water and wastewater), transport, construction materials and noise (Svane et al. 2011). Within these six thematic groups, the following topics were elaborated for further emphasis to be given in the final environmental plan of Hammarby Sjöstad. These included but were not limited to the following:

- *The reduction of CO2 emissions by about 50% compared to other parts of the city;*
- *Preservation of the natural habitat and green spaces;*
- *The rehabilitation of contaminated soil and water;*
- *Noise reduction especially from the traffic routes;*
- *Improvement of the transport system;*
- *Establishing environmentally sound building techniques and practices;*
- *Efficient waste and wastewater treatment;*
- *Building at higher densities, especially in places that were previously underused;*
- *Improvement of the district heating system.* (Vestbro 2005)

More specific descriptions of these goals, apart from the fact that they co-evolved (Kasioumi 2011) since their initial announcement, were elaborated, in detail, by Pandis Iveroth & Brandt (2011), and are included in 'Appendix I' of this case study report in revised and updated format. With regards to the operationalization of these objectives, much controversy and conflict was attributed to the political decisions and the level of support and commitment to the initially desired vision of Hammarby Sjöstad as an eco-development [43]. These were explored and further discussed in light of the factors influencing 'success', as identified in Chapter 3 of this thesis. In Appendix II, the framework and the procedural outcomes were investigated and expanded upon based on reports obtained from governmental agencies and published journal articles found through the comprehensive review of literature relevant to the development of Hammarby Sjöstad.

7.4 The assessment of the Hammarby Sjöstad through the six factors identified for developing successful eco-towns

7.4.1 Political commitment

1.1. Local government supported the development from the initiation;

1.2. National or regional governments supported the development and were in consensus in terms of the goals of the development;

1.3. Constant monitoring of the established codes and standards existed;

1.4. The local government helped to facilitate the policy management in order to most efficiently achieve development's goals and objectives. (See Table 5.5 in Section 5.3.1)

The research conducted on the development process of Hammarby Sjöstad revealed a number of changes in the political views (Vestbro 2005; Toussaint 2012), commitments of administrations and their influence on issues such as the land ownership, tenure forms, environmental goals and innovation (Kasioumi 2011), hence the outcome as a result (Svane et al. 2011; Pandis Iveroth & Brandt 2011; Pandis Iveroth et al. 2012). In order to under-

43 With regards to the critiques of the development and the governance, Brogren and Green (2003) claimed that the City administration of Stockholm was criticized for changing the rules during the development of the project, which in turn caused further negotiations / negotiable situations that weakened the authority. It was also suggested that the construction companies were too conservative and that they were not willing to use new technologies despite their potential contributions to goal achievement (Brogren and Green 2003). Rutherford (2008) further noted that the Hammarby Sjöstad's development was affected by the changing relationships between the local authorities and network service provision (actors) in terms of how these companies / actors (waste, water and energy companies initially owned by the City of Stockholm) worked together synergistically under the Municipality's umbrella in developing the eco-cycle model with the planners. He added that a number of difficulties have been encountered due to the decreasing articulation between the infrastructure and urban policies in Stockholm.

stand these dynamics and the ways in which the development process was affected, it was necessary to outline the political dynamics in Stockholm and Sweden since the early 1990s.

With regards to the City's political situation during which the Hammarby Sjöstad development took place; major parties consisted of the following: the Social Democrats and the Moderates (former right-wing party), the Liberals and the Left Party followed by the Green Party, the Christian Democrats and the local Stockholm Party (Vestbro 2005) [44]. Among these political groups, the Green Party was almost always within the administrative coalition while the power shifted from the left wing (red majority, 1994-1998) to the right wing (blue majority, 1998-2002) government and eventually regaining its position in the left-green configuration for the term between 2002-2006 (Toussaint 2012).

The red-green coalition's (1994-1998) influence on the vision to develop an environmentally sound district around Hammarby Lake area became a policy goal in 1995, together with the decision to bid for the Olympic Games of 2004. It was also the same period during which the 'ruling' Social Democratic Party's Minister of Finance, Göran Persson was elected as the new Chairman (March 1996) of the Party and immediately expressed his and the Party's commitment to achieve an ecologically sustainable society in Sweden as a whole (Lundqvist 2004). The goal toward Sweden's ecological modernization not only set the scene for future structural and procedural changes in the governance, it also helped to create new regulatory and economic instruments with which to help growth through green technologies, and production (Lundqvist 2001). The Local Investment Program (LIP) reviewed and contained in Appendix II, was developed as a result of this policy that was facilitated through the Delegation for Ecologically Sustainable Development (DESD) [45]. DESD allocated 16 billion Swedish Kroner (SEK) – approximately 2 billion USD *(One USD =7.72 SEK as of July 1997)* [46] for sustainability investment programs as summarized in Table 7.2.

The DESD's overall allocation of funds included a total of 12.6 billion SEK (approx. 1.6 billion USD) for the "Sustainability Investments Programs" between the years 1998 and 2000 from which 5.4 billion SEK (approx. 700 million USD) was used by the Local Investment Programs (LIP). The economic structural details were expanded upon in Section 7.4.3.

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44 *Dick Urban Vestbro* served as a politician and as a member of the Stockholm City Council during the period between 1994 and 2002 and he analyzed the overall political process during which the Hammarby Sjöstad development was initiated and implemented. His views, as a direct participant in this process, have been cited by many researchers in their respective analyses of the Hammarby area development, referenced with his paper titled "*Conflicting perspectives in the development of Hammarby Sjöstad, Stockholm*" and thus, frequently cited in this case study chapter.

45 The Delegation of Ecologically Sustainable Development (DESD) was established by the central government in January 1997 that consisted of Ministers of Agriculture, Environment, Taxation, Education and the Junior Minister of Labor (Lundqvist 2001). Sustainability Investment Program was initially addressed in the DESD report published in March 1997 and expanded upon the program's plan between 1998 and 2004.

46 The currency conversions in this chapter were performed based on the exchange rates found in the databases with links included in the web references section with reference to the respective dates of the events.

Table 7.2 Sustainability Investment Program and allocated funds as declared by the DESD in 1997.

Program description	Amount	Currency
Eco-cycle adjustment of built environments and infrastructure	*One billion*	*SEK*
Eco-cycle transformation of the Swedish energy system	*Nine billion*	*SEK*
Local investment programs for sustainability by the Municipal governments ***(Lundqvist 2001)***	*Six billion*	*SEK*

While the general consensus to support the Hammarby Sjöstad development at the national government level was found strong; the local level politics were found to have impacted the process less positively in terms of the goal achievements. For example, together with the subsequent administration that was elected from the right-wing majority in 1998 (the blue coalition), land sales to private developers were promoted and facilitated (Vestbro 2005). According to Svane (2007), this could have been used as an incentive in developing Hammarby Sjöstad, which he refers as the '*carrot*' or the '*whip*' depending on the construction company's performance in delivering the environmental standards and quality in exchange of potentially lower land prices. He noted that this approach was used to a small extent in the development of Sickla Udde, mostly because the municipality did not own the land in that particular section of Hammarby area, especially during the initial phases.[47] Vestbro (2005) further highlighted that there were conflicting views in terms of selling land to developers versus leasing. According to Vestbro (2005), the land ownership has traditionally been an issue of ideological differences. For example, the Stockholm City has been purchasing large portions of land (Svane 2007b) since the beginning of 20th century (Passow 1970). The left-wing administration in Stockholm also supported municipal ownership of land on which Hammarby Sjöstad was planned. This would increase control and therefore, help to implement policy goals. However, one of the major conflicts in the development process, occurred between the left and right wing parties, due to the claims about the difficulty to include legal conditions for implementing environmental measures in sales contracts, while this would be relatively easier to achieve with the leasing agreements.

Similar to the land ownership issue, other conflicts also occurred during the development of Hammarby Sjöstad. Some of these politicized subjects were the extent to which the environmental measures should be included in the contracts or be enforced during construction, the form of tenure, density and even the ratio of parking bays per household that became the topics of discussions in politically charged development process.

47 According to Rutherford (2013), most of the land in the area where Hammarby Sjöstad is now developed, the municipality owned almost 90% of the land except that of 'Sickla Udde' and 'Lugnet', which was privately owned. With regards to increasing the right to land ownership in these sections/locations, the City of Stockholm either offered the option to exchange land in other parts of Stockholm or alternatively paid compensations that were often above the market rates (Rutherford 2013).

With regards to the control of standards and monitoring, Pandis Iveroth and Brandt (2011) underscored the lack of systematic assessment of the goals during the construction process, which in turn resulted in the loss of valuable baseline data (Pandis Iveroth and Brandt 2011, pp.1061-1062). They further emphasized the vagueness of the goal formulation as well as the development of guidelines through which the assessment and evaluation of the environmental program would be performed. They noted that the late introduction of the environmental agenda was one of the contributing factors for the setbacks despite the strong political commitment locally and nationally. However, the changes in the political views and agendas between the administrations of right wing and left wing influenced both the formulation of operational goals and the process through which these were implemented. These were expanded upon in Appendix II more in detail.

At local levels, except a brief and temporary lack of motivation (which occurred after the loss of the Olympic Games bid), political commitment was found to highly exist during the development of Hammarby Sjöstad. Furthermore, the support from the central government of Sweden had existed with much needed policy changes and the economic inputs (see Section 7.4.3). This facilitated the municipal and local level administrations to implement various types of sustainability related projects, one of which is the Hammarby Sjöstad development in Stockholm. However, with regards to the local political situation in Stockholm, the change from the red-green coalition to the blue-green coalition was found to have negatively affected the policy management as well as the efficient formulation and achievement of social and environmental goals of the development.

7.4.2 Timing

2.1. The development was decided upon based on the anticipation of a great event, which could provide momentum and also popularity among stakeholders;
2.2. The development was a result of a national policy action plan;
2.3. There was a housing shortage and high demand at the time of the decision to develop new housing units;
2.4. The economic indicators looked positive in terms of mid and long-term affordability of the housing units.
(See Table 5.5 in Section 5.3.1)

The decision was made in the early 1990s to redevelop the area around Hammarby Lake after one of the prominent landowners began exploring its viability through consultations with the City of Stockholm (Bylund 2006, p.74). With regards to the timing, the decision to develop Hammarby Sjöstad as a demonstration eco-cycle district was made in the mid 90s as a result of a combination of factors. Initially, the development was initiated based upon the decision made by the City of Stockholm in 1990 in order to provide affordable housing and regenerate the inner urban locations that were potentially valuable for mixed-

use residential use. Additionally, the city officials wanted to take on the opportunity to compete for the 2004 Olympic Games. As discussed in Section 7.3.1, the potential benefits to promote Stockholm through a number of projects and events were found to be politically viable not only for the image of Stockholm but also for Sweden, in general (Stahre 2004).

After the Rio Earth Summit held in 1992 and together with the emergence of environmental concerns regarding urban policies and development models internationally, the newly elected Social Democratic government in Sweden used the opportunity to promote ecological modernization through a number of economic and regulatory policy instruments. Subsequently, the Stockholm City's decision for bidding to host the Olympic Games of 2004 and promoting Hammarby Sjöstad as an environmentally sound village for the athletes, became a 'situation of opportunity' (Svane 2007b), hence the '***timing'*** to seize one. Moreover, developing Hammarby Lake area was considered to be a potential site to regenerate the inadequate urban areas especially after the economic crisis (1992) [48] and the subsequent need for housing close to the city centers (Vestbro 2005).

In spite of the Olympic Committee's decision in support of Athens in 1997, the City of Stockholm remained committed to proceed with the development of Hammarby Sjöstad. Despite numerous procedural and contextual conflicts over the issues as described in Section 7.4.1, the ***timing*** **of the initiatives were** found to contribute very positively to the development process of Hammarby Sjöstad whilst helping to provide the political, economic and societal support locally and nationally.

7.4.3 Financial model

3.1. Initially and also throughout the process, the funding of the core management teams were provided;

3.2. The funds were allocated for the municipality's ownership of the land on which the development was built;

3.3. The funds for infrastructure and for the integration of innovative systems (such as energy, water, building technologies etc.) were made available through grants, long-term loans and / or subsidies;

3.4. Long-term financial plan was formulated and secured in order to ensure the planned delivery and occupancy of the units. (See Table 5.5 in Section 5.3.1)

48 The worst economic crisis in Sweden after the Great Depression of 1930s occurred in 1990 mainly due to the rapid increase in lending in the real estate and financial markets during the 1980s. Together with the economic slowdown globally and the restructuring in the tax regime to address low inflation in Sweden caused the crisis of early 90s. This resulted in the loss of jobs and the decrease in the investment in major industries that continued until 1992-1993. http://en.wikipedia.org/wiki/Economy_of_Sweden#cite_note-23 Accessed on July 27, 2014

As briefly discussed in Appendix II and Section 7.4.1, the financial model through which Hammarby Sjöstad was developed, involved governmental and local subsidies that funded the core management teams, technical and technological support and expertise. The Swedish government's Ministry of Environment has introduced the Local Investment Program's (LIP) budget, which allocated 5.4 billion SEK (approximately equivalent of 700 million USD) to be used between 1998 and 2000 (Lundqvist 2001). However, this included the developments within Sweden and was designed as part of the Sustainability Investment Program for which more than 12 billion SEK were made available by the central government.

With regards to the land ownership, the City of Stockholm traditionally had differing views as to whether to increase possession of land or follow a market-oriented developmental model depending on which administration had majority seats any given time. The left wing government had been purchasing land in the urban areas in order to prevent speculative land investments and also to empower the City in planning new developments (World Bank 2012, pp.180-181). According to Rutherford (2013), around 90% of the land of Hammarby Sjöstad was owned by the City of Stockholm and the remaining parts such as Sickla Udde and Lugnet were privately owned (Rutherford 2013) by the time the development began in early 1990s. Although the land ownership was found to increase the control over the environmental standards and design quality in large-scale eco-developments, after 1998, the right wing government was elected and began to promote the land sale to private owners (see Section 7.4.1).

According to Bylund (2006, p.73), the City of Stockholm's subsidy application for eco-cycling districts or eco-developments was 678 million SEK, 200 million SEK of which was tentatively designated for Hammarby Sjöstad. The overall cost of the development was estimated around 5 billion SEK (Bylund 2006). According to the Stockholm City (2010), the financial investment that was made for the development so far involved 0.5 billion Euros by the public and about 3 billion Euros from the private sector and developers (Cederquist 2010). Stockholm has received 300 million SEK from the LIP budget and half of this amount was intended for the environmentally sound technologies in the development of Hammarby Sjöstad (Brogren & Green 2003; Svane 2007a). These subsidies, according to Svane (2007a), amounted for 30% of the overall cost that was estimated for implementing environmental measures. The developers have found this amount to be inadequate to cover the extra costs that were anticipated to occur pertaining to the environmental measures introduced in 1997-1998, which was calculated to be approximately 900 million SEK (approximately 116 million USD or 99 million Euros). Additionally, the City of Stockholm was committed to contribute with subsidies worth 200 million SEK (approx. 22 million Euros) (Toussaint 2012; Svane 2007a), however this was later used for the implementation

of the integrated technical supply systems (for the 'Hammarby Model', see Section 7.4.6) (Svane 2007a).

Table 7.3 Value increase in cost of rental and ownership of accommodation in Hammarby Sjöstad.

Year	Rent / m2	Purchase price / m2	Maintenance fee / month
2010	€ 900 - €1200	€ 3,500- € 6,000	€ 400 / month
2013	€ 1200- €1800	€ 5,350- € 7,150	€ 600 / month

Sources: (Cederquist 2010) and the City of Stockholm (March 19, 2013) . [49]

With regards to the dwelling costs, Hammarby Sjöstad has experienced a rapid increase in value for both the rental as well as the purchase prices. According to the studies conducted by the Stockholm City, it was reported that the rent for an average medium size apartment (80 m^2) increased by about 30% between 2010 and 2013 while purchase price surged between 20-50% for the same period (see Table 7.3). Rutherford (2013, pp.17-18)'s research also highlighted the rapid value increase of the units in the development, suggesting that the development now caters for wealthier households rather than offering accommodation for residents from diverse socio-economic backgrounds of the society.

7.4.4. Physical qualities

4.1. The development has an attractive design with distinctive architecture in general;

4.2. The building standards and the quality of the materials are relatively higher than the conventional developments throughout the city;

4.3. The amenities and facilities in the neighborhood and its vicinity are well thought-out and they satisfy day-to-day needs of the residents;

4.4. The natural environment within the development and its surrounding area provide great potential for walking, cycling and exercising while enjoying outdoors;

4.5. The neighborhoods and the district are well connected through walk and bicycle lanes as well as with good public transport;

4.6. Eco-friendly energy, water, waste and transport systems are well embedded in the design of buildings and the urban spaces. (See Table 5.5 in Section 5.3.1)

According to Vestbro (2005), the urban development trends and housing programs (in planning and design) in Sweden followed '*modernist'* urban planning approaches until the late 80s and early 90s and gained much criticism and reaction due to the social and physical implications as a result [50]. The so called '*machine aesthetics*' (Dagen Bloom 2008)

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49 http://bygg.stockholm.se/Alla-projekt/hammarby-sjostad/In-english/Facts-and-figures/ Accessed on July 27, 2014

50 Modernism's *oversimplified* categorization of the city into its functions as the "*work, dwelling, transportation and recreation*" (Dagen Bloom 2008, p. 73) resulted in the design of anonymous spaces that are often associated with the tendency to ignore social aspects or other dimension of urban life, thus creating sterile,

with anonymous outdoor or public space designs and the high-rise residential buildings with communal areas eventually resulted in creating unsafe conditions for its residents (Newman 1995). With reference to the aesthetic aspects, the urban characteristics, which traditionally defined place, were lost and the qualities for which the communities felt most attached were replaced with elements of a simplified notion of ***international styles***.

Together with the overwhelming rejection of the modernist era urban planning doctrine (Vestbro 2005), all political parties came into consensus toward reviving the city of Stockholm in ways to bring society together and also to renew the image of the city with technologically advanced, innovative urban design and architectural characteristics that helped to increase enthusiasm for the development of Hammarby Lake area. Although there was general understanding of the rejected planning paradigms of the past, there were also conflicting views as to how the new design principles should be established in developing the Hammarby Lake area. For example, one of these issues was the density, which was strongly debated and much politicized. The developers were in favor of higher buildings in order to accommodate more residential units, which in turn would block the views and the valuable sunlight for the lower level apartments including the outdoor atriums where people could gather and socialize. Initially, this was resolved via keeping the building heights limited to between 5-7 stories. In spite of this decision, the density was later increased by another 10-20% above the initially agreed limits that were established during the administration of the blue coalition that served between 1998-2002 (Vestbro 2005).

Despite the traditional norms of relatively smaller openings of window space, architecturally, larger openings were introduced to visually make the best use of the views of the Hammarby Lake and its surrounding areas. Although initially, the modernist architecture and urban principles were rejected by the initiators of Hammarby Sjöstad, it was interesting to find a functional interpretation of modernistic qualities in building designs. These also included the flat roofs, large terraces and balconies as well as the use of steel, glass, stone and wood (GlashusEtt 2011) as elementary components of contemporary design. With regards to the urban characteristics, the site layouts and landscape features projected an integrated approach within which the water and green features were used as focal elements, thereby, creating a sense of a rich perception of the place in which to live and enjoy (see Section 7.3).

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elitist and even inhuman “machine aesthetics” as a result (Dagen Bloom 2008). As adopted by the modernist architects and urban planners around the world, often, little or no emphasis was given on the locality or the local context in terms of history, climate, location or site. This created the so-called international style and criticized by many, not only for the negative physical and social implications to urban life but also for contributing to counter-movements such as the post-modernism. (http://en.wikipedia.org/wiki/International_Style_(architecture) Accessed on July 27, 2014; http://en.wikipedia.org/wiki/Modernism Accessed on July 27, 2014)

In brief, the initial vision to redevelop Hammarby Lake area has been successful and has been highly complimented in terms of creating new districts that are livable and exemplary. It was also important to showcase such efforts especially for the rehabilitation of brownfield sites that are in close proximity of urban locations. Together with approximately 11,500 homes and over 250 000 m^2 of commercial space, the area currently has nearly 20,000 inhabitants and provides more than 6,500 jobs (City of Stockholm 2013)[51]. According to the report published by the City of Stockholm (2010), there are ten pre-schools, two high schools, a library, a cultural center / theater, care-center with residences for the elderly as well as medical healthcare facilities operating within Hammarby Sjöstad (Cederquist 2010).

With regard to the ***physical qualities***; it was reported that the initial residents mostly preferred Hammarby Sjöstad because of its architectural and urban characteristics as well as due to its close proximity to the city center (Pandis Iveroth & Brandt 2011). Therefore, besides the achieved level of innovation in urban systems and other environmental qualities, the physical characteristics were found to contribute highly toward the popularity of the development.

7.4.5 Stakeholder involvement

5.1. The multi-disciplinary approach / multi-actor involvement existed from the design stage and throughout the development;
5.2. The existing and future residents were included in the design process;
5.3. The existing and future residents influenced the decision-making process on issues affecting the outcome;
(See Table 5.5 in Section 5.3.1)

As reviewed in Section 7.3, stakeholder involvement and participation in decision-making have been highly emphasized, especially after the protests that occurred in Stockholm in the late 1960s and early 1970s. As Miller and Kraiisliaat (1979) reported, the Swedish planners and politicians realized the constructive results of citizen participation and consultations in the early stages of development processes, and even prior to the planning stages of the urban developments. They acknowledged that such protests often caused conflicts and time delays if citizen participation was not properly orchestrated. (Miller & Kraiisliaat 1979).

During the initiation, design and development of Hammarby Sjöstad, stakeholder engagement was used in varying degrees and approaches depending on the administration and development phase. For example, the initial plans for the development of Sickla Udde were developed in the early 1990s and potential developers were identified during which the pre-

51 http://bygg.stockholm.se/Alla-projekt/hammarby-sjostad/In-english/Facts-and-figures/ Accessed on July 26, 2014

liminary land designations were carried out with legal contracts (Svane et al. 2011). At this stage, neither consultations with stakeholders nor the citizen participation was involved. Together with the decision to host the Olympic Games of 2004, the Stockholm City's strategy in terms of the formulation of planning and development processes became more inclusive and participatory. This inclusive planning approach started in 1995 and lasted until 1997 during which the bidding process for the 2004 Olympic Games was decided negatively for Stockholm. During this period, the project team was established and a focused '*concerted'* effort was made to develop the vision and to establish the development's vision and goals. Svane et al. (2011) noted that the '*extensive network of actors*' included the politicians, the city officials and the project team who were actively involved in the process during this time. According to Johansson and Svane (2002, p.212), the stakeholders involved the politicians, administrations, companies, private developers, contractors and consultants. In general, the actors were almost exactly the same as any interested parties found in conventional urban development processes (Johansson & Svane 2002).

Despite the involvement of a wide variety of actors during the time the decision to host the Olympic Games was still pending, the Environmental Plan was developed without the project team and/or the prospective developers' involvements. This in turn caused goal conflicts, which Svane (2007b) referred to as '*external'* (Svane 2007b). Subsequently, more emphasis was given to the formulation of the process that involved the development of the Environmental Plan (see Section 7.4.6). However with regard to the stakeholder involvement, some of the critical factors that negatively affected the outcome included:

- *The development of the Environmental Plan without engagement of the project team and the developers;*
- *The lack of involvement of the future residents as active participants in the design and development, the formulation of environmental goals and the decision-making in general* (Kasioumi 2011).

Kasioumi (2011)'s findings were also supported by Pandis Iveroth & Brandt (2011, p.1055) in terms of the extent to which stakeholder involvement was achieved during the planning and development processes. Their review suggested that the City of Stockholm had been successful in terms of providing the multi-disciplinary approach, which consisted of professionals, city officials, actors that are directly related with the technical, planning or regulatory aspects. However they were unsuccessful and ineffective in integrating the citizen's perspective into the planning and design of their development.

As a result, based on the review of the literature and case studies conducted on various aspects of Hammarby Sjöstad, the lack of comprehensive '***stakeholder involvement***' was

a negative contributor to the achievement of environmental goals, thus the effective and efficient evolution of Hammarby Sjöstad's development.

7.4.6 Environmental model

6.1. The development had a clear environmental plan with realistic goals that were established from the beginning;

6.2. The environmental standards were monitored and ensured throughout the process;

6.3. The future residents and actors (developers, builders, architects etc.) were involved in the decision-making when the environmental plans were established;

6.4. There was a clear plan as to how to operationalize the environmental model and to achieve environmental goals and ambitions. (See Table 5.5 in Section 5.3.1)

As briefly mentioned in Appendix II, the vision in developing Hammarby Sjöstad was to create a district with "twice as good" compared with 'then available' planning and implementation methods of similar size developments. The idea to create a closed-loop eco-cycle model evolved from the Swedish government's initiative to develop strategies into establishing environmental adaptation since the emergence of oil crisis in 1970s and

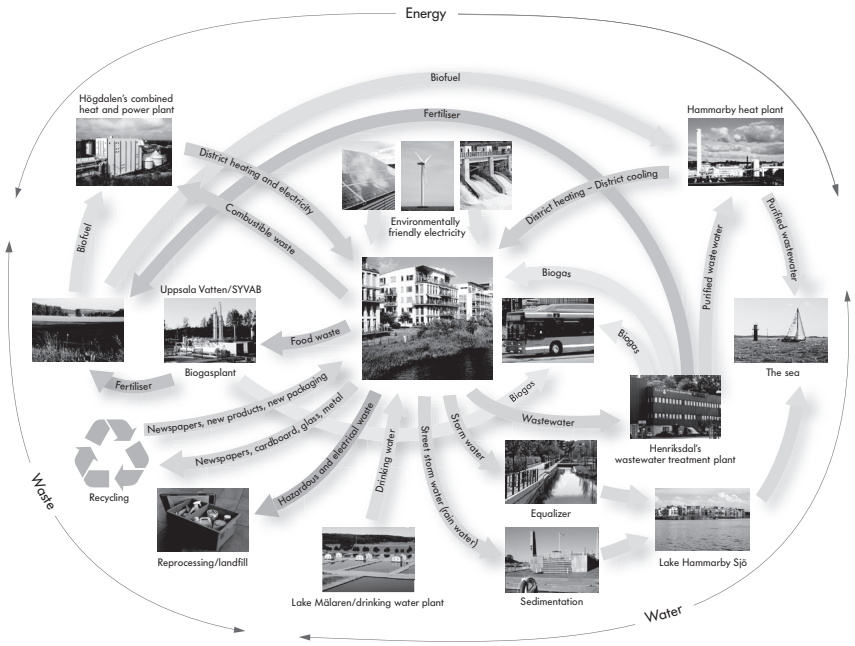

Figure 7.2 The Hammarby Model illustrating the closed-loop energy and material cycles. *(As obtained from the City of Stockholm's website (dated 2012) that was accessed on July 10, 2014 from this link: http://www.hammarbysjostad.se/inenglish/pdf/Kretslopp%20april%202012%20eng.pdf)*

subsequent challenges with regards to the energy provision in early 80s (Pandis Iveroth et al. 2012). Although, Hammarby Sjöstad has been acknowledged internationally and mostly because of its 'tentative' closed-loop eco-cycle model (see Figure 7.2), the goals (and the concept) co-evolved and have been revised multiple times since the eco-cycle companies first proposed it in September 1997 (Pandis Iveroth et al. 2013).

Furthermore, the review revealed that the development has not initially been planned to be a closed-loop eco-cycle district (Rutherford 2013, p.7). The City of Stockholm later adopted the objective to create a locally tailored, recycling model based upon 'systems integration', and this would be built upon the existing infrastructure and would encourage additional innovative technologies or system solutions (Rutherford 2013). Pandis Iveroth et al. (2013) defined the integrated infrastructural system as:

> *" ...Integrated technological solutions that represent efforts to close the material and energy cycles of an urban area." (*Pandis Iveroth et al. 2013)

With regards to the initial efforts to achieve this objective, City of Stockholm invited the officials from the municipality's energy, waste and wastewater treatment plants, together with the project team, to develop a model that would handle the metabolic flow cycles for the residential and commercial buildings in the district based upon proven technologies and infrastructural systems (Pandis Iveroth et al. 2013). Additionally, the less proven technologies (at that time), such as wind power, PV systems etc. were to be used to help to close the cycle. However, due to the relatively late introduction of the model during the development, conflicting views around the operational goals emerged and this affected the negotiation processes between Stockholm City and the developers negatively. As a result, neither the innovative systems integration nor the desired level of goal formulation was achieved as was initially envisioned. The literature review revealed that these aspects were highly criticized with respect to how they influenced the implementation of the core elements upon which Hammarby Sjöstad was built and governed.

The evolution of the model and the level of success in goal achievements were extensively studied, assessed and debated by researchers including but not limited to authors such as Pandis Iveroth S. et al., (2013); Pandis Iveroth, S. et al. (2012); Pandis Iveroth, S. & Brandt, N. (2011); Svane, O. et al. (2011), Svane, O. (2007a), Rutherford (2013) and others. In this section, based on the literature review and upon the published analyses, a brief outline of the 'environmental plan' is presented and the subsequent evaluation with regard to its success is summarized.

Among the innovations that were introduced, only some of them were realized. This was mainly due to the conflicting goals that were considered to affect the involved party's (ac-

tors in power) commercial interests negatively such as Stockholm Energi's rejection to adopt the solar heaters and PV systems (Pandis Iveroth et al. 2012).

- *Local wastewater treatment plant;*
- *Local storm water treatment system;*
- ***Black water treatment with additional macerator**s; (Not realized)*
- ***Thermal solar collectors in support of the district heating system;** (Not realized)*
- *District cooling;*
- ***Integrated photovoltaic panels;** (Not realized)*
- *Automated vacuum waste collection system. (Pandis Iverot et al. 2012)*

Moreover, some of these green features were rejected by architects in defense of the desired architectural characteristics of buildings such as the unintended look of solar thermal collectors on flat roofs or the size of window openings that could be optimized for better energy saving measures. The unwillingness to integrate innovative solutions for design related issues, the environmental plan's development without proper consulting through the project team and with the developers, were some of the aspects that resulted in failing to achieve the critical goals, at least for the short term.

In conjunction with the environmental model and its effectiveness, there were also found criticisms about the environmental tool used during the development of Hammarby Sjöstad. Forsberg (2003) highlighted the weaknesses and strengths of Environmental Load Profile (ELP), for evaluating the environmental impacts of building / construction, operational activities and the installed systems (Forsberg 2003). The most significant shortcoming of that tool was its complexity and the large amounts of data needed to calculate the true impact levels. Forsberg (2003) noted that the need for managing large databases led to increased risks of making errors and this could have significant impacts upon the decision-making processes. Furthermore, the lack of social and economic data negatively impacted the outcome, as environmentally sound features need to be assessed holistically with all parameters taken into consideration instead of just the technical input based on theoretical modeling.

In order to make best use of the ELP, baseline data were found to be crucial so that comparative analyses could be performed. In Hammarby Sjöstad, it was found that the pre-development data monitoring did not exist, at least to the extent that the tool could be efficiently utilized for sound comparative analyses (Pandis Iverot, S. & Brandt, N., 2011). However one of ELP's strengths, noted by Forsberg (2003), was its flexibility to improve through each application via accumulation of new data collected on the development's environmental performances over time. Rutherford (2013)'s research on Hammarby Sjöstad's development process revealed that the data gathering process has been conducted during

different construction phases and with little rigor toward measuring the actual consumption/efficiency values. According to Rutherford, the collected data were scattered and sometimes (or mostly) these contained theoretical projections produced by the developers (Rutherford 2013, p.11). Furthermore, the follow-up and monitoring as well as the operationalization of the environmental goals were found to be vague and open to interpretation as was found evident during the negotiations and construction phases (Rutherford 2013, p.12).

The research conducted by Pandis Iveroth and Brandt (2011) suggested that the formulation of operational goals was insufficient and involved unrealistic aspects in terms of the desired level of achievements initially. Moreover they noted that the assessment and methods with which to monitor progress had uncertainties (Pandis Iveroth & Brandt 2011, p. 1055).

7.5 Evaluation of Hammarby Sjöstad based on the 'success factors'

In previous sections, the six factors that were identified for establishing successful eco-towns were evaluated based on in-depth review of the relevant literature on Hammarby Sjöstad. The political commitment, timing, financial model, physical qualities, stakeholder involvement and environmental model were analyzed in order to determine the extent to which the strengths and weaknesses of the six factors have impacted the overall development process, hence the success of Hammarby Sjöstad in general. It was found that the overarching vision to build an eco-town 'twice as good' as the conventional models, has become a motivational tool both politically and economically. Due to the fragmented nature of the development's contextualization, valuable opportunities were lost in terms of achieving the desired goals and objectives physically, socially and environmentally.

As discussed and elaborated in previous sections of this chapter, critical assessments were performed by other researchers who conducted studies not only from a perspective that is relevant with technical/technological dimensions but also in relation to the residents' subjective views and perceptions of the QOL aspects. Based upon the analyses performed in this thesis, the following assessments were made to evaluate the level of success of Hammarby Sjöstad. The success indicators discussed in Chapter 1 of this thesis, were identified through the literature review on eco-developments and were presented in Table 1.2 in Section 1.6. These were grouped into the following three categories:

- *Dissemination of positive results and experiences;*
- *The community's behavioral and cognitive adaptations;*
- *Policy changes and adjustments.*

In light of the analysis of the six 'success factors,' performed in conjunction with the case study research on Hammarby Sjöstad development, the author expanded upon the development's overall success in the following sections.

7.5.1 Dissemination of positive results and experiences

Although the collaboration and participation among the actors varied significantly *(see Kasioumi 2011, p.104; Svane et al. 2011, p. 152; Rutherford 2013, pp.17-18; Khakee 2007)*, the dissemination of knowledge and lessons from the Hammarby Sjöstad's development processes were also noted by these and other researchers.

For example, as Kasioumi (2011) observed:

> *"...planners fostered a collaborative climate with developers through incentives, such as grants to cover the additional costs of innovative building technology, and through continuous communication. Eventually, everybody learned from the process and developers voluntarily improved environmental performance in the parts of [Hammarby Sjöstad] HS that are now under construction."* (Kasioumi 2011)

Svane et al. (2011) concluded:

> *" However, in recent years, the original ambition has started to gain ground and, as mentioned in the introduction, the Sjöstad development is now used as a basis for learning. For example, the Royal Seaport even has the ambition to go beyond the outcomes of Hammarby Sjöstad. Ongoing research on other recent planning projects in Stockholm also indicates that city administrations and officers have learned from the Sjöstad project. ... With a delay of some 10 years, the novelties in negotiation content, meta-governance and network organization have gradually gained momentum."* (Svane et al. 2011)

With regards to the technical / technological aspects of innovative planning and integration, Pandis Iveroth S. et al, (2013) conducted in-depth research into the metabolic flow rates of Hammarby Sjöstad and evaluated how effectively the environmental plan contributed to the outcome compared with the reference values in Stockholm's surrounding areas. Their findings suggested that the initially desired systems and technologies were partially implemented and some were only improvements of the existing systems.

These initially included the following objectives:

- *A local wastewater plant that would be exclusively used by the Hammarby Sjöstad to improve the quality of the treated water as well as to manage the leftover sludge. This sludge could then be used as fertilizer;*

- *Implementation of photovoltaic panels, fuel cells and solar thermal collectors on roofs in order to generate heat and electricity;*
- *Biogas would be generated from the wastewater treatment;*
- *Storm water would be treated locally;*
- *Bio-solids would be produced from household waste;*
- *Local wind power plants would be built. (*Pandis Iveroth et al. 2013)

The significant finding from the research conducted by Pandis Iveroth et al. (2013) was the extent to which the 'systems integration' in Hammarby Sjöstad was circular and self-sufficient as a whole. According to their study, except for the Högdalen CHP plant [52] and the Henriksdal wastewater treatment plant, not much was built for new energy production and water treatment as was initially proposed. It was found that the integrated PV systems and solar thermal collectors were not installed except by a few householders (Pandis Iveroth et al. 2013).

With regards to the results of Pandis Iveroth et al.'s research, they found that only 22% of the district heating, 24% of district cooling and 5% of electricity used in the district were generated through the proposed 'Hammarby Model'. Their study also documented that the biogas produced in the district exceeded the need for Hammarby Sjöstad, thereby, providing biogas for residential and transportation use in the city of Stockholm.

They emphasized that, the use of integrated solar heaters, PV systems and making additional use of the wind power would significantly reduce the metabolic flows, thus making the district more self-sufficient and relatively more circular as a result.

Based on the extensive analyses and research papers that were prepared on the environmental, economic, social and procedural aspects, the Hammarby Sjöstad development has been highly recognized as one of the largest-scale, eco-town developments in Sweden that was designed to establish closed-loop metabolic cycles in 1990s. Despite the procedural shortcomings of Hammarby Sjöstad, the analyses revealed that the lessons learned from the development processes helped to improve urban planning and development practices in Sweden. It was found that the politicians, planners, city officials and other stakeholders applied the lessons in other developments such as the *Royal Seaport* development in Stockholm or the *Vallastaden* development in Linköping, Sweden.

52 http://www.fortum.com/en/energy-production/combined-heat-and-power/sweden/pages/default.aspx Accessed on July 16, 2014. In fact, Högdalen Plant was built in 1970 and produces heat for south district heating network in Stockholm. The south heating district network was connected to the central district network since 2007. (Same website was accessed on January 7, 2016)

Table 7.4 Evaluation for the 'dissemination of positive results and experiences'

Hammarby Sjöstad	
Dissemination of positive results and experiences	
Diffusion of eco-friendly building practices;	Medium-High
Adoption by residents of innovative systems and technologies that are environmentally friendly	Medium
Adoption by developers of innovative systems and technologies that are environmentally friendly	Low

As presented in Table 7.4, the evaluation for the indicators grouped under the "*Dissemination of positive results and experiences"* developed for determining the level of success in Hammarby Sjöstad development presented average results.

7.5.2 The Community's behavioral and cognitive adaptations

With regards to the consumption levels in Hammarby Sjöstad, a study published by Pandis Iveroth S. & Brandt N (2011) found that the minimum energy use [53] for buildings was 95 kWh/m2 of which 48 kWh/m2 was used for electricity. The same study revealed that the highest consumption level was around 220 kWh/m2, and from this 43 kWh/m2 was used for the electricity. Another, recently conducted study among 7262 dwellings, documented that the average energy consumption was 142 kWh/m2 with an additional use of 51 kWh/m2 for electricity (Pandis Iveroth et al, 2013). These figures were found to be similar to the average consumption levels of residential units in the Stockholm area as reported by the Swedish Energy Agency (2013). According to their findings, the average consumption for space heating and hot water was 158 kWh/m2 while this value changed between 147 kWh/m2 and 185 kWh/m2 in 2010, depending on the geography and climatic conditions in Sweden (Swedish Energy Agency 2013). [54]

Based on these studies, the findings suggested that the level of goal achievement in terms of energy (electricity use) of 60 kWh/m2/year, which was initially targeted as the half of 1990 consumption levels, has not been achieved. However, according to the same researchers, the main reasons for this were not only due to the lack of integrated PV panels, the solar heaters or the architectural characteristics of the buildings, but also due to the residents' behavioral patterns because they were not willing to change their lifestyles to more environmentally sound ways (Vestbro 2005; Pandis Iveroth & Brandt 2011).

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53 Pandis Iveroth & Brandt (2011) used the term 'energy consumption' in their report with respect to their study of the buildings' overall 'electric power consumption' which is described by the World Bank as: *"the production of power plants and combined heat and power plants, less transmission, distribution, and transformation losses and own use by heat and power plants."* http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC Accessed on July 29, 2014

54 http://www.energimyndigheten.se/en/About-us/Press-/Press-releases/New-regional-energy-statistics-for-single—or-two-dwelling-buildings/ Accessed on July 17, 2014

It was found that the water consumption levels were 25% lower than those of the surrounding areas in Stockholm [55] but were not 50% lower as initially targeted by the Environmental Program (Pandis Iveroth & Brandt 2011). The current water consumption in Stockholm city in average, according to OECD report, is approximately 150 liters per capita per day. [56]

Table 7.5 Comparative energy and water consumption levels per household and/or person in Hammarby Sjöstad, Stockholm.

Average consumption levels	Average Persons per family / household [a]	Energy consumption for heating & hot water KWh/ M2	Electricity consumption KWh /m2 (Annual average)	Water consumption	
				M3 / household / year	lt / capita per day *
Hammarby Sjöstad homes	2.27 [c]	142 [d]	51	117-124 [b]	142-150 *
Reference homes/ Stockholm	2.14 [f]	158 [e]	43 [g]	105-117 [b]	180-200 *

a- The average household size per dwelling was found to change between 1.73 and 2.16 persons per dwelling in Södermalmsområdet and Södra Hammarbyhamnen respectively. The data from 2010, were obtained from the http://statistikomstockholm.se/temp_eng/a-tabeller/tvdee8.html?t=a67&sprak=eng accessed on July 16, 2014.

b- Water consumption in cubic meters per year was converted to liters per capita per day consumption in order to more clearly compare the findings with the previously presented data obtained from the Stockholm Municipality.

* This conversion was performed through the following exercise:

For water, 1 M3 = 1000 liters; Therefore, the water consumption per person per day can be found with the following equation using the values in the table above. (See Footnote 55)

[(M3 per year) x (1000)] / [(average person per household) x (365 days)] = liters / capita / day

c- http://bygg.stockholm.se/Alla-projekt/hammarby-sjostad/In-english/Facts-and-figures/ Accessed on July 20, 2014

d- See, Pandis Iveroth et al. (2013)

e- See, Swedish Energy Agency (2013)

f- SCB (2013)

g- Stockholm City (2013)

(IMPORTANT NOTE: The facts and figures in this table may require cross-sectional data as the statistical reports which were obtained and analyzed for this research lacked transparency and there were gaps and differences in the methodologies employed in developing the results - especially those that were found in the Swedish government websites and statistical agencies.)

55 These calculations were made based on the average water consumption rates and the average number of household inhabitants. Due to the higher average number of persons living in Hammarby Sjöstad, the 'per capita' water consumption was found to be less than the reference homes in the surrounding urban area in Stockholm although the 'per household' water consumption in M3 in Hammarby area was higher.

56 http://www.oecd.org/science/inno/49521826.pdf Accessed on July 19, 2014

In addition to the consumption levels shown in Table 7.5, the use of private cars and the objective to reduce parking space per household were among the other topics that were addressed repeatedly during the development of Hammarby Sjöstad's environmental program. Despite the debated relevance as to whether the number of parking bays is an indicator for measuring environmental awareness in a community; the willingness to live in a relatively car-free zone and choosing to use public transport, cycling or walking instead, can be accepted as positive signs of sustainable lifestyles especially for those who are willing to pay higher rental or purchase price for accommodation.

In that context, one of the initial goals in Hammarby Sjöstad was to achieve 0.25 parking spaces per apartment. Due to the political pressures from the right-wing (blue coalition) government that was elected in 1998, this ratio was revised to 0.7 (Vestbro 2005) compared to 0.5 per household situated in the city center and 1.0 parking space per unit outside the inner city locations in Stockholm. The use of public transport (52%) by means of walking and cycling (27%), were found to be the popular choice of transport by the residents (Faller et al. 2010) compared to the 21% of private vehicle use for daily commuting of residents living in the Hammarby Sjöstad development. Compared to these findings, the car use in the Stockholm area, in average, was claimed to be 35%, bus use was 50%, walking 8% and cycling 7% as the choice of transport (Brick 2008).

With regards to the waste generation and recycling, Pandis Iveroth et al. (2011)'s study documented that more than 95% of the waste generated in Hammarby Sjöstad and in Stockholm is combusted. According to the statistical data obtained from the City of Stockholm [57], the 'per person / year' treated household waste in 2010 was 444 kg compared to the average quantity of 463 kg in Sweden for the same year (Avfall-Sverige 2011).

In light of these observations and findings gathered via the literature review, it is suggested that the environmental measures have been influential in terms of achieving somewhat lower consumption levels however not nearly to the extent of the Environmental Program's desired level of goal attainments. This was underscored by other researchers who conducted semi-structured interviews and surveys and concluded that the Hammarby Sjöstad development was preferred by the residents (at least initially) in order to "*have an apartment or a house in an attractive area with easy access to the urban center and green spaces, and also because the area has very attractive water and landscape views*" (Vestbro 2005; Rutherford 2013).

Other researches revealed that a great deal of effort was being invested by the residents towards making improvements on the physical, environmental and social qualities through collaborative and proactive ways. This was specifically mentioned in Rutherford's study (2013) in which he noted that the citizens of Hammarby Sjöstad were implementing an

57 http://statistikomstockholm.se/images/stories/excel/b046.htm Accessed on July 16, 2014

"innovation platform" for developing ideas and strategies in collaboration with researchers, companies, public actors, consultants and scientists to develop a vision for the year 2020 (Rutherford 2013). Therefore, despite the controversial decision-making and development processes that were often assessed as delivering "not so successful" results in the goal achievements, the community's current grassroots initiative(s) to establish ecologically sustainable lifestyles are highly encouraging for the potential success of this and similar future developments.

However, in contrast with the initially stated improvements on the consumption levels in Hammarby Sjöstad, the recently conducted independent studies revealed different findings from those, which were based on theoretical models produced by the Environmental Load Program (ELP), and these were similar to the residential areas in surrounding locations in Stockholm. In light of these results, the author's evaluation of community's behavioral and cognitive adaptations in their residential development for Hammarby Sjöstad is presented in Table 7.6.

Table 7.6 Evaluation for the 'community's behavioral & cognitive adaptations'

Hammarby Sjöstad	
The Community's behavioral and cognitive adaptations:	
Reduction in energy and water consumption rates	Low
Solid waste reduction	Low
Reduced car ownership	Low
Increased usage of public transport compared to car usage	Yes
Increased level of walking, cycling etc. for daily activities	Yes

'HS' represents Hammarby Sjöstad development.

As presented in this section, the Hammarby Sjöstad development's impact on "the community's behavioral and cognitive adaptations" was found to be somewhat marginal except the increased use of public transport, cycling and walking, which can be also attributed to the general public awareness and perceived physical, environmental and financial benefits in Stockholm.

7.5.3 Policy change and adjustments

The case study research on Hammarby Sjöstad revealed that the role of stakeholder participation was integral in terms of achieving environmental goals, which required negotiations within and among the actors and also with the future residents, especially during the planning stages (Khakee 2002; Khakee 2007; Solitare 2005; Kasioumi 2011). Kasioumi (2011) suggested that the proactive role of actors in planning was even more important than the technological innovations to ensure that the desired level of standards in environmentally sound design and implementation were met (Kasioumi 2011). In the Hammarby Sjöstad development, the city administration and the appointed officials handled the initial planning

[58] during the early 90s, before the development was declared to be an exemplary eco-cycle development in Stockholm. The reasons for some of the goal conflicts were attributed to the development contracts, which were based on these initial plans. The subsequent implications of these goal conflicts to the overall development process, was expanded upon in Sections 7.4.6 and 7.5.1. Furthermore, the introduction of the 'Environmental Program' late in the development process caused additional conflicts, thus weakened the role of the local authority in decision-making, hence the achievement of environmental ambitions.

With regards to the changes in urban policies and practices, the development of Hammarby Sjöstad has provided valuable lessons and experiences. These lessons are being used as the *basis for learning* in developments such as the Royal Seaport (Norra Djurgårdsstadens) that is being developed in the northeast of the city center and will consist of 10,000 units when completed (Svane et al. 2011; Rutherford 2013). Also, the City of Stockholm is developing its new vision to become fossil-fuel-free by 2050 (Rutherford 2013). The earlier examples of large-scale demonstration projects (with "local solutions, closed-loop concepts") were criticized in terms of their replicability in other contexts and with regards to the limitations in the lessons learned (Femenias 2008). The early ones such as the Hammarby Sjöstad on which sound scientific studies were conducted and published, helped to disseminate lessons on various facets of planning, governance and participation and the impact on the outcomes.

Femenias (2008) noted that the positive contribution of such experimental developments, even though some with unsuccessful results in the beginning, should not be underestimated because they helped to establish a solid basis for bottom-up activities in the development of a more sustainable building culture in Sweden (Femenias 2008).

As Svane (2011) further emphasized, the novelties, in the ways that the negotiations were performed (between actors), in meta-governance and in network organizations, are now gaining momentum and thereby helping the government to more effectively plan and implement sustainable urban developments in Stockholm and in Sweden more broadly. Based on these findings, Table 7.7 presents the author's evaluation for the Hammarby Sjöstad development's impacts on the urban development policy and trends in Sweden.

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58 In Sweden's culture of planning practice, the detailed plans constitute an essential part of the development process in terms of determining the terms and conditions of the agreements entered between *a developer and a representative of the city's Roads and Real Estate Administration (Svane 2011)*. These are binding documents that can cover a wide range of specifications such as the land use, public spaces, implementation period, design quality, construction materials, floor sizes, heights etc. (Kasioumi, 2011). The detailed plans are instrumental in terms of conducting negotiations between the developers and the city administration especially when the land sale is part of the contract whereby the city administration can use the land price as a motivational tool to negotiate or compensate certain aspects such as the extra costs incurred by environmental standards and measures (Svane 2011). According to Kasioumi (2011) the negotiations with developers were concluded before the detailed plans for Hammarby Sjöstad were finalized (Kasioumi, 2011).

Table 7.7 Evaluation for the 'policy change and adjustment' impacts

Cases	HS
Policy changes and adjustments	
Improvements in urban development policies on regional and national levels in terms of both urban regeneration and for new developments;	High
Improvements in the building codes and regulations	Medium

'HS' represents Hammarby Sjöstad development.

7.6 The summary of the Hammarby Sjöstad case study

Hammarby Sjöstad has been and is still perceived to be a successful eco-town development. The research conducted on various aspects of the development process as well as the ex post evaluations revealed that the outcomes compared to the initially desired goals and vision, were however different than expected initially. In this case study, the author investigated the six 'success factors' and assessed the results with respect to the indicators identified to define successful eco-towns in previous sections. In light of this study, a number of procedural and contextual elements were found to have contributed to the less positive outcomes.

As Rutherford (2013, p. 7) noted that the initial plan to develop the Hammarby Lake area has never been to create a self-sufficient autonomous district. Instead, the planning was initiated as a result of the landowners' proposal to develop in early 1990s, during which the housing shortage became problematic and locations close to urban centers were too valuable to avoid (see Appendix II). The political will, therefore existed and this was further strengthened through the City's decision to host the 2004 Olympic Games. In spite of the strong commitment by the City officials and the support of the Swedish Government, the findings revealed that the roles as well as the levels of authority of actors, were affected by the changing political and economic conditions. This in turn, influenced the development processes and impacted the outcomes. The appointed 'project team' was integral in terms of keeping a certain degree of authority over the negotiations with developers during which the environmental measures were more effectively discussed. Together with the change of City's administration from left wing to right wing political majority, the ambitions of the development were changed and the environmental program became a tentative overarching vision rather than a binding one. This weakened the role of the project team and of its power in terms of ensuring that the environmental measures were adopted and implemented by the developers. Besides the political influence over the processes, the development framework was not thoroughly established and the developers ended up with more power in decision-making as a result of the evolving conflicts over the environmental measures.

With regard to the timing; the housing shortage, end of economic crisis in the early 90s in Sweden, and the decision to host the 2004 Olympic Games, have all contributed positively to the development process both politically and economically. Despite failing to win the bidding process to host the Games, the consensus among the City officials, developers and all stakeholders was established and this helped to provide the momentum to carry through the development. Moreover, the housing demand in urban locations increased during the economic growth in the 90s together with the need for affordable housing in inner city locations, which made Hammarby Sjöstad even more attractive for both the developers and the politicians.

Another important element with regards to the timing was the Rio Earth Summit held in 1992, which motivated the Swedish politicians to transform Hammarby Sjöstad into an eco-cycle district. However, the earlier planning of the Hammarby Lake area and the relatively late decision to turn it into a project with high environmental ambitions came without proper contextualization and thus, the negotiations between the local authority and developers on additional environmental measures resulted in goal conflicts both internally and externally. [59]

With regards to the economic input provided for the development; the Swedish government and its initiative to support sustainability investments through LIP was instrumental in providing Stockholm the power to proceed effectively and efficiently with the Hammarby Sjöstad development. The amount of subsidies and financial tools generated the much-needed momentum despite the loss of the 2004 Olympic Games or the impact of the economic crisis that affected the housing market negatively in late 90s. There were also criticisms in terms of the overall financial planning and the governance. As expanded upon earlier in this chapter, the initial contracts with the developers had very little emphasis on environmental measures that were hardly binding. Moreover the environmental plan was developed without proper consultation with the developers and the stakeholders. This not only created negative perceptions but also caused reactions due to the perceived costs in excess of the traditional building norms. During the land sales agreements between the City and developers, compromises were made in terms of how strict the measures should be implemented. Additionally, the developers convinced the local authority for more shares on developments despite the introduction of the Local Investment Plan (LIP) and the local subsidies. As a result, developers gained more power, thus sought to increase profits through increasing the sales and rental prices of their dwellings.

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59 Örjan Svane (2007a) described the 'goal conflicts' in three groups, which included: "internal", "external" and "procedural" goal conflicts. According to Svane (2007a), internal goal conflicts occur when two or more environmental goals cannot be realized at the same time. The external goal conflicts occur when realization of two or more environmental goals cause conflicting results in the objectives whether economically or ecologically. Procedural goal conflicts occur in case the implementation/realization of environmental goals, conflicts with the existing rules and regulations or the procedures (Svane 2007a).

As a result of this vagueness in the development's vision, framework and governance, the potential attainment of the operational goals was negatively impacted. The initial ambitions that revolved around the 2004 Olympic Games faded as Athens was awarded to host instead of Stockholm. The subsequent change of the political majority in the City administration affected the level of commitment in the environmental program as the socio-technical configuration involved some of the vital infrastructure and service providers that were to a large extent part of the municipality. This in turn affected the level of innovation integration in the already existed infrastructure.

There were also issues regarding the physical aspects, which influenced the outcome. For example, the choices in regard to the architecture had not necessarily prioritized attributes to increase environmental efficiency. They focused on the aesthetic notions, which were expanded upon in Section 7.4.4. Despite the positive perception of the residents then, these characteristics such as big terraces, flat roofs and wide window openings did not help to maximize building's performance on energy efficiency. Moreover, solar heaters were found to be unacceptable due to their appearance. The aesthetic values change and perceptions do so as well, depending on the needs and aspirations. At the time of the development's initial stages, the architects and developers adopted conventional approaches in design and planning in order to secure their investments rather than taking on the environmental challenge of being "twice as good" as the initial vision stated.

Hammarby Sjöstad's environmental program was developed and introduced in 1997, which was relatively a late stage of the development that began in early to mid 90s. Although the development of Sickla Udde was initiated and some of the agreements were made with the developers; the City introduced new environmental measures, which were formulated without proper consultations with the stakeholders. As a result, contradicting views emerged over the financial implications as well as the achievability of the operational goals in general. With regards to the extent of the stakeholder involvement, in the development of Hammarby Sjöstad, interested parties only consisted of the city officials, planning departments, service providers, professionals and mostly the developers. The citizens and future residents were not consulted in either the design or the environmental planning stages. This later influenced the outcome as the residents that moved into the Hammarby Sjöstad development involved those that were attracted to the aesthetic notions, surrounding environment and its close proximity to the city center.

Last but not least, the resident behavior was emphasized as one of the main factors for the limited achievement of environmental goals (Pandis Iveroth et al. 2011). As Khakee (2007) noted that the notion of future resident / citizen participation in the process was not thoroughly appreciated or understood by the planners in Hammarby Sjöstad. Although the participatory process was followed during the period between the application and

the announcement of the results for the Olympic Games, this was short lived and mainly included those who were involved in the development activities. Resident participation was essentially non-existent despite the Swedish urban development culture, which has emphasized its central importance since the 1970s (Passow 1973). People who could afford more expensive units moved into the Hammarby Sjöstad homes because of its architectural characteristics and the surrounding qualities rather than because of its environmental qualities (Vestbro 2005).

7.7 Overall lessons learned

During the research conducted on Hammarby Sjöstad in Stockholm, the review of the literature on various aspects of the development provided key lessons into the initial visions, the building design, development processes, the governance and the outcomes of the installed systems and performances with relatively recent ex-post evaluations.

In light of the findings and insights gained through the case study research on Hammarby Sjöstad, the most significant lessons include:

Collecting reliable baseline data and monitoring performance

In Hammarby Sjöstad, the overarching vision for the district was to achieve environmental performances "twice as good" compared to the 1990 levels. While this was considered to be highly ambitious, it was nevertheless possible to achieve based on the theoretical models conceptualized via the environmental program adopted at the time. In order for the comparative studies to be conducted, baseline data gathering was found to be highly critical. This must be done using reliable, scientific methods so that the actual performances can be measured and evaluated on a real time series basis. According to Pandis Iveroth et al. (2011), there was a lack of systematic assessment of operational goals of the development. Also, Rutherford (2013) suggested that there was no evidence found of a written protocol on how the progress or the follow-up into the goal achievements would be performed.

Therefore, the reliable, objective baseline data gathering should be one of the initial tasks with enough resources and time allocated, prior to the development is initiated. Without sufficient data collected beforehand, the performance levels cannot be possible to assess comparatively and/or scientifically.

On the same note, monitoring performance levels during and after the development (considering that resident occupation starts prior to the overall development is finalized especially in large-scale projects) should be organized through independent monitoring

firms or agencies in order to prevent biased results. Continuous evaluation, using feedback loops will further help the planners and decision-makers to correct mistakes during the initiation, planning and development stages.

Setting the environmental agenda, goals and program expectations early and realistically

It was found to be highly important to set the vision and operational goals early in the planning process and do so with the participation of all interested parties / stakeholders in order to create the much-needed consensus around the goals and objectives. The planners should involve the interested parties including the future residents, if possible, in the decision-making processes especially when the environmental objectives are determined and the operational goals are formulated. The review of the ex-post evaluations on the eco-town developments including but not limited to the Hammarby Sjöstad, revealed that building consensus around the goals during the planning stages yielded positive results when meaningful participation of the stakeholders was achieved, regardless of the time and cost implications. Therefore, early action for providing the necessary means for gathering and sharing information and communication among all actors, including the residents is key for short and long-term successes.

Maintaining authority and power in negotiating the development contracts and during implementation

Maintaining power and authority during the negotiations with potential contractors in the development was found to be essential in order to achieve the development's social, physical and environmental goals. These goals may include but are not limited to the environmental measures, building standards, design quality and the technologies or the terms within which the principle actors may enter into partnerships in exchange of land ownership. In this regard, the land ownership model, financial resources and a clear development plan were found to be some of the essential elements for engaging into meaningful partnerships and/or negotiations. As stated in the foregoing sections, it is also essential to have a clear and realistic environmental plan to help to create consensus through dialog among the actors.

Continuous political and economic commitment to ensure achievement of goals

It is important to note that the development of eco-towns require long-term commitments both politically and economically. The support of local administration as well as the regional and central government provides the capacity to amass the financial resources as well as the subsidies on national and supra-national levels. These help the initiators of eco-towns to develop necessary measures for potential market fluctuations, economic and other crises during the long-term development processes. Political consensus is also

important and should be maintained so that the shift in administrations do not hinder the development process hence the goal achievements as was found in the Hammarby Sjöstad.

Involving potential future residents in all phases of the planning and implementation processes

During the planning and implementation phases, involvement of future (or potential) residents was found to be highly positive in terms of the extent to which the environmental goals could be achieved. The involvement of interested residents helps to establish a sense of ownership and belonging. It is important to have an inclusive design process so that the future residents, the designers and the decision-makers experience a rigorous process through which consensus is reached on conflicting issues. This in turn, can be translated into more responsible behavior and adoption of sustainable lifestyle patterns as was reported to be the case, only in the latter phases of resident occupation in the Hammarby Sjöstad development.

On going learning from other similar efforts globally via an on-line network or via social media

It was found to be highly positive that extensive research was conducted to critically assess various aspects of the development during and after implementation. Those studies, some of which provided ex post evaluations, helped to assess the successes and failures of the developments but also provided valuable lessons for future developments in similar and different contexts. Availability of the results based on the researchers' continuous monitoring and evaluations helped to objectively evaluate data such as in the case of Hammarby Sjöstad. The performance levels as well as other related data, which are transparently available via government portals, provides researchers information that is needed to conduct comparative analyses.

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Chapter 8

Eco-town development in Germany: the case of Vauban in Freiburg

8.1 Introduction

Vauban in Freiburg, Germany was found to be one of the most frequently discussed cases in the context of eco-town developments among the initiatives in Northwestern Europe. Although its size and scope distinguished Vauban from the previous four cases studied in this thesis, the author decided to conduct in-depth research due to, a. its development framework and governance model, which were strongly associated with the achievements documented on social, physical and environmental levels, and b. its positive broader impacts on the urban planning and development policies and practices in Germany. Also, the strong emphasis given to the community participation during the initiation and planning phases, Vauban as a case study, provided important insights into the cultural and societal aspects of planning and development of sustainable towns and cities.

In this chapter, the author briefly discussed the historical background of the Vauban development. Subsequently, the vision, goals and objectives upon which the development was initiated and planned were reviewed. Finally the evaluation of the Vauban's development process was presented based upon the impacts of the 'success factors.' Furthermore, the author provided, in Appendix III, additional insights into the evolution of Freiburg's urban development process, together with the previously conducted analysis of Vauban's development framework in order to amplify upon the factors that might have influenced the procedural, contextual and conceptual approaches used during the initiation and implementation phases.

8.2 The development of Vauban

Vauban was originally named after the renowned French Marshal, *Sébastien Le Prestre de Vauban,* who built fortifications in Freiburg while the region was under the French rule in 17th century (see Section 1, Appendix III).[60] The area, which was previously called St. Georgen, was established as military barracks in 1938. Together with the occupation of French forces after the WWII, it was renamed as the "Vauban Quarters" (*Quartier Vauban in French*) (Freiburg 2008). Subsequent to the termination of French military presence in 1991, Germany's Federal Office of Assets Management took charge of the area in 1992 upon which the City of Freiburg purchased the initial 34 hectares of land. The remaining four hectares were acquired by the Office of Student Affairs under the Self-organized Independent Housing Initiative (S.U.S.I.) [61] (Freiburg 2008).

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60 http://en.wikipedia.org/wiki/Vauban,_Freiburg Accessed on August 7, 2014

61 "Selbstorganisierten Unabhängigen Siedlungs-initiative (S.U.S.I.): During the early 1990s, the increasing housing shortage resulted in the gathering of a group of students in order to acquire some parts of the military barracks in the Vauban area for their own residential use as well as for their tentative pro bono services (such as rehabilitating and integrating former drug addicts in the society). As a result of their increasing

In 1994, the City of Freiburg announced a design competition for the land-use master plan for a total of 41 hectares including the extra three hectares of green space. After having selected the successful team's proposal, the legally binding final designs were developed by the architects Kohlhoff & Kohlhoff (based in Stuttgart) in 1997 (City of Freiburg 2008). The construction began in March 1998 and the first residents began moving into their homes by the end of 1998 (City of Freiburg 2008).

Table 8.1 Descriptive outline of the Vauban development in Freiburg, Germany

	Vauban
Type of development	Mixed-use residential suburb
Land size	41.3 ha (Residential area:16.4 ha; Industrial area: 1.6 ha; Green spaces: 2.6ha; Traffic areas: 12.4 ha; Public spaces: 2 ha + 3ha for farming and other) *
Number of units	2,472
Population	5,522 residents living in 2,472 households
Construction period	Started in 1998 / finished in 2010 (with extended period for additional hotel building, finished in 2013) in 2014 some sites are still in development**
Density *	134.9 (135) persons/ ha in populated areas (City of Freiburg 2013a)
Initiation	Central, local and municipal (City) political consensus
Development model	Public-Private Partnership (PPP)
Land ownership	The City owned
Funding	Public-private + subsidies from national agencies
Governance	Bottom-up governance + participation with top-down commitment
Champion(s)	City of Freiburg and Future residents / Citizens
Goal(s)	Regeneration of an old military base / car-free development + energy efficient housing

* The Green Hotel and the Vaubanaise are being built in this portion of the development potentially allocating ca. 1 hectare from within the 3 ha of extra green space. [62] 2 Based on a joint document published by Forum Vauban and Öko-Institut (Institute for Applied Ecology), the distribution of areas in the land-use plan in-detail included: Residential: 19.0 ha (45,8%), Mixed: 2.2 ha (5.4%), Commercial Area: 3.2 ha (7,6%), Public Facilities: 1.9 ha (4.6%), Power supply: 0.7 ha (1.6%), green areas: 5.7 ha (13.6%) and traffic areas: 8.9 ha. (21.4%) with a total land cover of 41.6 ha (100.0%). (Forum-Vauban Öko-Institut 1999) According to the Statistics provided by the City of Freiburg, the total area of Vauban is 41.3 hectares (Freiburg 2013a).

** According to various sources, including the City of Freiburg, the very first residents began moving as early as the end of 1998. The second phase of the construction began in 2001 and the rate of occupancy increased since then until the residential units were almost completed in 2006. There were still development activities underway until 2014. http://www.vauban.de/en/topics/history Accessed on August 7, 2014.

public exposure, they established along with non-student members, an association named the self-organized independent housing initiative with the acronym for the German translation, S.U.S.I. in 1990. As a result of the negotiations with the Federal government, they were allowed to purchase four barracks (out of the initially sought 24 barracks) that were later converted into affordable living space in which 260 residents currently reside. http://susi-projekt.de/?page_id=88 Accessed on August 7, 2014

62 http://www.quartiersarbeit-vauban.de/index.php/das-quartier/vauban-in-zahlen Accessed on August 7, 2014

During the early stages of the project, the City administration established a body in order to facilitate and coordinate the development process. The Forum Vauban was founded in 1994, which was also recognized by the City of Freiburg as the legal body for the development. The role of the NGO (Forum Vauban) has been instrumental for ensuring opportunities for citizen participation, planning and negotiating building designs through cooperative self-help projects together with the property developers and investors. Currently, around 5,522 inhabitants live and an estimated number of 600 jobs are provided within the Vauban development (Freiburg 2013b).

8.3 The context in which the development was initiated

According to S.U.S.I. (see Section 8.2), the influencing factors for the initiation of the Vauban development mainly included the housing distress (on quantitative and qualitative terms) during the early 1990s and the rapidly increasing rents, especially for affordable units, all of which created an opportunity when the army barracks were abandoned by the French in 1992. These areas have become highly attractive for land speculators until

Figure 8.1 The master plan of Vauban development in Freiburg. Source: The PDF document titled, *"Vauban_Bebauungsplan_6-130e.pdf"was obtained from the web page of City of Freiburg on this link: http://www.freiburg.de/pb/,Lde/208764.html (Accessed on August 3, 2014) and adapted for use in this case study report. The development consists of: (1) The student village, (2) S.U.S.I., (3) Solarsiedlung (Solar Settlement), (4) Vauban Lane (Allée), (5) Merzhauser Road, (6) Vauban combined heat & power (CHP) plant, (7) 30 Passive Houses, (8) Vauban Car Park (Freiburg 2014)*

a group of students decided to transform the barracks into affordable places in which to live (SUSI 2014). It was suggested that during this period, the municipality was already planning to dismantle the barracks for new developments. Upon foundation of the S.U.S.I. and the public recognition of its initiative to use the barracks for socially, economically and ecologically sound development, the City and the Federal government agreed to designate initially, four (later 10 barracks) of the 24 barracks for their conversion concept (see Figure 8.1). The S.U.S.I.'s vision to develop affordable living space for those that wish to commit proactively in the process was perceived as an exciting opportunity by other citizen groups. Thus, the City of Freiburg founded Forum Vauban in the autumn of 1994 in order to facilitate 'enhanced citizen participation' (Forum-Vauban Öko-Institut 1999) and subsequently organized a design competition for the development of its master plans.

With regards to the competition guidelines of the master plan, Forum Vauban has proposed the overarching theme of "*learning while planning*" in order to establish extended participation of the citizens and stakeholders. The draft proposal submitted by the architectural firm '*Kohlhoff & Kohlhoff*' (together with the landscape architects 'Luz & Partners' and transportation planner Hans Billinger) [63] was selected as the winning entry which led to the development of the preliminary plans as early as 1995. Subsequently, the marketing of available plots was launched and the initial phase of construction was initiated in 1996. In the following year (1997), legally binding zoning plans were formulated [64] through which the land development and housing constructions began (see Figure 8.1). According to the authors of the book published jointly by Forum Vauban and Öko-Institut (1999), the basic principles upon which the urban planning of Vauban was developed, mainly included these following aspects:

- *Extensive conservation of the old trees around the site where the barracks were situated (here it was suggested that all designated avenues were to have groups of trees);*
- *"Shielding" of the site against the "emission" zones such as the railway embankment to the west, the industrial area to the north and Merzhauser street in the east as well as opening the building towards the south recreation area "Schoenberg";*
- *Establishing a "learning plan", that would enable flexibility towards the changing needs, requirements and aspirations, thereby to create a colorful, diverse development that would promote future or experienced concepts of modern, ecology-oriented residential and traffic solutions.* ***(Forum Vauban & Öko-Institut 1999, p.126)***

Based on these elements that helped to guide the development of the conceptual designs, the urban plans were developed with emphasis given to the residential density in the southern and central areas. The commercial and mixed-use functions were located in the

63 http://ravb.nl/learning-german-neighbourhood Accessed on August 9, 2014

64 http://www.vauban.de/themen/14-vauban/mobilitaet/194-verkehr-kapitel-4 Accessed on August 9, 2014

northern sections while the area between the residential lots and the Merzhauser Road **(Zone 5 in Figure 8.1)** in the east was planned for mixed-use development. With regards to the connectivity within the development, the east-west axis was found most convenient as the Vauban Road (also referred as the Vauban Allée in literature) **(Zone 4 in Figure 8.1)** already existed centrally as an axis line and this was incorporated with a tram service later in the process. Vauban Road also serves as the distribution line for residents to access the housing lots after having entered into the development from Merzhauser Road.

The green spaces in Vauban are mostly located in between the plots that were aligned on a north-south direction while some building designs allowed for spacious green courtyards in which people get together and socialize (Forum-Vauban Öko-Institut 1999). The building facades mostly have exposure toward the east and west [65], therefore, they can make efficient use of the sunlight especially in terms of the roof space designated for photovoltaic panels. Most of the space in the development was allocated for residential use and for the natural habitat in Vauban. The car park was located in the southeast entrance of the development **(Zone 8 in Figure 8.1)** in order to keep the 'open space' free of vehicles. This was to encourage people to walk and cycle in a relatively safer environment. There is a section in the northwestern edge of the development which is currently used as a recreational area featuring a community garden, which is also designated for additional parking space if required in the future (Freiburg 2014).

In designing Vauban, much emphasis was given to creating a vibrant residential development with exciting public spaces where the residents would engage in various activities and socialize with one another. Thus, it was crucial to plan focal points with leisure and recreational functions as well as spaces for small businesses in order to maintain long-term interest in the development. It was therefore, required to abandon the modernist approach to urban planning with "*separation of functions*" and plan a vibrant community life instead (Forum-Vauban Öko-Institut 1999). This was reportedly done via integrating a balanced mix of elements with physical, social and environmental qualities.

Some of these and other physical and environmental characteristics of the Vauban development were further discussed in Sections 8.4.4 and 8.4.6. More significant quality however, was found in the context of Vauban's initiation, planning and implementation. An extensive / extended mode of public-community partnership (PCP) was found embedded in the whole process, one which contributed positively to the integration of environmental innovations as was also discussed later in this chapter.

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65 http://www.telegraph.co.uk/earth/energy/solarpower/10996273/Most-solar-panels-are-facing-the-wrong-direction-say-scientists.html Accessed on August 28, 2014

> *"The inception and implementation of Vauban's green and brown innovations needs to be understood in the context of a unique planning culture that has evolved in Freiburg in general, and among the stakeholders involved in the planning of Vauban in particular."* **(Scheurer & Newman 2009, p.8)**

As Scheurer and Newman (2009) highlighted, the context in which Vauban's development was selected and initiated, can be linked to Freiburg's extensive citizen awareness in proactive planning and governance since the 1970s. The City of Freiburg has adopted rigorous plans to implement pedestrian-friendly land-use policy and later prioritized the expansion of its tramline to the city center. These became exemplary for new district developments in Freiburg as well as for other cities in Germany. According to Scheurer and Newman (2009), Vauban represents the ideal sustainable neighborhood model based upon a car-free environment, building integrated renewable energy applications, which is a result of Freiburg's efforts in sustainable urban planning, including the first solar powered demonstration buildings that were developed in the late 1970s.

8.3.1 The goals and objectives of Vauban's development

The vision and objectives of Vauban in Freiburg evolved around three thematic approaches. These included, firstly, integrating an efficient land-use and development with extensive transport infrastructure to encourage walking and cycling, thereby reducing car-use and ownership. Secondly, implementing the City's "low-energy standard" in housing and building practices, to help to achieve Freiburg's previous goal of 25% reduction in CO_2 emissions until 2010 (Kasioumi 2011). Thirdly, empowering extensive citizen participation in design and implementation of the project through continuous consultation with actors including scientists, academics, expert professionals and future residents who were willing to actively take part in the development process.

Additionally, the book published jointly by '*Forum Vauban e.V.*' and '*Öko-Institut e.V.*' in 1999, stated the following goals and objectives, which were outlined by the City of Freiburg prior to the development of the draft urban plans (*directly translated from German language via Google Translate*).

These included:

- *Creation of a near-downtown housing;*
- *Mixture of living and working (a mixed-use as well as a commercial area next to the residential area);*
- *Creation of housing for different (diverse) social groups;*
- *Smaller sub-division of land for plots, with diversity in the building structures;*
- *Maintenance / enhancement of existing natural habitat and creation of new natural spaces, rainwater infiltration;*

- *Promotion of public transport (bus and urban rail connection) as well as the pedestrian and bicycle traffic;*
- *Connecting all buildings to the district heating system and making low energy buildings mandatory;*
- *Development of a district center with shops for everyday needs;*
- *Establishing a primary school and childcare facilities, and;*
- *The establishment of an enhanced public participation.* ***(Forum Vauban & Öko-Institut 1999, p.19)***

Based on further research, additional elements were found in the Forum Vauban's information portal (Vauban.de) [66] that described the objectives of the development more in detail. (See Box 8.1)

Box 8.1 The objectives of Vauban development as outlined in the official website; www.Vauban.de.

- *Balance of working and living areas; balance of social groups;*
- *Division of land into small lots and preferential allocation to private builders and co-operative building projects;*
- *Integration of future building owners;*
- *Conservation of the 60-year-old trees and the biotopes of the bordering creek;*
- *Priority to pedestrians, cyclists and public transport;*
- *Privileges for car-free living;*
- *Co-generation plant and short-distance heating system;*
- *All buildings to be built at least with improved low energy standard (65 kWh/m2 per annum);*
- *Preferences for building owners that reach passive house standard of 15 kWh/m2 per annum in specially designated areas;*
- *Extensive use of ecological building materials and solar energy;*
- *Infiltration of rainwater into the ground, ecological sanitary systems;*
- *District centre with shops for the daily needs;*
- *Provision of primary school and kindergartens;*
- *Public green spaces, designed together with the local residents, neighborhood center for social interaction, cultural events etc;*
- *Diversity of building shapes;*
- *Family and children friendliness.* (Freiburg 2013b)

As presented in Section 2 of Appendix III, the level of goal achievement in Vauban has been strongly linked to the early involvement of various organizations and actors in the planning stage which in turn led to the design of realistic and attainable objectives that were clear to all parties from the beginning. This was observed partly due to the previous urban development projects, including the Rieselfeld development that was claimed

66 http://www.vauban.de/en/topics/history/276-an-introduction-to-vauban-district Accessed on August 14, 2014

to have provided valuable experiences and lessons for the Freiburg City (Ornetzeder & Rohracher 2006). In summation, Vauban has become an internationally recognized best practice in sustainable urban development and therefore has been selected for this research by the author of this thesis.

In the following sections of this chapter, the Vauban development was investigated through the six factors that were identified and characterized to play a role in helping to create successful eco-town developments in the Northwestern European context. These factors were identified primarily as the *political commitment, timing, financial model, physical qualities, stakeholder involvement and environmental plan.* The author subsequently expanded upon the findings on the level of success of Vauban in Freiburg, based on the following three groups of indicators:

a. *Dissemination of positive results and experiences*,
b. *Community's behavioral and cognitive adaptations*;
c. *Policy changes and adjustments*.

8.4 The assessment of the Vauban development through the six factors identified for developing successful eco-towns

8.4.1 Political commitment

1.1. Local government supported the development from the initiation;
1.2. National or regional governments supported the development and were in consensus in terms of the goals of the development;
1.3. Constant monitoring of the established codes and standards was performed;
1.4. The local government helped to facilitate the policy management in order to most efficiently achieve the development's goals and objectives. (See Table 5.5 in Section 5.3.1)

As discussed in Section 1 of Appendix III, political and citizen movement toward adopting environmentally sound urban policies dates back to 1970s and 80s in Freiburg (Kronsell 2013). The most significant achievement of the City's historical evolution in the past three or four decades was establishing the culture of citizen engagement in decision-making on issues concerning the urban policies. This was found to be highly evident during the initiation of Vauban. Because of changes that occurred in the local political institutions, the citizens were given more power in local politics since the beginning of 90s (Kronsell 2013). Above all, the City's decision to initiate and promote the citizen's wishes to collectively plan and develop Vauban was found to be key for its successful implementation. Forum Vauban was found to be instrumental in terms of communicating the aspirations of

all stakeholders, formalizing citizen participation through establishing the building groups (Baugruppen) and in promoting the project via public gatherings, workshops, seminars and conferences both nationally and internationally. The City of Freiburg, the Federal Environmental Foundation (DBU) and The European Union LIFE Program have all supported this initiative (Scheurer & Newman 2009), which is further discussed in Section 8.4.3. Therefore, the ***political commitment*** was found to have contributed positively to the development process, and helped to ensure its positive outcomes.

> *"It is mentioned that a particular political culture – the "**Freiburg mix**" (Hopwood 2007, p. 54), which includes the urban society as the bearer of sustainability – has been a crucial factor for successfully implementing sustainable urban development."* **(Freytag et al. 2014, p. 5)**

According to Hopwood (2007), the City of Freiburg's long-term commitment to environmental planning and policy adjustments have resulted in the trust of prospective residents. Over time these efforts attracted those who were interested in environmentally sound sustainable lifestyles. The political climate provided the much-needed confidence and empowered the citizens to shape their communities in accordance with their environmental ideals (Hopwood 2007). The Green Party, the Social Democrats (SPD) and the Christian Democrats (CDU) all agreed that the environmental objectives were highly important to "*prioritize*" and that there were very few conflicts among the major parties with regard to policy decisions and measures concerning environmental protection (Kronsell 2013). It was found, through the review of relevant literature, that the political commitment to Vauban's development was not only a result of the policy actions and objectives of the Green Party but also the consensus among the political leaders gathered around a common purpose of long-term sustainability.

One of the most significant indicators in terms of the political commitment has been found as the federal and local subsidies that were made available for encouraging bottom-up, low-carbon initiatives throughout Germany (Williams 2013). These included but were not limited to refurbishment projects of single units to low-energy housing developments in the size of Vauban through low-cost capital loans. Furthermore, the feed-in law in Germany guaranteed grid access that is applicable to all renewable energy producers, which offered political and economic conditions / security for commercially viable investments (Williams 2013). In the case of Vauban, 'badenova', the energy utility company, additionally provided funds for local low-carbon community-led projects. Together with other local and federal subsidies, much of the economic incentives and motivations were the results of political engagement for establishing sustainable communities / developments at local and national levels.

8.4.2 Timing

2.1. The decision to proceed with the development was based upon anticipation of a great event, which could provide momentum and popularity among stakeholders;
2.2. The development was a result of a national policy action plan;
2.3. There was a housing shortage and high demand at the time of the decision to develop;
2.4. The economic indicators looked positive in terms of mid and long-term affordability of the houses.
(See Table 5.5 in Section 5.3.1)

With regards to 'timing', several factors were identified to significantly play roles in the decision to develop Vauban. One of these was the termination of the presence of French Military based in Freiburg on which Vauban was developed, and the City's decision to use this space for future housing developments. Secondly, the increasing housing demand in Freiburg during early 1990s made this area attractive for developers due to its relatively close proximity to the urban center, which resulted in the citizens' initiative to create more affordable social housing. This was subsequently delegated through the non-profit organizations and citizen groups.

In addition to these main factors, the initial concept to build and live in environmentally friendly developments were increasingly discussed after the Chernobyl accident in 1986 (see Appendix III) followed by the Earth Summit in Rio in 1992. Soon after, Rieselfeld [67] development was initiated in 1992 with similar ideals of Vauban's, yet with more modest campaign on energy efficiency, traffic and environmental goals. While Rieselfeld provided the momentum for future eco-developments, the experiential process provided valuable lessons for Freiburg's city administration especially in regard to the citizen participation model and the procedural design of the project.

This research also identified the economic conditions in which Germany's post reunification period experienced three-yearly business cycles. These were mostly affected by external events and domestic policies that were mainly related to the labor market (European Commission 2002). In these cycles, economic growth and slowdowns were experienced especially during and between the years 1992, 1995 and 1998, which not only affected the overall economic activities or businesses but also influenced the nature of housing markets and construction related sectors. According to the EC Report (2002), during and after the reunification of East and West Germany, population growth accelerated signifi-

67 The Rieselfeld development located in the western part of Freiburg, is built on a land area of approximately 70 hectares, previously used as a sewage farm. The planning started in 1992 and the development began in 1993. The first phase of construction was completed in 1996 followed by the next three phases throughout much of the 90s and early 2000s. The number of inhabitants was reported to be around 9,200 in 2010. (http://de.wikipedia.org/wiki/Rieselfeld_(Freiburg_im_Breisgau) Accessed on August 21, 2014)

cantly more between 1988 and 1993 than in most OECD countries except that of the very large economies (European Commission 2002, p.16). With regards to the housing market, these fluctuations in the economy dramatically affected the building of residential and non-residential developments, which represented 60% and 40% respectively (European Commission 2002, p.30). Despite the strong demand for rental apartments in the first half of the 90s, the policy change to cut back subsidies to low-cost housing projects after 1995 resulted in the change of investment decisions and changes in the types of buildings in general. In Vauban, the economic indicators as well as the demand in the housing sector for both affordable rental and for ownership were found to be strong and these positively impacted the process during initiation and throughout the implementation phases.

In light of these findings, the ***timing*** for Vauban's initiation was found to have positively influenced its outcome.

8.4.3 Financial model

3.1. Initially and also throughout the process, the funding of the core management teams was fully provided;

3.2. The funds were allocated for the municipality's ownership of the land on which the development was built;

3.3. The funds for infrastructure and for the integration of innovative systems (such as energy, water, building technologies etc.) were made available through grants, long-term loans and / or subsidies;

3.4. The long-term financial plan was formulated and secured to ensure the planned delivery and occupancy of the units.

(See Table 5.5 in Section 5.3.1)

The overall budget of Forum Vauban for the work period between 1995 and 2001 was estimated to be around €2 million. Within this budget, the organization's main tasks included but were not limited to providing and maintaining citizen participation, facilitation of building groups, organization of seminars and supporting publicity campaigns.

- Forum Vauban was initially financed with approximately €200,000 obtained from the Project Group's budget.
- Additionally, the German Federal Foundation for the Environment (Deutsche Bundesstiftung Umwelt, DBU) provided €83,647 (equivalent of 163,600 DM usable for the period between 1996 and 1997) [68], which later reached a total of €200,000 for the period between 1996-2002.

68 http://www.vauban.de/themen/buergerbeteiligung/249-fachliche-begleitung-bürgerbeteiligung Accessed on August 21, 2014. More detailed information on funding details are found in this link: https://www.dbu.de/PDF-Files/A-07968.pdf Accessed on August 21, 2014

- Furthermore, a sum of €700,000 was provided by the European Union's LIFE Program for the period between 1997 and 1999 (Sperling 2002). A more accurate figure was found through the review of a report published on the ex-post evaluations of the EU's LIFE Program that the NGO-Foundation in Vauban was funded with around €715,000 from a total budget of €1,575,819 (COWI 2009).
- Membership fees of circa €10,000 per annum were estimated to have provided extra income to support the project management and organization's core duties.

Land acquisition:

Although the information on the overall value of the land and development were found to be somewhat sketchy initially, upon in depth research, the following data were obtained from various sources.

Through the review, it was found that the City of Freiburg had purchased the initially designated land from the Federal Authorities for a sum of approximately €20-20,5 million *(DM 40 million – the value in Deutsche Marks obtained from Vauban e.V.)* (Freiburg 2013b). In purchasing the land, a reduced price of €54/m2 was agreed upon compared to the €425/m2, which was the rate in the surrounding locations.[69]

Based on the information gathered from the official website of Vauban (Vauban.de), the S.U.S.I. organization had purchased four barracks, which were negotiated through the City officials for a price, equivalent of €10 million that was made payable in long-term installments. In gathering this amount without the initial investments, the funds were raised through a combination of capital market loans, low-interest bank loans available for social and student housing grants and also through allocation of individual savings of future tenants, all of which were paid back by 2013.[70] Additionally, the land on which the Solar City (Solarsiedlung) was developed on the eastern section of Vauban was purchased for €11.6 million (Freytag et al. 2014). This revealed that the initial investment made by the City authorities had a return of approximately €1.6 million before the development began.

> *(It is worth noting that the data with regard to the cost of the initial purchase of land have varied. In some sources the land value was stated to be around 20 million Euro equivalent in DM, while in others it was 20.5 million Euro including the Forum Vauban's website where this information was obtained.)*

69 http://www.energy-cities.eu/IMG/pdf/Sustainable_Districts_ADEME1_Vauban.pdf Accessed on Aug. 21, 2014

70 http://www.google.com/#q=Selbstbestimmte+Unabhängige+Siedlungs-Initiative Accessed on August 7, 2014

Subsequently, the project was given a special status (Sperling 2002) with its own budget of €85 million [71] controlled by the Project Group Vauban (see Figure 8.2 in Section 8.4.5).

> *[In spite of these widely substantiated figures such as those mentioned by Sperling (2002), it was also found through a document published by the City of Freiburg, that the funds that were made available by the City Council through LEG Baden-Württemberg, included the expenses to set up the new settlement and were €94 million with an ending period of until December 31, 2006. (Veith 2005)]*

This budget included approximately €5 million to help remediation costs, building the neighborhood center, kindergartens and primary school, which were all provided by the Redevelopment Fund of Baden-Württemberg as well as the City of Freiburg. These subsidies and funds were made available on terms of payment after income was generated through the plot sales. According to the official website of Vauban district (Vauban.de), the City of Freiburg had claimed that the site development (remediation, roads and infrastructure) had cost around €96 million including the purchase price of the land. [72]

Construction costs:

With regards to the actual costs incurred by the site preparation, remediation of the land prior to construction were found to have had an estimated cost of approximately €10 million (Veith 2005). Based on the Forum's brief analysis of construction costs, varying estimations were made depending on the quality and the context of building types. For example, the accommodation units built by S.U.S.I. had an average cost of 500 EUR/m2 without the land and acquisition costs. The housing units built by the GENOVA Housing Association, however, had a higher rate. The construction of these units were claimed to have a cost of 1250 EUR/m2 including land, tax, architect's and other professional fees with relatively better design qualities and extra features such as elevators etc. [73]

Furthermore, the buildings that were developed in Solarsiedlung with higher technological qualities and design attributes, the development cost ranged between 2,700 EUR/m2 and 3,300 EUR/m2 depending on the type of fittings and other details (Hagemann 2007).

(According to Freytag et al. (2014), the overall development cost of Solarsiedlung was estimated at around €40 million excluding the cost of land which was €11.6 million.)

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71 http://www.carstensperling.de/pdf/dubai-erg.pdf Accessed on August 22, 2014

72 http://www.vauban.de/themen/12-vauban/planung-daten/22-fragen-antworten-faq Accessed on Aug. 22, 2014

73 http://www.vauban.de/themen/12-vauban/planung-daten/22-fragen-antworten-faq Accessed on Aug 22, 2014

Based on the comprehensive review of the literature on the overall cost estimations (most of which has originated from studies conducted by Sperling (2002); a total of around €500 million were invested in the development of Vauban.

Moreover, there were other funding schemes and municipal arrangements that were made available, which facilitated the implementation of large-scale projects and integration of innovation within the development. For example, 'badenova,' the energy company provided direct subsidies for renewable energy projects in cooperation with a local bank (Solar Fabrik) and still provides low-cost PV installations in order to stimulate the PV market. Through their operations, private investors are encouraged to purchase funds and in return gain benefits from the feed-in-tariffs (Hopwood 2007).

As a result of the overall public-community partnership model, the building costs of the homes in Vauban were found to be 15-25% less than similar buildings found elsewhere in Freiburg. This significant saving in building costs was attributed to the collective building schemes, which reduced procurement of materials and craftsmanship. The extra costs incurred by the high-energy efficiency standards and integrated technologies however, were claimed to be 10-15% more when compared with buildings that were developed through conventional systems and technologies in that area.

In summary, the financial model through which the Vauban development evolved, was found to have been strongly related to the successful delivery of housing units as well as with the overall high quality of this development.

8.4.4 Physical qualities

4.1. The development has an attractive design with distinctive architecture;
4.2. The building standards and the quality of the materials were relatively higher than the conventional developments around the city;
4.3. The amenities and facilities in the neighborhood and its vicinity were well thought-out and they satisfy the day-to-day needs of the residents;
4.4. Natural environment within the development and its surrounding area provide great potential for walking, cycling and exercising while enjoying outdoors;
4.5. The neighborhoods and the district are well connected through walk and bicycle lanes as well as with good public transport;
4.6. Eco-friendly energy, water, waste and transport systems were well embedded in the design of buildings and the urban spaces. (See Table 5.5 in Section 5.3.1)

With regards to the physical qualities and characteristics of Vauban, the attributes were often discussed in the context of energy efficiency of buildings and protection of natural habitat in which traffic is either limited or excluded. These certainly describe the main themes upon which

the development was contextualized. However, Vauban is one of the very few developments where the 'with-user' design approach was adopted effectively rather than the 'for-user' design, and thus created a warm ambiance with socially inclusive open spaces within buildings and among neighborhoods. Due to the extensive involvement of citizens (more specifically the future residents) in the planning stages (Forum-Vauban 2000), the functional design approach was found to be dominant throughout the development. Most significant attributes with regards to the physical qualities included the diversity of architecture, choice of materials from renewable resources and creation of social spaces as each building group contributed to the building designs and outdoor planning in line with their own aspirations and needs.

Mostly 4-5 storey multi-family residential buildings were planned in order to make best use of the surrounding nature with inner courts that can be used by all inhabitants. With regard to the indoor planning, the living rooms, dining and bedrooms were designed to receive much light with wide window openings to either balconies or terraces. With regard to the energy efficiency; all buildings were designed to meet the minimum level of the 'Freiburg Low-Energy Standard' that permits a maximum of 65 kWh/m2 per year consumption for heating since 2001 (Scheurer & Newman 2009). Besides the passive houses, there were also built 'plus energy' structures, all of which were designed to consume less than 15 kWh/m2 per year energy for heating. Moreover, according to Scheurer & Newman (2009), most structures in Vauban are equipped with solar heating and photovoltaic panels as well as with mechanical ventilation and heat recovery (MVHR) systems due to high level of insulation required for increased energy efficiencies. The energy requirement for heating of some passive house applications were measured to be as low as 13.2 kWh/m2 per annum, while most housing units were built better than the standards required for the Low-Energy Code (see Section 8.3.1).

Simon Field's (2011) study of Vauban's planning has revealed a great deal of emphasis on the transport design including accessibility to public transportation and connectivity within and outside the development. Based on this report (Field 2011), the vehicle mobility design provided streets to be developed as pedestrian-friendly, which also served as social spaces for Vauban's residents. The net density of residential units in Vauban is between 90 and 100 households per hectare (Scheurer & Newman 2009) which is relatively compact. The development mostly consists of row housing and apartment buildings with reserved space required for traffic, recreation and other amenities.

Besides the main focus on energy and traffic aspects, water and waste were also emphasized in the planning. Rainwater is collected through open gutters and collected in ditches for further use in toilets, laundry or gardening after filtering occurs through natural processes. In some buildings, black water is flushed through the vacuum-toilets (without using water) into gas reactors that produce methane to be used in cooking and liquid fertilizer (Forum-Vauban 2000). The grey water from kitchens or bathrooms is further treated through aerated sand filters.

Furthermore, the amenities in the Vauban development include a number of services (Frey 2010) such as but not limited to a primary school, shops, nurseries, kindergarten, playgrounds, a pub, cafes and restaurants, bakery, food shop and supermarket, book shops, bicycle shop, a music shop, a pharmacy, bank, hotel and community office and center (Frey 2010).

With regards to the physical qualities, Vauban is a clear example of a successful "with-user" design approach, which contributed positively to its development process, hence the outcome. Despite some social concerns addressed by Freytag (2014), the innovation that was demonstrated in the Solar City (Solarsiedlung) in Vauban showcased that these technological features can positively influence contemporary architecture when used as smart design attributes.

8.4.5 Stakeholder involvement

5.1. The multi-disciplinary approach / multi-actor involvement existed from the design stage and throughout the development;
5.2. The existing and future residents were included in the design process;
5.3. The existing and future residents influenced the decision-making process on issues effecting the outcome;
(See Table 5.5 in Section 5.3.1)

With regards to the formation of actors, many entities, organizations and individuals including its residents were found to contribute to the planning and implementation processes in Vauban's development. The independent NGO (Forum Vauban) played a central role in establishing the organizational structure. It functioned as the organization to support the planning and implementation stages of the development through facilitating extended citizen participation. It further provided help in the coordination of community-based projects and in establishing building groups (Baugruppen) for co-housing and co-operative building projects (Freiburg 2013b), such as Genova building co-operative and the Buergerbau AG (City of Freiburg 2013). [74] According to the City of Freiburg (2013), other actors that were involved in the development process of Vauban (see Figure 8.2) included:

74 According to the City of Freiburg (2013), the Genova building cooperative was founded in 1997 as a traditional form of self-organizing, collective building entity in order to develop communal property. Based on City of Freiburg (2013), Genova's policy was to integrate people from diverse social and economic backgrounds regardless to demographic characteristics. Its emphasis was to collectively design the architecture and plan the individual apartments. The cooperative built 36 units, a communal house, a guestroom and a laundry (Vauban.de). The Buergerbau AG on the other hand worked as a corporation that offered professional services and also building activities. It also provided marketing and advertising in order to find future building owners and collectively managed the building process through which the building owners/groups were claimed to cut costs and implemented tailor-made high quality structures. According to the information gathered by the City of Freiburg, Buergerbau manages five building groups comprising 68 households in total. http://www.buergerbau.de/ Accessed on August 16, 2014.

- *The Institute for Applied Ecology (Öko-Institut);*
- *International Council for Local Environmental Initiatives (ICLEI)'s International Training Centre (ITC);*
- *Freiburg's public utilities (Freiburger Energie and Wasserversorgungs AG - FEW), currently known as 'badenova;'*
- *Freiburg's car sharing association (Freiburger Auto-Gemeinschaft FAG);*
- *Passive house "Wohnen & Arbeiten" (Co-Housing Initiative);*
- *Approximately another 30 private co-housing associations (Baugruppen) and co-housing initiatives.* **(City of Freiburg 2013 – Vauban.de)**

Another instrumental group in facilitating the development process was the City Council's appointed committee (also referred as GRAG) whose members consisted of representatives from political parties, consultants from Forum Vauban and other representatives from the City administration (Sperling 2002). This committee served as a platform for information exchange, discussion and collective decision-making (Kasioumi 2011). Furthermore, a Project Group, which consisted of five to seven employees from the City's Planning and Building Office, was established in order to work closely with the City's property trustees, implementing the decisions of the committee, dealing with the project budget (Kasioumi 2011), and to provide coordination between local authorities and administrative management for issues concerning Vauban (Sperling 2002).

As Williams (2013) noted that the '*long-term political support for collaborative planning is required for success*' (Williams 2013). She further suggested that engagement of public authorities with institutional structures (such as community cooperatives, forums and co-building groups) would be required in co-designing and co-provisioning during development processes in order for effective community action. Such cooperation was found to be very strong in the development of Vauban from the early stages of initiation throughout the development and governance.

Kronsell (2013) suggested that a clear sustainability and low-mobility agenda gave the citizens the flexibility to involve in the planning process and co-design their homes, which she referred as 'responsible planning'. She described this process, in reviewing Vauban's achievements, both inclusive and reflexive, as it was a step-by-step learning process (Kronsell 2013). In reference to one politician's comments on **Vauban and Rieselfeld** developments in Freiburg, Kronsell (2013) quoted that:

> *"the planning experiences were found as good examples of the kind of social learning that can take place when participation is done early, is genuinely inclusive and is built on the ideas of engaged citizens. These are also the kind of processes that need to be enacted when it comes to climate politics."* **(Kronsell 2013, p.976)**

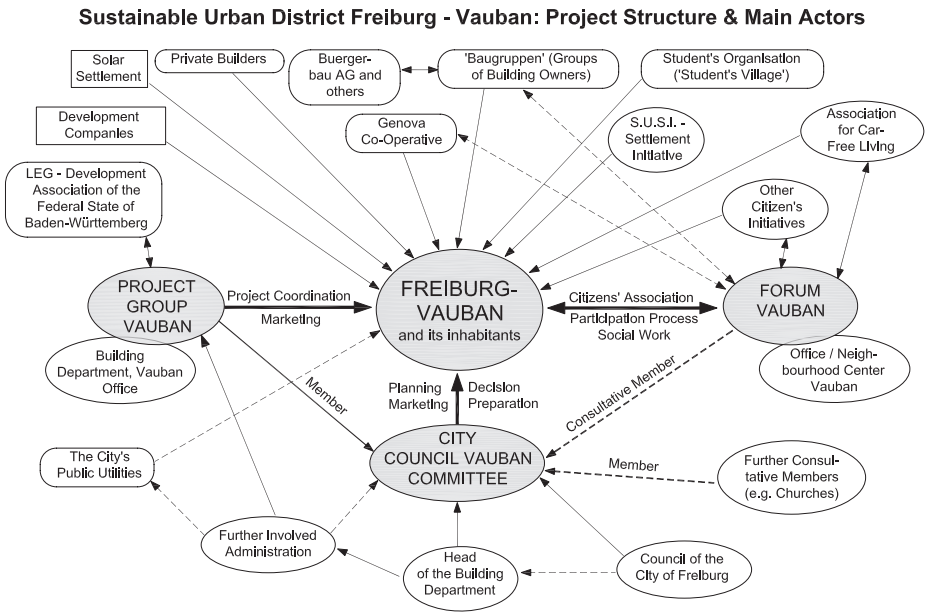

Figure 8.2 Vauban's development framework titled: *"Sustainable Urban District Freiburg- Vauban: Project Structure & Main Actors" developed by Öko-Institut e.V. (Brohmann et al. 2002); original version of the framework's illustration can be found in this link: http://www.vauban.de/themen/14-vauban/mobilitaet/194-verkehr-kapitel-4 Accessed on August 19, 2014*

Based on the review of relevant literature on Vauban, the overall development process was found to be built on the stakeholder involvement and proactive citizen participation during the design and implementation. Therefore, stakeholder involvement and its contribution to the development process were found to be exemplary and affected the outcome positively.

8.4.6 Environmental model

6.1. The development had a clear environmental plan with realistic goals that were established from the beginning;

6.2. The environmental standards were monitored and ensured throughout the process;

6.3. The future residents and actors (developers, builders, architects etc.) were involved in the decision-making when the environmental plans were established;

6.4. There was a clear plan on how to operationalize the environmental model and to achieve environmental goals and ambitions. (See Table 5.5 in Section 5.3.1)

Vauban's environmental plan included but was not limited to the introduction of energy efficient design of buildings and integration of renewable energy systems; extensive use

of sustainable building materials; infiltration of rainwater as well as the use of ecological sanitary systems (Freiburg 2013b) or low-mobility with reduced car ownership. Other goals included promoting public transport, walking and cycling; extensive citizen engagement in the development process and in the balance of social groups.

With regards to operationalization of these goals and objectives; the exemplary organization of the institutional structure as discussed by Williams (2013) and mentioned in Section 8.4.5, was found to be instrumental. The foundation of Forum Vauban and its work in negotiating / communicating these objectives with all actors involved in the process, helped to promote the culture of participatory planning and building, and also helped to establish Vauban's environment-friendly community. As Scheurer and Newman (2009) underscored, the '*inception and implementation*' of Vauban's environmental plan (or the green and brown agendas, as they referred) needed to be understood in the context of the planning culture that evolved in the 70s and 80s in Freiburg. This extensive participation in the planning and decision-making was evident among the stakeholders involved in the Vauban's development (Scheurer and Newman 2009). In depth research further revealed the extent to which the participatory planning process resulted in the achievement of the initially desired goals and objectives.

For example, with regards to energy efficiency measures for heating and cooling of buildings, the built units were planned to consume an average of 65 kWh/m2 per year compared to 100 kWh/m2 year for new constructions and 200 kWh/m2 year for relatively older structures in Germany. In Vauban, the environmental plan included the development of passive and plus-energy houses. The passive houses were designed to use maximum energy for heating in average of 15kWh/m2 year while plus-energy units were designed to produce more energy than they consumed.

Furthermore, a combined heat and power plant (CHP) was introduced to help to improve district heating through burning wood-chips. Additionally, the solar heaters and building integrated photovoltaic panels were used extensively to make optimal use of solar sources of energy.

The second overarching theme of the environmental plan involved an ambitious traffic or low-mobility concept within the district. This included primarily reducing the number of parking spaces to 0.5 per household although the legislation dictated every household to have access to parking space in the State of Baden-Württemberg. This was further emphasized through the sales of parking spaces for those who wished to own cars. In addition to the reduced traffic, the ban on personal motor vehicle-use on some streets was decided in order to ensure safe zones for kids to play and for residents to walk and cycle. Despite its late introduction, the tram service became operational in 2006 further reducing the car dependency in the area.

With regards to water, waste and wastewater management; 'Reducing, Recycling and Reusing' as an approach, was emphasized in the environmental planning of Vauban. Although some critical views were found in terms of the lack of clear definition of environmental goals on these aspects, the Freiburg City's Environmental Policy document presented improved strategies to increase effective planning and implementation of measures in the new developments.

The environmental plan was found to be mostly based on the community's bottom-up commitment rather than a top-down design of rules and measures. The overall concept to reduce environmental impact and to provide socially and physically healthy lifestyles was transformed into goals that were embedded in the design and implementation, which were also supported by local and federal schemes.

With regards to the overall success of the environmental plan; this was often discussed in reports and research results derived from theoretical models. These studies specifically focused on measuring of CO2 reductions associated with the applications of each innovation but not so much based on the continuous monitoring of environmental performances and results that can help to perform comparative analyses among similar and other developments. Therefore, in the following sections, the author of this thesis, explored and expanded upon the factors that were identified to be crucial to establish successful eco-towns and worked to clarify the reported successes found on Vauban based on empirical evidence.

8.5 Evaluation of Vauban based on the 'success factors'

8.5.1 Dissemination of positive results and experiences

As discussed in this case study report, Vauban's development followed a relatively early trend of environmental movement that began in the 70s and 80s. The culture of environmental planning, eco-friendly approaches in building and design were established along with the culture of participatory and collective action on issues concerning the communities in Freiburg. This was found to be highly evident in the case of Vauban. As a result of the combined results and experiences gained during Vauban's and from other earlier developments such as Rieselfeld, the dissemination of positive results and experiences included but was not limited to initiatives such as:

- *Upgrade of a residential district of Haslach;*
- *Construction and rehabilitation of several buildings and housing blocks with eco-friendly methods and features;*
- *Retrofitting of the "Buggi-50" high-rise building and so forth.* ***(Freytag et al. 2014)***

Additionally, the City of Freiburg decided to switch to 50% co-generation for electricity and heating with CHP plants that operate through methane gas captured from landfills and / or burning of woodchips (ICLEI 2009). According to ICLEI (2009) additional measures were put in place by the City of Freiburg in order to extend the transport system, linking the walking and cycling paths to public transport nodes (bus, train and tram). Furthermore, solar energy systems (solar heating and PV) were increasingly installed on both private and municipal buildings. The City has provided the citizens with free internet-based tool to measure the performance and efficiency level of their building-integrated PV systems, thereby to take necessary action to make adjustments if required. ICLEI's report also noted that a small proportion of hydropower, biomass and wind energy projects were realized, which brought additional renewable energy into the energy mix of the City of Freiburg (ICLEI 2009).

Table 8.2 Evaluation for the 'dissemination of positive results and experiences'

Vauban	
Dissemination of positive results and experiences	
Diffusion of eco-friendly building practices;	High
Adoption by residents of innovative systems and technologies that are environmentally friendly;	High
Adoption by developers of innovative systems and technologies that are environmentally friendly;	High

8.5.2 The Community's behavioral and cognitive adaptations

With regards to the community's behavioral and cognitive adaptations, the research on the Vauban development revealed exemplary results in terms of the consumption levels, commitment to achieving the initially decided goals and promoting the community-led urban initiatives. Apart from many other developments that are often initiated through top-down decision-making and governance with little or no effective citizen participation in planning, Vauban demonstrated how the '*cultural context influences community stakeholders' involvement in collaborative planning process, thus it prioritized environmental measures and objectives*' (Williams 2013, p. 695).

Despite the overwhelming data on the energy consumption levels in Vauban's various house types (energy-efficient, passive house, plus-energy), most reports were found to reflect upon theoretically derived figures on energy-use (mostly for heating and cooling). As discussed more in Section 2.2 of Appendix III, the Solar Settlement (Solarsiedlung) was more efficiently monitored in terms of energy performances due to the context in which it was developed. Based on the research on the overall energy consumption, an average home with 137 m2 floor area (equipped with 49 m2 PV installations) was found to consume around 79 kWh/m2 per year average while it generates 115 kWh/m2 per year with a household size of 2.9 persons (Freytag et al. 2014; Heinze & Voss 2009).

Table 8.3 Comparative consumption levels per household and / or person in Vauban, Freiburg

Average consumption levels (mixed)	Average Persons per family / household	Energy consumption for heating & hot water kWh/ m2 year	Electricity consumption kWh /m2 (year average)	Water consumption	
				M3 / household / year	Liter / capita per day *
Vauban homes	2.3 [a]	65 [c]	23 [e]	82 [g]	98 [75] 3
Reference homes	1.8 [b]	161 [d]	Y [f]	80 [g]	122 [31]

a- Average household size based on the data obtained from Statistisches Jahrbuch 2013 (City of Freiburg 2013a, p. 41)
b- Average household size based on the same statistics (City of Freiburg 2013a, p.41) measured for the Freiburg area considered as Reference homes in this study.
c- Maximum energy consumption allowed for heating in new housing constructions as permitted by the local energy efficiency code known as the "Freiburg Low-Energy Standard" (Scheurer and Newman 2009). For Passive Houses, the maximum consumption level is determined at 15 kWh/m2.
d- Average natural gas consumption in the years 2011 and 2012 (converted into kilowatt hours per square meter) for heating and other uses in Freiburg was 138 kWh/m2 and 135 kWh/m2 respectively. (http://de.statista.com/statistik/daten/studie/234145/umfrage/erdgasverbrauch-nach-staedten-in-deutschland/ Accessed on August 26, 2014.) Energy consumption in Germany is reported to vary between 100 and 200 kWh/m2 year depending on the building's age and period in which it was built. Based on the theoretical model (bdew 2010) developed to determine the energy consumption ratios per household, an average household in Freiburg is estimated to use 168kWh/m2 year total. Also based on the report published by UBA (2011), the energy consumption for space heating in 2007 was measured at 161 kWh/m2 annum average (UBA 2011).
e- Average apartment with floor area of 86.35 m2 was found to consume 2000 kWh/year. http://www.immobilienscout24.de/expose/74226345 Accessed on August 27, 2014
f- Water consumption in cubic meters per year, was derived from the per capita per day consumption. This conversion was performed through the following exercise:
For water, 1 m3 = 1000 liters; Therefore, the water consumption per person a day can be found with the following formula using the values in the table above.
[(m^3 per year) x (1000)] / [(average person per household) x (365 days)] = liters / capita / day

NOTE: The average use of electricity per inhabitant in Freiburg is 1637 kWh / year compared to 1850 kWh / year for the average in Baden-Württemberg (Residential sector averages). Data obtained on this link: http://de.statista.com/statistik/daten/studie/217675/umfrage/staedte-mit-dem-niedrigsten-stromverbrauch-in-deutschland/ Accessed on August 24, 2014
The overall electricity consumption per inhabitant in Freiburg (including industry and the household use) was 4470 kWh/year compared to 7650 kWh/year. http://www.energieagentur-regio-freiburg.de/fileadmin/user_upload/Aktuell/2012/Endbericht_Bilanz_Region_FR_FINAL.pdf Accessed on August 27, 2014. (ERF 2012)

IMPORTANT NOTE: The average household size as indicated in Table 8.3, was obtained from the statistics data (City of Freiburg 2013a, p. 41) published by the Freiburg City. In the same report, the average number of persons living in apartments in Freiburg was 2.0 compared to 3.0 inhabitants per apartment in Vauban (City of Freiburg 2013a, p. 156). The terminology and use of language was re-checked in order to clarify the nature of contradicting information. This issue was also addressed in

75 The average water consumption per capita (in Baden-Württemberg) in 2010 was around 98 liters per day or 35,770 liters per year. In Baden-Württemberg the span of the average water consumption is 54 to 220 liters per capita per day. While one factor for this difference is the number of devices connected to a water meter per capita. another reason is the size of city, town and the type of development. The range of average number of persons per household connected to a water meter is between 1.2 (in Hagnau am Bodensee) and 17.9 persons (in Lörrach). These data were obtained from this link: http://www.statistik-bw.de/Veroeffentl/Monatshefte/essay.asp?xYear=2013&xMonth=03&eNr=07 (Accessed and translated via Google Translate on August 24, 2014) Based on further research, the data found in newspaper articles revealed that the average water consumption per capita per day in Germany was reported to vary between 120 and 125 liters per capita per day. (http://de.statista.com/statistik/daten/studie/12353/umfrage/wasserverbrauch-pro-einwohner-und-tag-seit-1990/ Accessed on August 24, 2014).

Frey (2010)'s report, highlighting the difference between the number of households and the number of physical housing units built in Vauban. For example, the updated values in report published by the City of Freiburg in 2013 of what was originally underscored by Frey in her report published in 2010 were; the number of households was 2,472 (City of Freiburg 2013a, p. 41) and the number of apartments was 1816 (City of Freiburg 2013a, p. 16). As a result, the exact phrasing of "household size" was searched and the values found under this topic were used in this case study report.

The passive houses in Vauban were claimed to use maximum of 15 kWh/m2 year while the norms in Germany require only 65 kWh/m2 (Scheurer & Newman 2009). Based on the document published by Forum Vauban, the energy required for heating for the Passive Houses in Vauban was 13.8 kWh/m2a (Forum-Vauban 2000). However, in the documents and reports, the methodology with which these values were obtained was not made clear. This thesis author assumed that it was based on theoretical models and estimations but not through proper monitoring over time. In case these values were obtained through sound assessments, they are almost as efficient as the homes built in Solar City in Vauban (see, Freytag 2014) which was 13.2 kWh/m2 year and this indicates a highly successful implementation of the measures set forth by the Freiburg Energy Standard.

With regards to car ownership; there were 172 cars owned in Vauban compared to 336 cars per 1000 inhabitants in Freiburg (Freytag 2014). Besides the fact that there were only few recent studies on the car ownership in Vauban, Melia (2010) suggested that the significant decline that was observed in the use of parking spaces could indicate that a substantial majority of households preferred to not own a car (Melia 2010). According to an earlier study conducted in 2000, of the travel behavior among the residents of Vauban; only 16% of the inhabitants were found to use cars while 64% walked and cycled. Those who used public transport represented 19% of the residents (Scheurer & Newman 2009) before the tramline became operational in 2006.

In addition to those findings, the waste generation per capita in Freiburg in 2009 was found to be 124 kg/capita/year compared to the national average of 143 kg/capita/year in Germany for the same year (City of Freiburg 2011a). These and other aspects mentioned in this section were found to be highly positive in terms of the community's responses to environmental measures and innovation.

Table 8.4 Evaluation for the 'community's behavioral & cognitive adaptations' for its special development.

Vauban	
The Community's behavioral and cognitive adaptations:	
Reduction in energy and water consumption rates;	Yes
Solid waste reduction;	?
Reduced car ownership;	Yes
Increased usage of public transport compared to car usage;	Yes
Increased level of walking, cycling etc. for daily activities	Yes

8.5.3 Policy change and adjustments

As discussed extensively in this case study report, Vauban has become an exemplary development in terms of its technical/technological and social aspects in planning and implementation of environmentally sound housing developments in the country and internationally. Freiburg's contribution to Vauban's success is highly acknowledged in terms of its climate politics, policy changes and implementations since the 1980s. Annica Kronsell (2013) argued that the ruling Green Party's strong belief '*in favor of climate measures and environmental policies'* has gained significant electoral vote over three decades, but the overall consensus on issues concerning environment was also reached through compromises negotiated between political parties (Kronsell 2013). This revealed a continuous and across-the-board support and commitment for improvement on all social, political and environmental levels. Kronsell (2013) further noted that Freiburg has been one of the pioneers in Germany in terms of pushing for urban energy transitions (Rohracher & Spath 2014) and improvement of environmental measures and urban policies (Bulkeley & Kern 2006; Kronsell 2013).

A report developed by the City of Freiburg (2011) presented various improvements with regards to environmental policy decisions and actions. These included structural changes such as the "re-municipalization" of public services especially the power companies in order to effectively modernize infrastructure and increase renewable sources in their energy mixes. 'badenova' has been a forerunner in this movement since 2008-2009, through extending its network of CHP plants and investments on biomass, wind and further PV installations throughout the region (Freiburg 2011a). Most importantly, the education on environmental protection was found to engage the students very early in schools in Freiburg. The city has been supporting, both financially and logistically the initiatives and groups to raise funds in order to contribute to various educational activities. Furthermore, special emphasis was given to enabling the curriculum to teach waste prevention, energy and water saving and other environmentally sound behaviors from early ages (Freiburg 2011b).

In light of the overwhelming amount of information gathered and studied on Vauban as well as on Freiburg, it is evident that significant policy improvements were made based upon the experiences and lessons gained on eco-developments such as Vauban and its predecessors. More importantly, their positive influence on environmental and urban policies was also found to be evident in other cities in the State of Baden-Württemberg and Germany at large.

Table 8.5 Evaluation for the 'policy change and adjustment' impacts.

Vauban	
Policy changes and adjustments	
Improvements in urban development policies on regional and national levels in terms of both urban regeneration and for new developments;	Yes
Improvements in the building codes and regulations	Yes

8.6 The summary of the Vauban case study

In this case study report, the relevant literature and the documents that were published were reviewed with emphasis given to the political, economic, environmental, physical and social aspects of Vauban's development processes. It was found that there is strong perception and consensus on the successful outcomes as a result of the development framework, more particularly because of the actor formation and extended stakeholder involvement. In spite of the somewhat fragmented empirical data in general, Vauban's performance levels measured between the years 2000 and 2006 on the physical, environmental and social qualities, were reported to be of high quality, and were found to be also credible. However it was also discovered that further attention was required to monitor environmental performances with transparency and independently at the local and the municipal levels.

With regards to the energy, water and waste management, the author analyzed the data gathered based on recent reports and peer-reviewed journal articles as well as official documents in the German language published through government agencies. The overwhelming consensus on the legitimacy of the development framework and its positive outcomes on these aspects were not only limited to Vauban but were also heavily attributed to the context that included political, economic and social dimensions in the city of Freiburg.

> *"The local context is often the place where democratic politics can be carried out more intensively and where citizens can engage actively with grass-root and local issues. This highlights the centrality of the relationship between the citizens and the leadership in an innovative city and this article suggests that the relationship can be understood through the concept of legitimacy."* **(Kronsell 2013, p. 966)**

In creating a sustainable model district, both the development framework and the implementation models were found to be the natural continuum of socio-political and socio-technical formations that evolved historically in the past three decades in Freiburg. Therefore, neither the perceived success nor the impact on urban and environmental policies can be separated or evaluated individually apart from the city as a whole. Some of the key factors in Freiburg's achievements were made as a result of on-going education (Williams 2013) learning and establishment of a wide range of research institutions, lobby organizations, NGOs and companies that are dedicated to implement environmentally sound technologies. These include ICLEI, Fraunhofer Institute on Solar Energy, Institute for Applied Ecology, International Solar Energy Society (ISES) and others that were found to be instrumental in the dissemination of knowledge (Rohracher & Spath 2014). Moreover, the utility companies, the financial institutions and the local authority were found to collectively work with these institutions in order to accomplish the City's environmental goals. In this context, it is worth noting that Freiburg's goal to reduce 25% of the CO2 emissions by 2010 compared

to the levels in 1992 was not achieved (WWF 2008) [76], thus they developed a new vision and measures to effectively cut emissions by 40% until the year 2030 (EGC-Report 2009).

The case study research on Vauban revealed that the overarching '*collaborative, systemic and market-shaping approaches*' adopted in Freiburg also resulted in the effective planning and implementation model demonstrated in the development of Vauban.

8.7 Overall lessons learned

This case study highlighted some of the critical factors that were found to play a role in the overall goal achievement of Vauban development in Freiburg. The most significant lessons that were learned during this exercise included but were not limited to the following aspects:

Firstly, the early development of the socio-technical structure led by the local government provided the platform for various groups of actors to interact with one another around a common purpose. This supported the establishment of co-building groups to take collective action in the planning and decision-making together with professionals and other involved parties for the development of their homes. The formulation of the development framework/ structure and its replicability to deliver similar results in different cultural and geographical contexts is certainly open for debate. However, the involvement of future residents resulted in the efficient operationalization of goals including those that were formulated by the City of Freiburg prior to the initiation of the development. Through the close interaction of various co-development groups, the transfer of knowledge, experiences and ideas were found to be effective, which in turn helped the experimentation of novel architectural and technological attributes.

Secondly, a unique socio-political formation was embedded from the start throughout the implementation of the project. The political commitment, as was demonstrated in Freiburg since the 1980s, helped with the rapid mobilization of local government's resources, taking the necessary regulatory measures and to make the policy adjustments. This was also observed in the foundation of Forum Vauban as the catalytic agency that became instrumental in the success of the development process. It facilitated early participation of citizens and helped to establish the building groups from interested prospective residents, thereby providing a sense of ownership from the start. Forum Vauban also organized workshops and meetings during which these community groups could communicate their ideas, aspira-

76 According to WWF (2008) report, the CO2 emissions released into the atmosphere per person in 1997 was 10.6 tons /year. The CO2 emissions per person / year in 2003 was 9.6 tons which is less than 10% reduction in six years (WWF 2008).

tions and needs. Moreover it succeeded to establish clear goals and objectives early in the planning process through negotiations and conflict resolutions with greater consensus as a result.

Thirdly, the existence of educational facilities, research institutions and companies that were dedicated to environmental technologies within the close proximity, facilitated the adoption of innovation relatively more easily, especially in the early years of these technologies. Furthermore, a wide range of financial instruments such as subsidies and low-interest capital loans were facilitated. These and other economic incentives that were made available by local and federal governments helped to get the building groups started in their developments. Additionally, the feed-in-tariffs were found to be highly instrumental for expanding building integrated renewable energy technologies including the PV installations in Germany.

Joanna Williams suggested in her analysis (Williams 2013, p. 703) that collaborative and market-shaped approaches provide more successful results in establishing low-carbon infrastructure projects when supported by entrepreneurial and collaborative form of governance. In the case of Vauban, the local authority's initiative to incorporate various actors in creating such conditions strongly existed. Moreover, the City's control over resources such as land, funds, utilities and sometimes the housing companies, greatly influenced the control over environmental measures and programs (Williams 2013, p. 696). As demonstrated in the Vauban case, the City of Freiburg gained much control and authority over the development through acquiring land, establishing preliminary guidelines upon which the co-building groups could improve and work together with the officially appointed bodies such as the Forum Vauban, The Council Committee and the Project Group all of which worked synergistically to achieve the project goals.

Vauban was found to be one of the unique examples of participatory design and implementation in which residents acted as co-planners and co-developers in building their settlement within the urban setting. The results of similar approaches may be expected differently in other social and cultural contexts (Williams 2013). It may be also possible that similar successful results can be achieved if the environmental goals and objectives are contextualized around the community's needs, aspirations and culture with the extended participation of all interested groups as was done in Vauban.

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Chapter 9

Cross Case Analysis: identifying and characterizing key ‘success factors’

9.1 Introduction

The case study research for this thesis was designed to gain a deeper understanding of the overall planning and developmental processes of the selected eco-town developments and to explore the implications and relevance of the six 'success factors' (see Chapter 3) that were used to evaluate the developments.

With further emphasis given to the conceptual notion of the eco-town's success in Chapter 5, the author of this thesis investigated five cases, the results of which are presented in Chapters 6, 7 and 8. The emphasis of those chapters was upon answering the research question: "Did the eco-town development's results achieve the goals set by their planners for improving the residents' quality of life, provide support for positive behavioral and cognitive adaptations and lead to appropriate policy changes?" In spite of the many positive experiences and lessons gained from the eco-town development processes, the author found that the overall transformative change and the 'spin off effects' were somewhat limited in terms of positive policy implementations, attainment of social and environmental goals as well as the behavioral changes to sustainable consumption and lifestyles. In this chapter, the findings from the case study research were evaluated through an integrative, cross-case analysis of the five cases to assess the results and determine how or if the findings helped this thesis author to answer his research's questions.

In performing the cross-case analysis, a 'case-comparison' approach (Yin 1981, p.63), with a reflective (qualitative) method of analysis (Dooley 2002, p.343) was found to be useful due to the context-dependent knowledge (Flyvbjerg 2006) gained during in-depth research into the eco-town development processes. In doing so, the findings through the assessments of the dependent variable (success of eco-town) and independent variables, the six 'success factors,' were reviewed to: ***a.*** test the validity of the factors that were selected, and ***b.*** to determine the configuration within which these factors can potentially contribute to improved successes within future eco-towns (see Sections 9.2-9.4).

In Section 9.2, these factors were analyzed with further emphasis on their relevance and/or of their interrelatedness affecting the outcomes. This chapter was designed to reflect upon the development phase of an eco-town in light of the findings from previous research conducted on the quality of life (QOL) aspects of residents from eco-developments and from conventional settings. The insights gained about the similarities and differences of residents' perceptions into their residential well-being, additionally the QOL dimensions were used to critically access the extent to which the 'success factors' could be more effectively formulated, so that improved, long-term, positive societal and environmental impacts can be achieved (see Section 9.3).

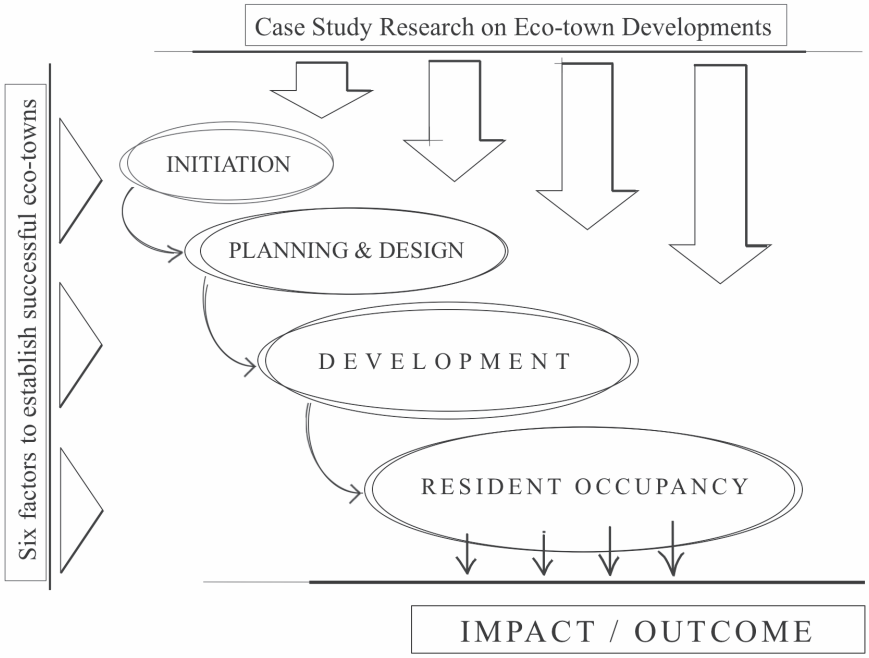

Figure 9.1 Logical structuring of the integrative cross-case analysis used in this thesis.

In Section 9.3, in addition to the findings on the QOL dimensions, which were contextualized with respect to the long-term success of eco-towns, other aspects were found to be valuable to discuss in terms of the dweller's perceptions and how these affected the planning and development processes. In Section 9.4, the author presented his conclusions in regard to the extent to which the 'success factors' had significant impacts on the outcome, and what other elements were found to influence the short and long-term successes of eco-town developments.

9.2 Assessment of the roles of the six 'success factors' in the eco-town developments studied

As presented in Chapter 3, and later expanded upon in each case study chapter for their roles in the overall development process; the six 'success factors' were found to have both *primary* and *secondary* effects in terms of eco-town's goal achievements. In some cases, the lack of one or more of the factors was found to have negatively affected the outcomes, while in others, the application of the 'success factors,' effectively helped to guide the process to achieve more successful outcomes. In the cross case study analyses, surprises

were found with regard to the symbiotic effects of these factors, and how they interacted differently under diverse societal and institutional contexts. In order to perform structured analyses of the cases, impacts of the six 'success factors' were examined from an organizational vantage point, for the initiation, design and development phases of eco-towns, and with additional insights gained from experiences during the occupancy stage, which were explored in conjunction with the residents' perceptions of well-being in their residence as presented in Chapter 4.

In Figure 9.1, the author's approach for analyzing eco-town development was designed according to the commonly accepted '*project management'* timeline (Heurkens 2012, pp. 404-405). It was used to guide the analyses of the use of the six 'success factors' in the evaluation of the comparative successfulness of the cases studied. It is important to emphasize that each phase involved sub-development stages, which were pivotal in affecting the outcome of the overall developmental processes. For example, financing, governance, monitoring of standards and performance levels and others that were discussed in Chapter 3 were included in this evaluation. The illustration in Figure 9.1 represents the logical approach used in the presentation of the integrative cross-case analyses. In the following sections of this chapter, the author expanded upon the roles of the 'success factors' in assessing the progress of eco-town development.

In doing so, each of the 'success factors' was discussed in conjunction with their individual and synergistic effects within the various phases of the development as explained in Figure 9.1. Therefore, in the subsequent sections, the political commitment, timing, financial model, physical qualities, stakeholder involvement and the environmental model were expanded upon separately under the sub-headings of the 'initiation', 'planning and design', 'development' and the 'occupancy', all of which were found to have important implications for the factors' interrelated impacts on the outcomes.

9.2.1 Political commitment

The Initiation Phase

The importance of the political commitment was underscored by the literature review findings presented in Chapters 2 and 3 as well as by the data from the real-life experiences. The conclusions from those sources were that large-scale developments require political, economic and social dynamics to create the right pre-conditions for the actors involved in the process to make the initial decision to proceed with the development of an eco-town. However even if those pre-conditions were fulfilled, it can take a significant time before the actual planning and construction are initiated.

In the initial decision of the development, aspects such as, availability of land on which the development is to be made, bringing the necessary actors to a shared vision, making financial and policy arrangements (which are all necessary for infrastructural and super structural design and implementation), require political will or support unless the eco-town initiatives are led by developers or by the communities. Also, political will, is not sufficient for establishing successful eco-towns, as was found in the case study research. Despite well-intentioned politics, willingness without the long-term commitment is risky in regard to overall success due to the complex nature of the development processes. The long-term political commitment is necessary and must be present throughout the development process regardless of the potential changes in the administrative powers during the period in which the planning, design and implementation occurred.

In the five cases investigated in this thesis, the political commitment was built upon different elements. For example, in Kattenbroek, the political commitment was formed through the decision of the development, which was a result of nationwide, spatial planning strategy and the local authority's initiative to supply affordable and better quality housing (see Section 6.2). In the initiation, the Alderman's personal efforts to increase the design quality and diversity in architecture (see Section 6.3.2 & 6.4.1) played an important role in terms of strengthening the institutional support, hence the political commitment and consensus for the decision to develop Kattenbroek. The initiation of Nieuwland however was the combination of both the national policy on spatial planning and the decision to test the integration of renewable energy systems (see Section 6.7.2) in large-scale residential developments. In Nieuwland's development, both the political and the institutional commitment played crucial roles in the successful planning and implementation phases.

It was found that the political commitment was affected by the timing structures, whether it was through policy decisions at national levels or sometimes because of the local ambitions to make timely use of the current events and conditions. For example, in the development of Hammarby Sjöstad in Stockholm, the City administration's political will existed initially, but later its supportive inputs fluctuated in intensity and form. The initial decision to develop the Hammarby Lake area was attributed to the local developers and urban planners, who were willing to create a new residential area in close proximity to the urban center (Section 2 of Appendix II). The political commitment in Hammarby Sjöstad later gathered around the ambition to promote the development in a bid to host the 2004 Olympics (see Section 7.2). The differences in policy views of administrations from different political parties (such as the left-wing and right-wing majorities) negatively affected, the course and framework within which the project was initiated, designed and implemented. Despite the overall consensus on sustainability issues, the decisions on how the land deals were conducted or on the scope of the Project Team's changing roles from being a catalytic agent to becoming a team with less administrative power were caused by differentiating political

agendas. Moreover, the conflicting views of administrations and their policy implementations regarding the development of Hammarby Sjöstad, led to compromises on aspects from design to goal formulation, which negatively impacted the overall success of the development [77].

The case study research also revealed that the 'form' of *political commitment* is an important aspect and should be contextualized in line with the vision that has clear operational goals. The administrative power can potentially be used to both empower and encourage initiatives to be taken (such as the eco-towns) while it can also serve to ensure the highest standards and proper implementation of the operational goals. In the development of Vauban in Freiburg (see Chapter 8), the societal and cultural aspects strongly influenced the political discourse that facilitated participative approaches in planning and in the decision-making processes in urban development initiatives. Therefore, in Vauban's development, the municipality took the leadership to bring in the stakeholders together and enabled the conditions necessary for meaningful participation. This ensured that the planning evolved around the shared goals and values of the residents (Section 2 of Appendix III).

These four cases revealed that the political commitment affected the success of the development to varying degrees depending on whether or how strongly it exists and expands participation in the decision-making processes. In the case study research, it was found that weak political commitment in the sense that lack of authority and control over the development process, negatively impacted the outcomes, more specifically the achievement of their environmental goals. For example, in Vathorst, the local authority's commitment existed but with little or no support from the regional administration or from the Ministry of Transportation and Infrastructure although the area was designated as a VINEX [78] location by the central government of the Dutch nation (see Section 6.12.1). The local authority's involvement was positive but was dependent on the developers (landowners) in

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77 Success, in the context of the case study research, was defined as the outcomes with positive improvements in the residents' behavioral adaptations and sustainable lifestyle changes, adopting forward-looking urban development policies and practices and the resultant impacts including but not limited to the consumption levels. However, the perceived successes of the development were also found to be linked to other factors that were discussed in the final section of this chapter. It should be noted that the cases studied for this thesis were selected from the developments that were initially discovered among the ***successful examples***. The case study analyses helped to reveal that the actual improvements in some cases differed from the previously anticipated outcomes.

78 "*de Vierde Nota Ruimtelijke Ordening Extra*" (VINEX) in English is "the Fourth Memorandum of the Spatial Planning Extra or Expansion," which was published as a policy briefing by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) in 1988. It was a nationwide program designed to reduce both the housing shortage and the growth of car use. It was initiated in the early 1990's as a broad plan to develop the land near municipalities, through contracting private landowners, transport companies and developers to fill in the commercial and residential plots from within the sites that were allocated according to a priority list depending on how close they were to the urban centers. The purpose of this approach was to develop the areas in or around the urban locations so that they would make best use of the existing infrastructure and networks. This would eventually help to reduce private vehicle usage and reduce overall

the decision for its initiation, and subsequently, as a shareholder rather than as an authority in the decision-making and control over the standards and the project goals. This type of political involvement was the consequence of the predominantly developer-led vision and resultant development process with more concern for economic interests, and relatively little emphasis on environmental aspects.

The Planning & Design Phase

The *planning and design* is the most critical phase of the eco-town development processes during which the negotiations and deals with various actors (landowners, the developers, financial institutions or utility companies), the formulation of operational goals and the actual design activities are performed. Similar to the initiation stage, the lack of political will and commitment negatively influences the planning process and may result in compromises of the social, physical and environmental goals that are central to the eco-town's success.

One of the initial steps of the development process is the land acquisition. The land ownership model helps to determine who has what level of power and authority on which the subsequent phases are inter-dependent. The land, if owned by the city or the municipality, may provide significant leverage for the decision-makers in the negotiations with the potential developers, and may potentially increase their control over the standards, level of innovation and environmental measures with which to plan and design the eco-town development. Sequentially, the master plans are developed, the land sub-divisions are made and the plots are allocated among the various contractors. During this stage, the initial ownership of the land by the municipality (or the local authority) as the eco-town initiator was found to strengthen the vision, goals and guidelines upon which the planning was operationalized. Although this primarily requires financial and administrative level decision-making, the land acquisition process may take considerably longer and may require policy level actions with commitment at both administrative and political levels.

For example, in the development of Vathorst in Amersfoort, the developers were comprised of the major landowners. This led to the public-private partnership model in which the municipality became a shareholder with relatively less control over the decision-making. In

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fossil fuel consumption. The initial contracts were planned to be started in 1995 and to be finished by 2005. However this deadline was extended to 2010 along with plans for the program to be continued until 2020. The program provided valuable experience for planners, participants as stakeholders and governmental leaders in terms of the dynamics involved in urban developments from policy design to implementation. In 2003, a new national, spatial strategy called "nota ruimte" was introduced to bring an integrated approach for putting an emphasis on increased decentralization, reducing distances in daily commuting through enabling walking and cycling or through encouraging the use of public transport and increased cooperation between the spatial planning and infrastructure investments (Van Remmen & van der Burg 2008). However, the rapid increase in the real estate developments in the Netherlands led to the increased involvement of the privately-led investments and management of the built environment projects through public-private partnerships with less local authority influence in land acquisition, capital and knowledge (Heurkens 2012, p.34).

the case of Vathorst, this was found to be due to the municipality's ambition to develop the area without proper arrangements and the full commitment of the regional government. It was also due to lack of interest from the governmental agencies, due in part, to the timing of the decision (see Section 9.2.2). In the development of Hammarby Sjöstad, the initial land deals and development contracts that were made prior to the decision to transform the Lake area into an eco-district significantly reduced the City's influence on the measures, design and development (see Chapter 7).

As documented in these two examples, an initial consensus around a vision can exist, but conflicts may arise due to subsequent diverse perspectives of the stakeholders, as the leadership and commitment evolve. While the political commitment is highly essential during the goal formulation, design and planning, it was concluded that it is *neither constant nor a given*, especially within the development timeframes of large-scale urban initiatives such as the eco-towns.

Additionally, the support and leadership were found to be effectively catalyzed via particular individuals and organizations during the planning and development phases. For example, in the development of Kattenbroek, there was synergy and mutual support between the Alderman and the chief supervising architect who were the champions of the project. This provided the motivation and cooperation required for the unconventional approaches in design and planning, and also helped the development's recognition and public acceptance. In the Nieuwland development, the needed support and commitment came from the local, national and international levels with focus upon creating the largest experimental PV integrated district in Europe and in the world at that time. This not only facilitated obtaining the extensive financial and institutional capital but also helped the environmental planning to evolve beyond the initial goals and thereby, to further implement a holistically designed development (see Section 6.7.2).

Similarly, in Vauban's development in Freiburg, the political commitment and the support of local, regional and federal governments toward the sustainability goals, existed during the planning phase. The local authority continuously promoted the sustainable building technologies, and supported the research and development facilities in the city of Freiburg, which contributed positively to Vauban's success as an eco-development. Also in Vauban, the political commitment was based upon cultural and historical elements that encouraged both the local authority and the future residents to proactively participate in the planning and design as well as in becoming actively involved residents (see in Appendix III).

In this context, the political power can be essential, not as a controlling or steering element, but more towards enabling participatory and democratic governance of the decision-making processes. It should also be noted that the existing power relationships in the political

systems were found to pose barriers to '*change'* due to the established economic and institutional '*assets'* (Vergragt et al. 2014, p.3). In order to achieve political consensus and success toward necessary policy changes, a more open style of decision-making compared to the authoritarian approaches and clear environmental objectives were found to be essential in '*guiding change processes*' (Keijzers 2011, p.193).

Therefore, the modality of the political commitment needs to be clearly defined. On the one hand it should serve as a framework and guide for the evolution of a clear plan for the development process, which requires strong leadership to guide actors and policy changes. On the other hand, it needs to welcome multiple actors to be involved in the decision-making processes and to be empowered to engage in meaningful dialogue during the planning and design phases, so that broader consensus can be effectively achieved.

The Development Phase

With regards to the development phase of eco-towns, there are key aspects such as the actor identification and involvement, policy arrangements, ensuring the standards/quality and organizational support within and among local/regional and in some cases, support by national governmental agencies was beneficial.

In the implementation phase of large-scale urban developments, actors including but not limited to the energy company, water / wastewater administrations, department or ministry in charge of transportation, have important roles in the planning and in the actual construction of the development. In some cases, the actors, were independent parties, while in others, they operated within governments. In both situations, they were guided by their respective policy agendas. In the case of eco-town developments, such actors' involvement in the decision-making processes with regard to the solutions they offer systemically, technologically and financially greatly influenced the goal formulation during the planning stages. Their proactive participation was important because, the level of innovation and technology for the planned eco-town development needs to be considered feasible individually and also for the eco-town's vision as a whole. Despite the subsidies, grants and loans that can be made available for the implementation of new or eco-friendly technologies, the anticipated operational costs were also found to influence those actors' willingness to cooperate and implement the eco-town's innovative features. In this context, political commitment was found to help in creating the consensus, which helped the actors to more effectively agree upon the vision and to then dynamically, develop the technical and financial adjustments in the visions and in the plans.

For example, in Nieuwland in Amersfoort, the local and national vision to implement district-scale building integrated PV systems was supported financially as well as politically. Despite the extensive use of PV technologies, which was a first at the district-scale

implementation, the energy company and the developers agreed to participate in this relatively experimental initiative. However, in Vathorst in Amersfoort, the lack of commitment in building upon the lessons and experiences from the development of Nieuwland resulted in the decision to implement conventional urban systems and technologies. This decision was, in part, due to concerns about the feasibility of systems' integration and the anticipated operational costs. The developers and the local authority (as the shareholders) considered these features to be potential risks. In regard to the political commitment's role in the development phase, the case study research on Hammarby Sjöstad also provided valuable insights. The different views of the administrations during which the development took place, significantly affected the framework within which the project was implemented. The changing role of the Project Team, reformulation of the environmental plan and to some extent the constantly evolving operational goals of the development were some of the aspects that negatively contributed to the outcomes of Hammarby Sjöstad.

The political commitment to the vision and goals is needed with thorough consideration of the key actors' involvement in the planning, implementation and operational stages. The research documented that the policy adjustments for effective implementation of the environmental measures, building standards and codes can make efficient use of the lessons and experiences that were gained during the development phase. In order for these processes to be efficient and effective, however, constant monitoring and evaluation during the development phase must be formulated, operationalized, monitored, documented and publicized internally and externally on a regular basis. Additionally, the continuous support of the political power in the development process was key to effectively operationalize the goals and visions.

The Occupancy Phase

The perceived positive and negative aspects of the eco-town during occupancy stages were found to affect the overall outcome as well as the plans to develop future eco-town developments locally and regionally. There are important aspects such as the physical qualities, environmental measures, social and economic impacts, which affect the residents' perceptions and residential well-being. Political commitment in the form of encouraging research on all aspects of an eco-town's impact on the community is crucial so that immediate and future policy adjustments in the planning, development and governance models can be made.

For example, in the Nieuwland development, various issues were found in conjunction with the occupancy stage. These included but were not limited to the building integrated PV systems that were not properly maintained, some user-related issues regarding the performance measuring tools, the ownership rights of the roof space on which the PV modules were installed and even the economic benefits for the occupants which were not clearly defined and orchestrated. As a result, the impact of the lack of sufficient post-development

care resulted in the energy company's negative assessment of the PV installations in district scales due to feasibility concerns. Therefore, they decided to promote conventional heat and energy technologies in the subsequent development of Vathorst.

The resultant impacts similar to the one described for the Vathorst case, can be generalized for projects in which the form of commitment during the occupancy stage does not involve objective monitoring and assessment. In this context, *political commitment* is required so that the timely assessments and subsequent improvements for efficient usage of the technologies, planning principles and the governance models can be made. Based upon the results, they have information to disseminate about the knowledge, experience and benefits of the actors involved to help others learn from the positive and negative aspects to help them as they seek to develop better eco-town developments.

In contrast to the cases studied in Amersfoort, the amount and quality of research performed in the Hammarby Sjöstad development were found to have effectively helped in building upon the lessons and experiences, most of which were gained during the development and occupancy phases. Despite the many shortcomings of Hammarby Sjöstad as an eco-town, the lessons contributed positively (Suzuki et al. 2010, p.192), especially via the dissemination of the results in the longer term.

9.2.2 Timing

The decision to initiate large-scale developments involves sound evaluation of the changes in the urban population, housing demand, economic indicators, and urban policies at local and national levels. These changes can affect the complex development processes and may potentially cause undesired consequences, if not addressed adequately. Although, in most cases, these large-scale urban development initiatives were decided based upon proper assessment of the above factors, eco-town development may require more consensus with regard to cost implications, public acceptance and marketability as well as on the technological and infrastructural challenges. Such consensus among politicians, developers, utility companies and even with future residents can create the conditions for a successful eco-town development. Timing, in that case, is an important factor, bringing together the additional elements into the development of eco-towns in different scales, whether they are in the form of single projects locally or within a much broader context regionally and even internationally. Although the timing was initially considered to have mostly immediate impacts during the initiation stages of the development, the case study research and the review of the relevant literature revealed that there are many interrelated effects in the latter stages during both the development and occupancy phases.

The Initiation Phase

Various elements influenced the timing of initiation of the eco-town developments of the five cases investigated in this thesis. These included:

a. The housing shortages and more specifically the need for affordable housing in the late 1980s and 90s in the Netherlands, Germany and Sweden;
b. The political, cultural, societal and environmental factors, which directly and indirectly set the context of the new urban developments that took place in these countries;
c. The relatively more sustainable planning and development strategies that were being adopted by city administrations after the publication of the Brundtland Report in 1987 and of the Agenda 21 from the Rio Earth Summit in 1992; [79]
d. The urban development policy changes, from promotion of traditional models to promote more sustainable design and development during the past three decades;
e. The city administrations' willingness to create a stronger image for their cities as the capital of sustainable urban developments nationally, regionally and internationally, through major events, such as the Olympic Games, World Expo Fairs and others;
f. The eco-labeling of the large-scale urban developments for marketing and branding even though the characteristics and qualities were very limited contextually, conceptually and/or procedurally.

With regard to the decision to either develop an area with the eco-town qualities or transform an urban area into one, the timing of the decision was found to influence the level of public, societal and institutional support, which in turn, contributed to the level of development's longer-term success. The case study research findings suggested that a number of different elements influenced the timing, in some cases individually and in others, more collectively as outlined in the above paragraph. For example, Quental et al. (2009) suggested that the political support was found to be more present during and shortly after the major international agreements toward the initiatives and policy actions that emphasized sustainable developments. The consensus building elements included but were not limited to the major events as well as the long-term commitment and consecutive policy adaptations toward resolving housing shortages, most of which were found in the cases studied among the Northwestern European nations. These elements or the sub-processes as described by Svane (2007), led to the formative moments during which the decisions for the eco-town developments are made. In the case studies, it was found that the timing of the decision affected the pre-development organizational phase in which the development model and framework was formulated. These formative moments also contributed to the

79 According to research conducted by Quental et al. (2009), the 'peaks' in political activity in terms of integrating sustainability agendas and goals to the national and local level initiatives were found to be coincided with the major agreements such as the Earth Summits of the UNCED, WSSD and UNCHS. These and other international agreements were found to be strong catalysts for wider societal and political actions (Quental et al. 2009, p.26).

building of political and institutional commitment, which was discussed in Section 9.2.1. Although the decision to initiate the eco-town development involved previously analyzed urban conditions such as the housing, the environment and the will to promote sustainable urban planning and development, major events (Svane 2007) also provided the windows of opportunity to further build the needed momentum.

For example, in Hammarby Sjöstad, the timing was found to play a significant role both in the decision as well as for the outcome (see Sections 7.3 and 7.4.2). Although sustainable urban planning and development trends and actions were initiated earlier in Sweden in different scales, the City of Stockholm made the decision to use the opportunity to improve the city's image internationally through bidding to host the 2004 Olympic Games.[80] Similar examples were documented in other cities in Europe such as the Kronsberg in Hannover or Ecociudad Valdespartera in Zaragoza, in Spain. The case study research found that helping to build momentum through events and opportunities similar to the ones described above might positively contribute to building the consensus around the vision and goals. Decisions to initiate an eco-town development however should be built upon sound evaluation of the population's needs, the region's aspirations and upon other urban dynamics and not only to be based on political or market driven decisions.

The Planning & Design Phase

The research and this thesis author's experiences as a professional architect in development of different projects at a wide array of scales, helped him to better understand some of the less discussed aspects, one of which is the impact of timing on the planning and design. The timing of the development leader's decisions was found to be a positive contributor, if the vision, goals and the needs of the society were well aligned with the initiative. For example, in the development of Nieuwland in Amersfoort and Vauban in Freiburg, much of the societal, technological and political dynamics played positive and formative roles in the contextualization of planning and design. The formulation of (urban, architectural, social and the environmental) goals was positively influenced when the spatial and temporal factors were well assessed and integrated within the community's needs and aspirations. In contrast with these examples, the Amersfoort Municipality's decision to develop Vathorst shortly after the Nieuwland development's initiation caused direct and indirect impacts on the planning due to a market-driven approach adopted for its development model. Therefore, timing, with regards to establishing broader consensus on all political, societal and

80 In Chapter 7, the author expanded upon the negative implications of the decision to transform the Hammarby Lake area into the Olympic Village and subsequently into an eco-town without properly assessing the previously signed contracts with the developers. Furthermore, the environmental measures were decided upon without having properly consulted with the stakeholders, which in turn created negative reactions and even resistance toward the additional measures due to the perceived costs. These and other procedural conflicts occurred partially due to the hasty decision-making process, which underscore the centrality of ***'timing***' (see Chapter 7).

institutional levels, may contribute to the planning especially, in the context of eco-town developments.

With regards to the initial decision to develop the eco-town, the institutional and/or intellectual capacities were also found to be important for supporting and guiding the eco-town planning processes. The desired and envisioned outcomes were linked to the residents' as well as to the developers' perceptions of the long-term effects of innovative design and building practices. For example, insufficient technological / administrative ability or the lack of willingness of the actors towards the formulation and/or operationalization of the goals can negatively affect the anticipated outcomes. On the one hand, realistic approaches may be needed in order to meet the desired results, hence the broader expectations that may affect the perceptions toward the novel attributes of the eco-town. On the other hand, building intellectual capacity through education, training and raising awareness environmentally and socially help to establish the social capital needed for the eco-town development. Therefore, deliberative and participatory approaches were found to create more objectively and holistically formulated planning processes. According to the quality of life (QOL) survey presented in Chapter 4 of this thesis, the residents of eco-developments perceived higher levels of residential well-being and life satisfactions compared to residents living in conventional developments. In spite of some minor challenges with regards to time and costs during the decision-making process (Bayulken & Huisingh 2015a), consensus building through participatory design and development strengthened the vision, goals and the sense of community among potential residents (Solitare 2005).

The Development Phase

The research revealed that the timing was also affected by the development phase through the contextualization and scope of the project. As highlighted in Section 9.2.2 on the initiation phase, the social and economic dynamics and the indicators used to monitor them can be used to help to build the demand and momentum that are highly critical for the planned implementation of the eco-town developments. It was found that the ambitions often exceed the needs, whether they were for economic reasons or due to misinterpretations of the market conditions; and as a result, the development process may be exposed to financial vulnerabilities as was observed in the case of Vathorst's development. The decision to develop Vathorst not only affected the ongoing development of Nieuwland but also resulted in a reduced level of political commitment from the regional government. Moreover, the development plans were, to some extent, altered due to the financial crisis of 2008-2009 leaving about 30% undeveloped or underdeveloped areas. As discussed in Section 6.11.3 of Chapter 6, the construction phase was revised for completion for sometime between 2015-2021.

Additionally, if the decisions are made based on short-term political agendas, the success of the eco-town development can be adversely affected. As reviewed in the *'political commitment'* section, continuous support and the form of governance in line with the vision and goals are central to successful results of eco-town's development processes. Initiation of the eco-towns without proper assessment of their complex development processes will result in differing perceptions in terms of the financial and social costs or benefits among the actors as well as among the potential residents. For example, the development of Hammarby Sjöstad was decided based upon the anticipation that Stockholm would be granted the rights to host the Olympic Games of 2004, and this was tentatively planned to improve Stockholm's image and its brand as the capital of sustainable urban developments.

The vision for transforming the Hammarby Lake area into an eco-cycle district took longer than anticipated due to the fact that their bid to host the Games was unsuccessful. However, this initiative helped to create political consensus to develop that region without having the Olympic Games, as the main driver. [81] Also, due to shifts in political power at the local level and the unsuccessful bidding process to host the Games resulted in changes of goals, framework and the desired outcome as an eco-town development. As discussed extensively in Section 7.3.1 and in Appendix I of Chapter 7, the initial objectives in the development of Hammarby Sjöstad included but were not limited to soil decontamination, efficient management of energy, waste, water and wastewater, improvements in the transport system, integration of sustainable construction materials and building practices. Although the final environmental plan was designed to create a closed loop system, this was later limited to the technological improvements in urban management systems to help to reduce the metabolic flow rates rather than to achieve the systemic changes that were initially envisioned by the City of Stockholm.

Although sustainability goals and measures were designed with the objective to win the Olympic Games of 2004, the City made significant efforts to develop the Hammarby Lake with the eco-cycle model agreed upon in 1997. However, the failure to host the Olympic Games during the bidding process not only negatively impacted the development timeline but also reduced the level of enthusiasm and consensus around the environmental measures that were designed during the bidding process. Furthermore, the shift in the administrative power brought in contrasting political views and ambitions. With little authority over the developers and the infrastructure companies, the City of Stockholm compromised on the

81 The initiative to develop the Hammarby Lake area in the early 1990s emerged as a result of the proposed development plan by a group of private developers and urban planners. It was later decided that this location would be used as the Athletes' village in support of the City's attempt to bid for the 2004 Olympic Games. In doing so, the City of Stockholm decided that planning this area as an eco-district could enhance their chance to win the Games. Therefore, the decisions to develop Hammarby Sjöstad as an 'eco-cycle' district and to host the 2004 Olympic Games were strongly linked (see Section 2 of Appendix II).

environmental goals and measures for the Hammarby development. The research on the Hammarby Sjöstad development revealed how the political dynamics impacted the planning and implementation phases and changed the outcome with respect to the design goals and the vision. The timing of the decision for converting the ongoing development of the Hammarby Lake area into the Olympic village and subsequently into an eco-town showed that the timing was part of the '*formative function'* (Lundqvist 2004, p.1284) of the eco-town development process in which the sociotechnical and sociopolitical aspects should be considered in making key decisions.

The Occupancy Phase

With regards to the impacts of timing on the outcomes of the cases studied for this thesis research, two relevant examples were found in terms of the development's overall success. As presented in Chapter 6, Vathorst's development was initiated in close proximity to the development of Nieuwland, which was also in progress. Based upon an interview this thesis researcher had with Professor Kees Duijvestein, it was learned that the rapid decision to initiate Vathorst resulted in the loss of political commitment that was critical for Nieuwland's development and for successful occupancy, more so because it was partly an experimental project in which a number of novel energy, water and design features were involved.

The formation of community groups as well as the sense of belonging requires time to be established in newly developed areas, especially when there was little involvement of the future residents in the planning and development. The decision to develop Vathorst might have caused the diversion of public attention and interest from Nieuwland as an experimental and innovative eco-town to Vathorst, which was a relatively more traditional development with promising commercial and social features for both the investors and the future residents.

Additionally, in an interview with Trudy de Mooy [82], it was learned that Nieuwland residents initially chose to move into the Vathorst area due to its relatively attractive physical qualities and amenities as much as for its anticipated future value. Some residents moved back to Kattenbroek, which was the first of three successive district-size developments in Amersfoort because of: a. Kattenbroek's more attractive property prices compared to those in the new developments, and b. its vibrant and established design and sense of place (see Chapter 6).

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82 Trudy de Mooy was invited for the semi-structured interview designed for the case study research on the three developments of Amersfoort, mainly because of her role in the development of Vathorst and also due to her extensive knowledge of the Kattenbroek and Nieuwland developments. She is currently the head of the Vathorst i-Centrum in Amersfoort and has been actively involved in the development phase of Vathorst. She provided valuable information for the research as an expert resident living in Vathorst, Amersfoort.

The cross-case study analysis revealed that, *'timing'* as a factor contributed to the success of the eco-town development, both directly and indirectly, depending on how the dynamics were used to create the political, economic and societal consensus and momentum that was needed. For example, in Vauban, the timing was the result of a series of events that built up to support the decision to initiate the eco-development. These included the Chernobyl Nuclear disaster, the Earth Summit in 1992, the termination of French troops' occupancy in the area and more importantly the shortage of affordable housing in the city of Freiburg. A combination of societal and policy level elements had emerged in conjunction with the urgent need for affordable housing before the initial proposal to transform the Vauban area into an eco-development was made.

In conclusion, proper sensitivity to *'timing'* can contribute positively to all the aspects outlined in this chapter and to the success of the eco-town, if considered with proper analyses of the challenges, opportunities and potential implications. Good timing can help to create the momentum, which is essential in establishing *public acceptance.* However, this also requires the consideration of the degree to which the perceived impacts of the *physical, social and environmental qualities* influence the anticipated resident's well-being. Otherwise, seeking to only manage expectations may harm the perceived and true benefits, some of which can and should be experiential, in the context of life in eco-towns.

9.2.3 The Financial Model

The case study research revealed that the financial model has a multitude of implications in terms of goal achievements as well as in relation to the eco-town's overall success. As presented in Chapters 6, 7 and 8, the funding of large-scale urban development projects changed during the 1990s, along with the development frameworks, increasingly allowing private actors in the development as well as in the decision-making processes, which was previously almost exclusively controlled by public parties within the contexts researched for this thesis.

Together with the public-private partnerships (PPP), the financial mechanisms and tools with which the projects were implemented also evolved, thus requiring more extensive planning before the initiation throughout the development phase. Heurkens (2012) discussed the governance and power relationships in the urban development processes, illustrating the periods during which the State (public), the Market (private actors) and the Civic Society (communities) roles have changed in terms of how they influenced the development frameworks and models since 1980s in the Netherlands. His research and analyses documented three successive periods of 1980-2000, 2000-2010 and post 2010, which were found to represent similar evolutionary aspects within the geographies explored for this thesis. The historically dominant power of the state shifted into becoming market and

society led governance and decision-making in which the public interests and the interests of the local communities had to be safeguarded (Heurkens 2012, p. 212).

Financial planning for the eco-town developments can be associated with similar dynamics of the public-private partnerships. However, nuances in their frameworks have had significantly more impact on the success, in part, due to the complexities in design and the developmental processes compared to conventional urban developments. In the following sections, the financial model's critical role in the success of the eco-town development process was discussed with respect to the development stages as was also presented in Section 9.2 of this chapter.

The Initiation Phase

The research into the financial model of large-scale urban development projects revealed various aspects that need to be underscored with regard to the initiation phase. The critical decision to develop the eco-town involves understanding and agreement among public and private parties in which viability/feasibility; potential risks are assessed via dialogues of the capacity to bring in the required skills, experience, innovation and technology to establish the eco-town development. The financial model, in this context, plays central roles in terms of how effectively the development framework is established and in terms of the context in which different actors engage within the overall development process. Although the momentum toward the eco-town's initiation may evolve through political, social, environmental and other physical factors; the successful operationalization of the development process mainly depends on the extent to which the public and private actors agree upon 'what', 'how' and 'when'. In brief, the goals (social, physical and environmental), the standards (building norms and design quality) and the timeframe of the development need strong consensus among the interest groups prior to the planning and development phases. In the context of eco-town developments studied in this research, the State (except in public-community partnership structures) as the initiator was found to have a central role in shaping and safeguarding the implementation of the initially envisioned objectives through the arrangement of development agreements with the private parties. The financial model was highly relevant in this context because it sets the tone for the overall negotiation process performed between the actors from both the public and private domains.

With regards to the level of authority needed to help in establishing and enabling the social, physical and environmental measures, the land acquisition process was found to be the first critical milestone for the local authority (municipality and/or other actors as the initiators), whose level of power can be affected either positively or negatively. Although this was reviewed in Section 9.2.1, the financial instruments to secure the land ownership rights were found to be pivotal in managing the negotiation processes with the developers or with private actors. The case study research findings suggested that the public and community

interests in terms of enabling the environmental measures were linked to the structuring of the financial model within the public-led concessions that were made in exchange for being granted the development rights and partnerships. The financial means to perform pre-development tasks and obligations (such as the land acquisitions, master planning, establishing the teams to conduct environmental, urban and architectural planning, baseline data gathering and supervision), need to be formulated prior to conducting negotiations with potential developers. Moreover, the arrangements of grants, subsidies and low interest loans for the implementation of the environmental measures help to increase the negotiating power, thus should be integrated within the financial models early in the process.

For example, in the development of Nieuwland, a number of factors positively influenced engagement of public parties with private groups during the initiation phase of the development process. First of all, the land ownership was fully secured by the local administration prior to the planning, thereby providing the municipality control over the development process. In support of the vision to create the largest PV integrated district, the government and international bodies provided the additional funds for implementing the environmental measures and innovative technologies that would otherwise be unfeasible within the traditional means of residential developments. Moreover the agreements with the energy company helped to provide the technical / technological expertise along with the capital investment to be recovered from the operational revenues. Similar concession models were documented in different cases where public-private partnerships (PPP) were established, yet with different levels of innovation adoption or success in terms of integration of sustainable urban planning and development models.

For example, in Vathorst, neither the public parties nor the private actors were found to include building integrated PV technologies despite the extensive lessons gained in the previously developed Nieuwland district. One of the main reasons for this was found to be the feasibility for which the energy company opted for the conventional systems (see Chapter 6). The in-depth research revealed that the decision to develop the Vathorst area involved the local authority's extensive use of private actors in acquiring land as well as in obtaining the financial resources required to fulfill the pre-development responsibilities. This resulted in the local authority having relatively less control over the development's environmental targets. The financial model, or the lack thereof, was found to influence the Hammarby Sjöstad in Stockholm negatively in the initiation as well as during the planning and development stages. The perceived costs of environmental measures, if not addressed early in the process (through potential subsidies, concession models, grants etc), may cause compromises during the negotiation with private actors and ultimately in the development agreements, hence the goal achievements. In the case of Hammarby Sjöstad, neither the financial nor the environmental model was decided upon in advance. The project evolved through time in which decisions changed as to whether the area would be developed in a

conventional form or as an eco-town while the development negotiations were conducted before and during the allocation of additional funds for innovative and environmental measures was made.

As discussed in Chapter 6, the Dutch urban development model shifted from hierarchical towards a more cooperative approach in which market mechanisms increasingly played a role in the decision-making processes. In the case of Vauban, the development was formulated with the residents being the planners, investors, developers and the beneficiaries as a result. The public-community partnership was supported via private, institutional and governmental as well as intergovernmental agencies. While the subsidies and grants helped much in the sustainable planning and building practices, the proactive participation of residents in the development processes also resulted in the significant savings in the overall costs. This contributed positively to the integration of environmental features with the consensus of the residents.

With regards to the financial model within the public-private partnerships, the size and scope of the urban development initiative was found to determine the extent to which various typologies can be used to achieve successful results. For example, a similar model to the one implemented in Vauban (see Chapter 8), would yield different results in Hammarby Sjöstad, Nieuwland or in Vathorst considering the extent to which all three of the latter had relatively less or no resident participation. Even so, the urban planning and the integration of environmental planning would require different approaches since the model implemented in Vauban was the only community-led project among the five cases.

As Heurkens (2012, p.388) reported in his research, demand-driven development strategies and the financing mechanisms that support bottom-up development initiatives, value-oriented development or development phasing through partial planning can be further explored in the context of financial modeling. However, in such attempts, various other factors discussed in this thesis, such as the extent to which stakeholder participation or the environmental model can be effectively operationalized, also require careful attention in the context of eco-town's desired success.

It was, concluded that the financial model is highly relevant with regard to the overall development process. Its formulation between and among the actors, beginning with the initiation phase sets the stage for communicating goals on all social, environmental and physical levels. It was found that the formative aspects such as the development framework, the timing structures and consensus building elements among the public and private actors play crucial roles in terms of how effective the financial model is formulated and operationalized.

The Planning & Design Phase

As presented in the previous sub-section, the initial funding, potential subsidies and grants/ incentives, the availability of these financial instruments are integral to the structure of the financial model within which the development can be planned and implemented. The availability of the funds for planning of the social, physical and environmental goals of the project is central to the sound formulation of the environmental management process (Johansson & Svane 2002, p.213). In Nieuwland for example, the planning and design processes could be supervised in line with the development's goals and objectives and this was possible due to the clearly organized financial model. The lack of clarity in this context could result to either compromising of the design quality, the standards or to the co-evolution of and implementation of the environmental goals. The latter occurred in Hammarby Sjöstad's development due to uncertainties at many levels, one of which was the perceived extra costs of environmental measures and how they would impact the overall feasibility of the systems integration. As a result, neither the ambitious eco-cycle concept nor the affordable housing vision was fully accomplished (see Chapter 7).

Financial model must be formulated early and clearly in ways to provide the eco-town initiators the power to negotiate and with clear guidelines to enter into agreements with the private actors. This not only helps to establish control over the design process but also enables the operationalization of the goals in line with the vision. The case study research revealed that the financial model's clarity was an important aspect and the lack of it negatively influences the planning and design phases. Physical qualities, environmental ambitions and the social goals of the eco-town development were found to have been affected by the decisions made mostly during the planning and design phases. It has been found that financial means to support an effective design process, were strongly linked, to successful outcomes.

The Development Phase

The financial model's impacts on the implementation of the eco-town development were found to be similar to the complexities that was observed or experienced in almost all conventional urban residential developments. The lack of sufficient fund allocations for additional environmental measures can cause realignment of the project goals and even the initially desired visions may be ignored or substantially dimmed.

Firstly, the implementation of the extra measures requires funds that are best made available before the planning starts. In cases where changes occur in the initially developed financial models, the actors involved in the development phase will have to make revisions in the additional measures adopted for building standards, in order to maintain the viability of their investments. This can cause changes in the overall goals and even in the vision to build the eco-town, rendering the goal attainment almost obsolete, at least theoretically.

Secondly, the *monitoring of the standards,* anticipations of *future technologies* as well as the *potential systems integration changes* may all require additional funds that need to be formulated during the development and during occupancy stages. These extra financial measures may help to cover the unexpected changes or modifications, should they become necessary during the development.

Although the case studies revealed a certain degree of developer-led 'unit sales price' increases to cover the operational costs, maintenance and the unexpected technological changes; such changes affected the resultant purchase prices of the dwellings, either by attracting higher income households and/or by causing increases in the rental values, thereby reducing the affordability of the housing for many.

The case study research also revealed that the phases of construction must be carefully planned with respect to the financial model in order to allow the occupancy within various stages during which the continuing or suspended activities might cause negative perceptions among the residents. For example, in Vathorst, the development phase expanded along with the period during which the economic crisis occurred. This slowed down both the sales of plots and the finishing of housing units, thereby; creating uncertainties about how the development would proceed. The lack of proper financial planning may have impacts on the physical qualities, resident's perceptions of the residential quality (and value) and it may have economic implications for the investors due to the additional costs incurred by the loan interest, ultimately causing early termination of the development.

The Occupancy Phase

As expanded upon in previous sections, resident's occupancy begins prior to completion of the eco-town. Due to current technologies and to changes in user behavior, preferences and adaptations to environmental measures, immediate short-term benefits of innovative features may not be possible to assess. The incentives may help residents to adjust to the new systems, financially and to the eco-town resident's long-term education through experiencing the potential benefits of more sustainable lifestyles. This was clearly observed in the Vauban development in which the resident use/implementation of the building's integrated PV systems was supported by the government subsidies and by economic incentives (such as high feed-in tariffs), which encouraged other developers within and around the area to use similar planning models.

In Nieuwland, on the other hand, despite the extensive financial support of various financial capacities, the maintenance problems of integrated PV technologies became, to some extent, the concern for both the energy company and of the new residents. In the financial model, the ownership rights for the roof space on which the PV units were installed, their

maintenance and other related physical issues were not clarified and that contingencies for such problems required further consideration during the occupancy stage.

The financial planners must anticipate potential setbacks due to implementation of new systems and technologies so that perceived residential quality is maintained until sufficient user knowledge and experience is established. Moreover, the social goals can be better achieved through consideration of the user's financial benefits via providing incentives based on consumption levels whether the housing units are owned by the housing associations or by private owners. In almost all cases, the residents living in rental units were found to have received no particular benefits for positive behavioral adaptations toward sustainable lifestyles. This was also found in the QOL survey conducted among the eco-development residents and conventional development residents presented in Chapter 4 of this thesis. The research on the size, the physical qualities of housing units and the environmental attributes of the place in which they lived had less significance in terms of the perceived benefits and QOL, if the dwellers were living in rental accommodations. Financial incentives for the residents living in affordable rental housing can help to improve the level of goal achievement, sense of place and the sense of community.

With respect to the critical findings, formulation of the financial model was found to have significant impact on the degree of implementation of environmental measures, the physical qualities, user perceptions, hence the overall success of the eco-town development both positively and/or negatively.

9.2.4 Physical qualities

Based upon the case study research, the term physical qualities primarily included but were not limited to the architectural characteristics, building designs, housing quality and features that are environmentally friendly. They included the urban amenities, the landscape and the natural environment within which the residents engage physically, socially as well as psychologically. All of these elements contribute to the success of the development because they influence the perceptions of residents through potential impacts, which are directly and indirectly related with their perceived quality of life (see Section 9.3). As Rogerson and Rice (2009) noted that the space/place continuum was defined as the place as a location, a setting for day to day activities and the sense of belonging, which gives the place its own identity (Rogerson & Rice 2009, p.148). The physical qualities, in this context, define the attributes of the place and help to create the identity with which one associates well-being in general. Therefore, the physical qualities influence the decision-making processes with consequences that can profoundly impact the goal structure, hence the outcome of the development process. With regard to the physical qualities' role as one of the six 'success factors,' in the following sections, the findings of the cross-case study analysis are presented.

The Initiation Phase

The initial decision to develop an eco-town, requires vision, understanding of the communities' needs and desires as well as understanding of the future challenges and opportunities socially and environmentally. The physical qualities have been used to generate interest and momentum towards the successful planning, implementation as well as acceptance through the perceived benefits of the place in which to live. Even though the decision to initiate the development of an eco-town was based on sound evaluation of analyses and studies, the decision-makers need to emphasize the physical qualities in order to create consensus among the stakeholders around the ideals and visions of urban and spatial planning.

With regards to the physical qualities, it is imperative for the eco-town planners and the decision-makers, to understand the interrelatedness of the architectural, urban and environmental design characteristics and the resultant social, physical and ecological impacts, hence their contribution to the success of the eco-town.

The Planning & Design Phase

The eco-town planning process requires holistic design with systems thinking in order to achieve the goals of the development, and furthermore, to '*create net ecological gains, beyond the needs of urban residents'* (Birkeland 2012, p.183). The first examples of eco-town developments were designed to reduce water and energy consumption, to encourage the use of public transportation, to reduce and recycle waste, encourage walking, cycling and to help residents adopt more sustainable lifestyles.

While the earlier approaches evolved around circular metabolisms of urban environments, the more advanced concepts such as regenerative or net-positive developments discussed the significantly increasing metabolic flow rates, and addressed the need for better design and planning approaches so that the urban eco-systems can be improved. As Birkeland noted, the urban planning and design can have positive [*spillover*] effects if approached as an *'intrinsic part of the complex interrelated open social and ecological system'*(Birkeland 2012, p.183).

The many dimensions of 'place making', including but not limited to, the design of the master plan, building/structural designs, architectural characteristics, natural landscape and habitat or the urban amenities and features that help to sustain urban life in many ways, need proper contextualization and framework within which to perform the overall planning activities. The physical qualities, in this context, represent almost all visual and experiential notions of the eco-town, which affect resident's well-being and quality of life as a whole. Therefore, the disciplines within and outside of the realm of planning must be orchestrated to attain the positive social and ecological effects.

For example, Kattenbroek was initiated with limited objectives, one of which was to provide better design quality compared to the traditional urban developments in the Netherlands. Therefore, the physical qualities were instrumental in Kattenbroek's wider acceptance and success. The case study research revealed that, the residents were satisfied with their place of living and their immediate surroundings and moved to the development due to those expectations. This was also the case in the Hammarby Sjöstad development. These findings were supported by the quality of life (QOL) study conducted on resident's perception of well-being (see Chapter 4). The physical qualities, and related effects on one's lifestyle and the perceived well-being were among the factors that strongly influenced the decision to move to the particular eco-development instead of into an abode in a normal development. The physical qualities were also found to create constraints and sometimes conflicts in terms of achieving relatively better environmental performances. In Hammarby Sjöstad, significant compromises were made from some environmental ambitions in order to increase aesthetic values (see Chapter 7).

In the developments of Nieuwland in Amersfoort and Vauban in Freiburg, the design characteristics were influenced by the overall social, physical and environmental goals in which significant differences were found as to how the overall design processes were formulated. In Nieuwland, the environmental visions influenced the urban planning including the building plans and the integrated PV features, which were very new for both the designers and for the future residents. The aesthetic notions were perceived to be unconventional and to some extent they were criticized, at least initially. In Vauban, similar to the Nieuwland development, the environmental planning helped to improve the development's physical qualities. This was done in collaboration with the future residents who had the opportunity to co-envision their dwellings and their immediate surroundings. The physical qualities that were in line with the environmental plan were achieved through the community's acceptance and thereby, contributed to the success of the development.

Due to the many aspects that shape the physical qualities of a place, the initial approach for the planners should be to identify the social, environmental and physical goals of the development, which are interrelated in terms of their individual and collective contributions to the eco-town's success. The planning and design phase is central as it involves the actors from various disciplines as well as the inputs of those that represent potential future community members. They collectively help to determine both the objective and subjective notions of the resultant eco-town development. In that context, stakeholder involvement was found to play a very important role in the planning process during which operational goals are formulated to positively encompass the physical, environmental and social qualities.

With regards to the physical qualities, there are both endogenous [83] and exogenous factors, which affect the operational goals and outcomes. Exogenous factors, in the context of this research can be defined as the critical 'success factors' that are extensively reviewed in this chapter. For example, aspects such as the level of political will and commitment to the overall vision, the environmental planning and the financial model were all found to influence the physical qualities, especially during the planning phase of eco-town development. The endogenous factors, involve elements that are design-related in particular, which can either help or hinder the goal achievement. For example, in the development of Hammarby Sjöstad, the planners opted out of using thermal solar heaters due to aesthetic concerns (Pandis Iveroth et al. 2012). Additionally, large terraces, flat roofs and wide window openings created environmental goal conflicts, but for aesthetic reasons, the residents perceived them favorably.

The relatively more contemporary and modern style in architectural characteristics attracted the higher income groups that could afford to live in the Hammarby Sjöstad development. This in turn caused conflicting outcomes with regard to the initial goal to create inner-city affordable housing for diverse income groups. Some of the other internal and external goal conflicts (Svane 2007) included the energy company's persistence to use centralized urban systems rather than building-integrated renewable energy solutions and the limited use of technical innovations such as green roofs, biogas stoves etc, (Pandis Iveroth & Brandt 2011, p.1060) that had negative impacts on overall goal achievements. The findings of the case study research suggested that the user knowledge (through participatory, with-user planning approaches) of the implications of design choices and innovations, helped to reduce goal conflicts and resulted in better results in terms of the resident's adaptation to the environmental measures.

In Vauban, the involvement of residents in the design and planning phase of their development helped to prevent the potential goal conflicts of either endogenous or exogenous contexts or for their synergistic impacts. The goals that included but were not limited to the use of sustainable building designs and practices, the design of surrounding natural and physical environment, the limitation on car ownership or the use of motor vehicles within the development were all decided upon collectively within a public-community partnership development structure.

The Development Phase

Most of the physical qualities' impact upon the success of eco-town during the development phase was found to be experiential and educational in nature. The actors such as

83 The endogenous factors briefly emphasized in this cross-case study analyses can be associated with the type of conflicts as described and used by Orjan Svane's research on the Hammarby Sjöstad development (2007). He identified the goal conflicts in three groups, namely the internal, external and procedural, which were expanded upon in Chapter 3 and Chapter 7 of this thesis.

the planners, builders, developers, utility companies and the residents who are involved in the development (as was found in the Vauban's case) gain knowledge and experience into the implementation methods, planning principles and various eco-town features. These helped them to disseminate information about the aspects that were critical to the broader understanding of the benefits as well as to stimulate recommendations for further ways to improve future eco-town developments. The critical analyses of not only the physical qualities but also the aspects of the eco-town development during and after implementation were found to have policy level value and impacts, which can help to increase the double and triple-loop societal learning, if properly monitored, studied and analyzed scientifically. In the Hammarby Sjöstad development, the conflicts in design and planning choices, governance model and the environmental management process, were found to have provided valuable lessons and guidelines for subsequent developments. Unfortunately, the case study research found that the monitoring and analyses of the eco-town developments was seldom properly organized, at least during their development processes.

The systematic assessment of the goal achievements requires baseline data gathering that must be performed within structured data management protocols so that sound future analyses can be conducted. In the Hammarby Sjöstad development, critical mistakes were made with regards to data gathering and management and with regard to the environmental performance reports that were initially based only upon theoretical assumptions/calculations. The physical qualities, as reviewed in the previous sections, were interrelated in ways that can help to achieve the desired environmental performances, if the resident's behavior is within the desired parameters.

The Occupancy Phase

With regards to the impact of the physical qualities on the overall success during the development and occupancy phases, the author presented these aspects from a resident's perspective both physically and psychologically (Section 9.3). However, from an eco-town developer/planner's perspective, there are other issues that were found to be important that contribute negatively and positively to the overall success. There is a vast array of elements that can be addressed within the physical qualities and can be further researched among the critical factors. The integrated eco-efficient features in the buildings, design improvements to increase building performances and the ways in which the immediate surroundings are planned to optimize the eco-town's attributes are some aspects that should be addressed. The case study research revealed that the user behavior influenced the outcome significantly even more than the impact of the physical qualities that were present in the development. While the physical qualities were found to attract the residents in the first place, improving results required sustainable lifestyle choices, behavioral changes and the residents' willingness to adapt to the environmental measures. Among the cases studied for their environmental performances, there were very few improvements due to the systems

installed or due to the physical qualities that were introduced except in the Vauban development in which extensive stakeholder involvement was formulated in identifying physical and environmental qualities.

As an example, in the Nieuwland development, the building integrated PV modules, the performance monitoring tools, the maintenance and ownership issues were some of the many aspects that were relatively new for the planners and the energy company as well as for the residents. During the occupancy stage, problems that were claimed and reportedly occurred (Jadranca & Horst 2008) created uncertainties as to whether the development was really livable (see Section 6.12.5). According to an interview in Vathorst in Amersfoort, some of the previous residents decided to move to other locations due to these minor problems, which were avoidable, if the management had had enough resources to maintain the *communication* and *monitoring* during occupancy's early stages, they would have been prevented or repaired in a timely and effective fashion.

9.2.5 Stakeholder involvement

Stakeholder involvement, which was identified in the review chapters as one of the 'success factors,' was also reviewed extensively in the case studies due to the extent to which it was found to affect the outcomes of the eco-town developments. In the five cases, the models through which the stakeholder involvement was formulated were found to strongly influence the outcome; hence they determined the level of success. The stakeholders in the development process were found to ideally include interest groups such as the public and private actors that are given roles as decision-makers in developing the eco-town, as well as the societal organizations and citizens who are directly and/or indirectly affected by the outcomes. Edelenbos and Klijn (2005) defined the stakeholder engagement in two categories. They suggested that the degree to which the chance was given to participate in each phase of the interactive process (in this thesis' context, the interactive process would be the eco-town development) was the 'width' of participation; and the degree to which each individual (or the stakeholder) had the opportunity to determine the final outcome would be defined as the 'depth' of participation (Edelenbos & Klijn 2005, p.428). In their analyses, the width of participation, was found to be linked to the variety of the outcomes while the depth was more likely to influence the level of satisfaction with the outcomes (Edelenbos & Klijn 2005, p.429).

In the following sections, the stakeholder involvement was analyzed through the findings of the case study research with emphasis given to the width and depth of participation and the resultant impacts on the eco-town development's level of success. It was concluded that the stakeholder involvement and its extensiveness were aspects that highly influenced the effectiveness of other 'success factors' while it also directly affected the outcomes.

The Initiation Phase

The decision to initiate large-scale urban developments may involve political, financial, environmental, social and demographic analyses based on many indicators used by policy makers of various levels. Although these analyses helped to determine the immediate and future needs of the society, they did not necessarily provide insights into how the processes can be better managed or more successful outcomes can be achieved in the future. The cross-case study analysis revealed that the successful outcomes in the eco-town developments were highly linked to the cognitive and behavioral adaptations of the communities, which required relatively more understanding of the subjective views of residents on the needs and aspirations for their place of living individually and as a community. Therefore, public acceptance and consensus among actors require participation starting from the initial decision to develop the eco-town throughout the decision-making process during planning and implementation. This provided the opportunity to share and to elaborate on the vision and ideas about the location, constraints and opportunities at all ecological, architectural and urban planning levels, which in turn helped the planners to develop the operational goals as the next logical step. The participation at the initial stages was found to help to build greater momentum, which was presented in the financial planning and political commitment sections of this chapter. The breadth of participation at the initial phase of the eco-town development was a place/time to start to build social, institutional and political capitals that were found to be essential for the planning and development phases. This stage was also important because it allowed the eco-town initiators to publicly share their visions and to start gathering the interested parties and potential residents to actively participate in the planning and development processes. It was found that the initial decision to develop an area stemmed from economic drivers and urban policy goals after which the environmental and social aspects were emphasized either through political ambitions or through the community's proactive involvement in the initiatives. In Vauban's development, this process was managed via establishing an NGO, 'Vauban Forum,' which facilitated the citizen engagement and participation of stakeholders in the decision-making processes. This phase was integral for creating interest and in attracting the potential residents even though they were not fully committed in the beginning.

The Planning & Design Phase

The case study research identified both the 'width' and 'depth' of stakeholder participation in the planning and design phase to be critical for the success of eco-town development. In-depth research into the participatory processes revealed further distinctions between the types of stakeholder participation that were found to influence the decision-making and the outcomes. For example, Solitare (2005) suggested different methods to create stakeholder participation within urban planning and development. One of them is weak participation, which she suggested as the 'meaningless' opportunities used to manipulate public. The other method was described as the strong participation with 'real opportunities' to empower

citizens to actively take part in the decision-making and to build consensus on issues that interest both the effectors and the affected parties (Solitare 2005, pp.920-921). In the planning and design stage of eco-towns, the case study research found that both arguments were relevant and active participation of the actors including the future community members could help to build a common vision around the shared values and to help to prevent or to resolve potential conflicts that might prevent goal achievement in the long-term.

In the development of Vauban, significant efforts were made in terms of the participation of stakeholders from the very beginning of the planning throughout the implementation processes. Firstly, the development was initiated through the support and motivation of 'potential future residents'. The institutional/ organizational support was provided via Forum Vauban, which was established by the local authority and given broader control over the process in terms of helping to gather and establish the building groups and maintaining effective involvement of the citizens in the decision-making, especially during the planning phase. For most cases, Vauban can be defined as an initiative of an intentional community that is dedicated to adopting and maintaining sustainable lifestyles. Although historical and cultural factors played important roles in Vauban's extended stakeholder engagement, involving future residents in different contexts may require facilitating conditions in which the developers and decision-makers are motivated to create interest in an urban area prior to the planning and development. Also, it is a challenging task to bring together a residential community before and during the initial stages of planning, but the will to be involved in the decision-making and the potentiality of interest to become residents, increased when the ideas were made public and were shared transparently by the eco-town initiators. In this process, conflicts emerged and were resolved through dialogue with greater consensus as a result. As expanded upon in Chapter 8 of this thesis, the extensive collaboration and engagement of stakeholders including the future residents were found to contribute to the success of Vauban during and also after the development. In the case of Vauban, the catalytic agent providing the resident engagement in the decision-making and development processes was found to be highly pivotal to the goal achievements. It was also found that, the decision-making can be difficult in interactive processes during which ideas and personalities compete (see Chapter 4 / the QOL research) which in turn create conflicts and time delays (Solitare 2005, p.921). The role of the catalytic agent, in these situations, is to use opportunities to educate, create meaningful participation and provide guidance through which the involved parties can resolve these differences in opinions, thereby, to gather around the common goals that benefit the entire community.

In the Dutch cases, the champion as well as the Alderman appointed for the project was found to be the facilitator, but not necessarily the provider of a meaningful participation organized among all actors including the citizens as discussed earlier in this section. This was mainly due to the urban planning culture that existed in the 80s and 90s, which was found

to have changed toward more interactive and participatory design processes in the past decades. In the Hammarby Sjöstad case, very little or no in-depth collaboration with future residents or the surrounding communities was found despite the historically established culture of citizen participation in urban development projects in Sweden. Stakeholder involvement was relatively strong for only a short period during which the Project Team, as the facilitator, was proactively involved in the planning process.

Solitare (2005) explained the conditions for creating meaningful participation, which included five groups of situational characteristics. These were: the political commitment for the involvement of public in the decision-making process; building awareness among the citizens (or interested parties) toward the potential opportunities and gains as a result of the participation; the availability of the resources for effective participation to take place (such as time, place, finances, etc.); the trust in other stakeholders in terms of their honesty and fairness; and the perceived benefits of the participation process and its impact on the issues at stake or on the genuine concerns of the public. Thus, effective stakeholder involvement in the planning and the design stage, involves pre-planning of the participatory process with consideration and organization of these elements.

The Development Phase

With regard to the stakeholder involvement's role in the implementation phase, the participation of actors requires a relatively more attentive approach during which the concepts and ideas physically take shape. On the one hand, the changes at any level during this phase may cause undesired delays and financial losses. On the other hand, continuous communication among the actors can help to prevent mistakes, early enough to avoid potential time and financial losses. The findings of the case study research suggested that stakeholder involvement with the future resident's participation in the development process increased the level of goal achievement such as the reduced consumption of energy, water and/or better waste management. The educational and experiential process, if formulated effectively among citizens can increase awareness toward the environmentally sound innovations for which the residents can feel sense of belonging and responsibility. In Nieuwland's development, the stakeholder involvement included a wide range of actors such as the environmental supervisor in order to achieve the environmental goals. The extent to which the residents were involved in the development process, in this case, was comprised of a limited research-based participation of the citizens. Despite the extensive application of innovation and holistic design approach in Nieuwland, relatively better environmental performances were only found where resident's participation in the development process had existed. Therefore, with regards to 'stakeholder involvement' in the development process, the involvement of all stakeholders was found to yield positive results, if formulated to generate 'authentic dialogue' within and among actors.

The Occupancy Phase

Although the stakeholder involvement could be considered to affect the initiation, design and development stages, the interactions among the actors during occupancy, was also found to be highly relevant for a number of reasons. Firstly, the communication between the developers (including the utility companies) may need to be maintained to ensure that the installed systems and applied technologies work and are used and maintained properly. This will increase the environmental performance levels and help the residents feel confident about the new features and their anticipated benefits. Secondly, the actors and residents may need to resolve governance and other administrative issues that require collective action and decision-making after the occupancy starts in the eco-town. For example, in Hammarby Sjöstad, '*GlashusEtt'* was functional as an information center as well as an administrative organization where the residents could consult and can proactively use the facility as a platform for dialogue. Similarly in Vathorst, '*i-Centrum'* has functioned in a similar way in addition to conducting other administrative tasks for the development company established between the shareholders including the local authority. In Vauban, '*Forum Vauban'* conducted successful work together with the residents and housing associations, in collaboratively planning and developing Vauban.

In conclusion, stakeholder involvement was found to contribute positively to the success of eco-town's development. It was found that such engagement is greatly affected by the governance model and context through which the initial decision was made to develop an area. In conjunction with the 'success factors,' width and depth of participation were found to affect both the decision-making and the outcomes. In Section 9.3, the relevance of stakeholder involvement was further discussed with respect to the residents' perceptions on residential well-being.

9.2.6 Environmental model

The case study research revealed that the reports on environmental performances have often used theoretical calculations instead of the systematically monitored performances over a period during the occupancy. Moreover, the consumption levels, documented during in-depth analyses, exceeded the initially desired targets even though the environmental criteria were met during the planning and development of the eco-town. In most cases, the residents' behavioral adaptations, or the lack of them, were blamed as the causes for the poor environmental performances. It was found that achieving or failing to achieve the initially desired environmental goals was linked to many reasons including the lifestyle choices of the residents, establishing the environmental model, conceptually, contextually and procedurally, was found to contribute much to the success of the eco-town. In analyzing the environmental model, the case study research findings suggested that the ways in which the environmental model was formulated and implemented, significantly affected the residents' behavioral adaptations and their environmental performances.

The Planning & Design Phase

The case study research revealed that the environmental goals were often designed with an overarching objective to reduce the energy, water consumption and waste reduction or to limit car ownership/ use and to promote sustainable transport modes, in the proposed new eco-town developments in the early 90s. Although the conceptualized planning and implementation of the systems and technologies were found to potentially help to achieve the desired results, there were several factors that created setbacks in the formulation and operationalization of the goals, ultimately conflicting with the long-term social and/or physical needs of the community.

The findings from the literature review and the case study research suggested that the planning of the environmental models was often influenced by the environmental agendas of local, regional and national governments and it was not always a straightforward process when the actual planning occurred. Financial aspects, political commitments and the physical qualities of the developments were among the factors that significantly influenced the environmental planning and management processes. Identifying the overarching goals and operationalization of these goals was found to be different processes and required holistic approaches to achieve relatively more positive results.

The case study research revealed that conceptualization of the environmental model is a critical phase during which priorities and central themes are determined. During an interview with the environmental supervisor of the Nieuwland development, it was learned that various factors had influenced the design of operational goals. However, working with thematic approaches helped to develop clear guidelines through which communication with various planning and design disciplines. The initial guidelines were developed through examination of the topographic, climatic, environmental characteristics of the land and these helped to identify the challenges and opportunities for the physical design of the master plan as well as the building designs in general. This was found to be a critical stage where the physical qualities of the development were affected by the environmental decisions even though they were not clearly specified or established as measures at this stage of the project.

With regards to architectural design and urban planning, it is important to orchestrate the environmental planning in conjunction with the design process as they were found to add up or cancel each other with respect to the level of goal achievement. The ways in which the environmental model influenced the physical planning were found to have important impacts on the perceptions toward the residential qualities. For example, in Nieuwland's development, the environmental planning was the dominant element in terms of providing other disciplines the guidance for design and implementation. With much effort to accommodate the necessary PV space in the roofs, the perceived effects of the architecture were

monotonous and somewhat too technological for a residential development. An interview with Trudy de Mooy (see Section 9.2.2) in Vathorst revealed that the residents initially reacted negatively to the physical qualities of Nieuwland, and despite the holistic design notions, much of the attention was given to the upcoming Vathorst development. In contrast, the lack of a clear environmental agenda in Hammarby Sjöstad resulted in the developer-led planning and development process in which financial interests as well as the interrelated physical attributes became more dominant. The lack of strong leadership and the shift in political commitments to the vision resulted in compromises in terms of the formulation of operational goals. But the development was and continues to be successful in terms of attracting new residents and in maintaining its popularity as an inner-urban residential area to date.

The eco-town leadership and authority, were found to be strongly linked to ensuring the goals and objectives so that the design and planning related disciplines are synchronized with the desired results. However, even though the environmental model is established with the consensus of actors, the desired results were not always achieved at least environmentally. The findings of the case study research on the achievement of environmental goals suggested that, the resident's behavior strongly affected the outcomes. In Vauban, the resident's participation in the planning process helped to create the public acceptance of both the measures and the level of behavioral adaptations that were needed to achieve positive results. The participatory design and planning in which the residents were involved did not exist in the Hammarby Sjöstad case. This had two levels of impacts. Firstly, higher income groups moved in due to the cost, location and the physical and architectural characteristics. This was reportedly found in contrast with the goal to create affordable housing, which was initially desired. Secondly, and in conjunction with the type of new residents, despite the technologies, the behavioral adaptations / lifestyle changes did not immediately occur until the level of awareness to environmental measures was established later during the occupancy. In brief, planning and implementation of the environmental model requires communication among all actors. Moreover, societal acceptance was one of many issues that must be considered for better contextualization and formulation of the guidelines, goals and measures.

The Development Phase

With regards to the operationalization of the environmental model, the case study research found that the technologies and innovations are only part of the environmental planning. The use of these features or the performances of the infrastructural, urban or building integrated systems must also be soundly evaluated and analyzed. The collection of baseline data therefore, is vital prior to the development or as early as possible in the development process. The environmental performance monitoring is key to understanding the residents' behaviors after occupancy is started. The results of the monitoring must then be used to

provide regular feedback to the residents, along with educational inputs on how they can improve their environmental and social contributions to more sustainable societal development.

The case study research provided insights into the protocols with which to ensure the standards determined by the environmental model. Developing guidelines within which the developers can proceed with design and building related activities and continuous supervision of the development process were found necessary aspects in order to ensure the quality and also to help training the building groups for future similar projects. Furthermore, the involvement of citizens in the development process was found to increase interest, awareness and to educate future residents for the eco-towns features on all social, environmental and physical benefits, which have interrelated impacts on the residential well-being and the QOL.

The findings of the case study research on the environmental performances suggested that there were few differences in the consumption levels in the eco-town developments compared to the surrounding areas and these were found to be due to mainly the improvements in the infrastructure and building features. Among the five cases, significant differences in the goal achievement were found in the Vauban development in which there was extensive stakeholder and resident participation. This was found to have created consensus and awareness toward the environmental measures as well as the social and physical goals, which in turn contributed positively to the success of the eco-town. It was found that the resident participation and environmental model are strongly linked on the condition that residents are environmentally aware and involved in seeking to make a difference by their life-styles.

In conjunction with the environmental model's impact on the outcome, holistic and participatory approaches were found to be key. However, the extensive participation of all interest groups (including the residents) was found to require much time (due to the longer decision-making process) and financial resources in order to establish ideal situations for communicative / inclusive and with-user planning. Therefore, the planning and implementation of the environmental model need to have institutional, political and financial commitments from the planning throughout the development phases.

9.3 The resident's perspective

In light of the cross-case analysis summarized and presented in the previous sections of this chapter, the sense of belonging (to the future residential place and community) and the perceived QOL dimensions were found to be critical aspects associated with the choices

that were made in relation to one's residential place as well as adopting pro-environmental behavior (Steg & Vlek 2009), which in turn influenced the success of eco-towns directly and indirectly.

Sirgy (2012a) suggested that the needs, values and lifestyles that fit with one's positive immediate environment (where one lives, works, socializes and interacts with neighbors, work colleagues, family and friends) are related with higher QOL perceptions (Sirgy 2012a, p.180). The resident's view of her/his positive social and physical environment within a positive community was found to be important to one's sense of belonging as well as to the perceived QOL, in general.

With regards to the elements that influence the QOL perceptions more broadly, Sirgy (2012b, p.309) highlighted the role of the residential environment, its features, amenities and services, (for example, the neighborhood as the larger social unit in which one resides) in one's social and physical interactions, and subsequently underscored the housing (dwelling), which is one of the '*largest consumption items in a lifetime in which one finds refuge and lives intimate experiences*' (pp.308-309). These elements were also addressed by the concept of needs / or the '*need concepts*' and include 'belonging' as an integral part of the subjective QOL dimensions (Sirgy 2012a, p. 179).

Forrest and Kearns (2001) suggested that the residential place, such as the neighborhood, plays an important role in social cohesion, which emphasizes the need for aspects including but not limited to '*a sense of morality and a common purpose, social interaction within communities / families and a sense of belonging to place*' (Forrest & Kearns 2001, p.2128). In this context, residential place in which one resides, experiences life, interacts socially and physically becomes highly relevant to one's attachment to that place as a context of '*personal and place identity*' (Forrest & Kearns 2001, p.2129). Also, 'residential attachment' and 'satisfaction with the residential environmental quality' relation has been explored within social and psychological contexts (Bonaiuto et al. 1999). It was argued that the satisfaction with one's residential environment could be explained through '*the perceptions and cognitive evaluations*', while the residential attachment had more to do with '*people's affective bonds with their residential environment as a whole*' (Bonaiuto et al. 1999, p.333). Although the studies distinguished 'attachment' from 'satisfaction' in terms of '*the affective and cognitive QOL components'* (Connerly & Marans 1985, p.30), both dimensions were found to be relevant in terms of explaining the perceived quality of the residential place, hence the impact on the overall quality of life in that social unit of analysis (Connerly & Marans 1985, pp. 42-44).

More recently, Sirgy (2012) explained the construct of "residential well-being" from a psychological perspective in which he gave the following definitions: *the differences between*

the residents' actual and desired housing and neighborhood conditions; residents' attitude towards their living space; feeling of satisfaction with the community; the residents' perception of the overall quality of life (QOL) of the community; the community pride / feelings of gratification of living in a specific place, and; the satisfaction with the dwelling features (Sirgy 2012b, pp. 303). Moreover, the resident's well-being and the well-being of the community were accepted as part of the subjective aspects of QOL studies (p.319) and these were found to influence one's life satisfaction in varying degrees. Furthermore, it was suggested that the quality of a residential place (the city, neighborhood, the dwelling etc.) was a subjective phenomenon and that the resident would have her/his own individual view, perception and assessments about it (Marans 2003, p.74). With respect to QOL measurements, the recent works such as the (Eurofound 2013; Eurofound 2014; UN-Habitat 2013) have more comprehensively used the subjective and objective aspects including but not limited to the quality of the residential place, its social, physical and environmental dimensions in order to assess perceptions and evaluations from the resident's perspective.

One's desire to influence her/his immediate surroundings whether it is the housing, the residential environment and/or the environmentally sound features that impact the QOL perceptions individually and as a community, should be underscored especially within the context of eco-town developments. The case study research revealed that the proactive involvement of the residents in the planning and decision-making processes, increased awareness of the immediate surroundings, the physical qualities and toward achieving the environmental goals, which in turn can help to establish sense of belonging and potentially adopt more sustainable lifestyle patterns and behaviors[84] within their communities.
The survey conducted on the perceived QOL dimensions exploring the similarities and differences between the residents from conventional and eco-developments, revealed that physical and social elements in the place of living, played an integral role in terms of influencing the QOL perceptions. Moreover, shared sense of values, common purpose within the community such as those in the eco-town developments were found to be key elements to establishing sustainable eco-developments (Bayulken & Huisingh 2015b).

84 Steg and Vlek (2009) analyzed the factors that may encourage and promote pro-environmental behavior from various theoretical frameworks such as the norm-activation model (NAM), the value-norm-belief theory of environmentalism (VBN), the theory of planned behavior (TPB) and more. They developed an integrative theory of "goal-frame" suggesting three distinctive motivational conditions through which behavioral change can occur (Steg & Vlek 2009, pp.311-312). Pro-environmental behavior was suggested to result from values and environmental concern, which was categorized as normative goal-frames explaining the appropriate actions.

9.4 Conclusions

Although the author investigated each factor sequentially as if they were linear, the cross case analysis revealed that the six 'success factors,' were all interconnected and dynamically interlinked. It was also found that their synergistic effects varied depending on the contexts during which the eco-town developments were decided upon, initiated and formulated. In light of the cross case analyses performed on the five cases, the following conclusions were drawn with respect to the six 'success factors,' individual and synergistic impacts:

1. *The six 'success factors' are interrelated, and explain the success of eco-town development.*

The findings of the case study research revealed that the six 'success factors' influence on the outcomes of eco-town developments was evident in terms of achieving their project goals. It was found that the resultant impacts of the development processes varied depending on how these factors were formulated and operationalized individually and collectively. Additionally, these factors' combined effects on the results varied depending on their interrelatedness during the initiation, planning and development phases. In other words, the six 'success factors' affected the outcomes synergistically and via interacting with each other dynamically across different phases of the developments.

2. *The environmental model and stakeholder involvement were interrelated, and jointly they were the strongest factors in explaining the success of eco-town development.*

The environmental model and the stakeholder involvement, which were strongly interrelated, made significant differences with regards to the success level of the eco-town. Additionally, the extent to which the resident participation was formulated whether in planning of the environmental model or about the aspects that affect the perceived benefits of the development was found to be instrumental in achieving the overall vision. For example, the physical qualities were found to attract residents because they were perceived as potential indicators of life quality within the place of residence.

3. *The success of eco-town development is especially higher if residents are involved in designing their homes. It leads to more environmental features, better environmental performance, environmentally aware behavior and a stronger sense of belonging among residents in the occupancy stage.*

In that context, significant differences were found in achieved results when the residents were involved in the decision-making process through designing their homes, participation in the environmental and physical planning, or simply by being consulted for their

aspirations, dreams or desires toward building their future place of residence. The research revealed the importance of both the human and technical aspects of the planning process that are dynamic and context-dependent. The societal, cultural, psychological and/or other aspects influence the overall design and formulation of the development process; they also affect the outcomes more broadly.

4. *It is not just about involving residents through the design, planning and development stage; a process of community building occurs that continues during the occupation stage. Environmentally aware behavior is shaped in this process, at the individual and community level, and this leads to a collective sense of belonging.*

In Chapter 8, the research on Vauban's development showed the community's willingness to shape their residential place in line with their own specific needs and aspirations. This not only helped them to create consensus around the environmental, social and physical goals, but also resulted in collectively adopting sustainable consumption patterns, behaviors so that the goals were met in the development. This finding raised the question of causality and/or the selection effect, and more importantly, addressed the need to further explore the link between the potential residents' perceptual and cognitive responses in relation to the place of residence and also for their willingness to adopt sustainable behaviors and lifestyles.

5. *Long-term value was created when the financial model was contextualized in line with the social, environmental and physical aspects of community development. Public-community partnerships built upon long-term financial planning yielded more positive environmental results and better design and development quality.*

The financial model contributed to the outcome of the eco-town development positively in the short and the long-term if formulated through comprehensive analysis of the market projections, project costs, pricing and above all, the financial mechanisms that are needed for additional environmental measures and systems. The mixture of rental and ownership of the property as well as the social housing with diverse types of tenure need to be facilitated so that the long-term feasibility of the project is achieved. Among the cases investigated in this thesis, demand-driven development strategies with financing mechanisms, which were placed in support of the bottom-up development initiatives were found to be key for successful eco-town developments. The financial model that was built upon multi-actor partnerships created more value in the long-term and helped to safeguard the interests of both the public as well as the private parties' interests.

6. *Sense of belonging to the community and to one's place of living provides higher quality of life perceptions. These aspects also affect one's behavioral adaptations positively toward more sustainable lifestyles, which in turn contribute to the success of the eco-town development.*

One of the significant differences in the results was found to occur when a '**sense of belonging**' to the place and community was established through participatory and inclusive planning and development. This was found both in the case study research and also in the QOL survey that was conducted to compare the perceived QOL dimensions of the residents living in eco-developments and in conventional settings. As discussed in Section 9.3 of this chapter and more extensively in Chapter 4 of this thesis, the collective action toward making decisions that affect the 'place of living' (in terms of both the dwellings and the surrounding area), was found to strongly influence the sense of place and the sense of belonging. While this was discussed extensively in the 'stakeholder involvement' section of this chapter, the positive impacts of residential well-being have been mostly emphasized within the context of QOL aspects (see Chapter 4) that affect the residents' attachment to the place of living. This in turn may affect one's behavioral adaptations toward more sustainable lifestyles. Therefore, the evaluation of the residents' QOL perceptions in the surrounding areas and potentially those that will live in the eco-town, was found to be among the 'success factors' that would additionally help the planners to understanding how the notions of sense of place and belonging and the sense of community could be better established and enhanced.

7. *The specific relations found between the six 'success factors' and success of eco-town development, as summarized in the above conclusions, suggests that participative planning yields more success than top-down planning, or market dominated planning.*

Although the large-scale urban development initiatives such as the ones studied in this thesis involved a large number of actors and complex economic and political relations among them, the case of Vauban's development revealed the positive impacts of extensive communication among stakeholders with participatory and integrated decision-making on all issues pertaining to the vision, planning and development processes. In this context, public-community partnership (PCP) as a planning and development model was found to be exemplary and at the same time highly context-dependent as the local knowledge, culture and societal needs or aspirations may differ widely and may affect the decision-making processes, hence the success in different contexts significantly. As discussed by Femenias (2008), potentially successful developments, not as products but as **processes**, should involve the participation of a large range of actors / stakeholders through all stages of the development within an integrated approach and this should further allow time for the

recognition of innovative approaches of sustainable planning and development so that the perceived benefits can be experienced and learned by the wider public (Femenias 2008).

8. *Eco-town development is a dynamic process of learning that continues throughout the occupancy stage. Learning better ways to plan and develop needs to be followed by the experiential process that defines an integral part of the eco-town's success.*

The successes of eco-town developments were found to be strongly related to the extent to which the conditions for '**learning**' were created before, during and after the developments evolved. The community's adaptations to sustainable consumption behaviors and ecologically responsible lifestyles can be catalyzed through experiential processes as well as via the exchange and sharing of useful information (e.g. by means of campaigning, workshops, social networking) and even more effectively through integrating practical and theoretical learning in the formal educational processes, facilitate 'dialogue' and 'joint learning' for the integration of values, interests and expertise was found to be essential (Oldenhuizing et al. 2013). The eco-town development, as much as it is - or should be - considered a process of co-production, it is experiential and dynamic, therefore, it should further address the post-development (occupancy) stage as an integral part of the learning process. The case study research findings suggested that the communities that were environmentally conscious, had taken better advantage of the opportunities and had used the timing wisely in favor of establishing visions and goals around their shared values and aspirations.

In conclusion, the findings of the case study research supported the proposition that the six 'success factors' of: political commitment, timing, financial model, physical qualities, stakeholder involvement and the environmental model are crucial for successful eco-town development. In addition to the key factors discussed in the case study research and analyses, the 'sense of belonging', 'good governance' and facilitating and expanding 'learning', were found to be additional key aspects that were needed to help to ensure success in constructive evolution of eco-towns.

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Chapter 10

Conclusions and Recommendations

10.1 Introduction

This author's thesis journey started with a comprehensive review of the literature on the urbanization processes and trends after industrialization began in the early 1800s. The review process first investigated the Garden Cities in the UK and subsequently in other parts of Europe and beyond. It was found that, in spite of the gradual increase in popularity regionally, the Garden Cities movement remained somewhat limited due to the Great Depression of 1929 and subsequently due to WWII. The urgent need for new housing in the post WWII era however, led to the wider adoption of urban policies that were influenced by economic growth policies. During this evolutionary period of the urban development and growth in the first half of the 20th century, a new urban planning doctrine emerged with the ideals to separate urban functions of dwelling, work, recreation and transportation. This modernist trend oversimplified the complex social, physical and environmental dynamics of the urban metabolism and evolved into an international style of city planning and development approach that was adopted by many of the planners, globally.

Modernism's influence and the adaptation of its planning principles into different cultures and geographical contexts without proper contextualization in times of rapid urban developments resulted unintentionally in negative social, physical and environmental consequences. The city planners in the Western European countries and in the Scandinavian block, however, have emphasized the spatial, societal and demographic factors that were found to be important in terms of urban planning and decision-making processes, and for anticipating the future urban challenges. The literature review further helped the author to expand upon the distinctive variations in terms of the urban planning and development approaches between the developing countries with emerging economies and the nations with progressive urban policies with relatively higher levels of integration of environmental planning in their urban design processes. Among the European models, the positive contributions of early sustainability approaches at local levels as well as the integration of macro-theoretical models such as Ecological Modernization (EM) and Sustainable Development (SD) at the national policy levels were found to be part of the progressive steps toward seeking to find solutions for social, environmental and economic challenges of urbanization. Therefore, in Chapter 2, the concepts of EM and SD were discussed, and additionally, the alternative sustainability concepts such as the Regenerative Sustainability and net Positive Development were highlighted in response to the emerging social, ecological and physical urban challenges. [85]

85 These include but are not limited to: '*climate change, population growth, economic and social crises, resource constraints, food and water insecurity, biological and other disasters as well as the physical capital such as housing, infrastructure, services or social capital of health, education and security'(see Section 6 in Chapter 2).*

With the emphases given to some recent examples of sustainable urban development models; the author reviewed and presented, in Chapter 3, a review and cross analysis of his case studies of eco-towns that emerged in the Northwestern Europe during and after the 1990s. In the second part of the two-paper, literature review, the frameworks, typologies and processes were focused upon, and the key aspects were highlighted to help to achieve sustainability goals and objectives in urban contexts. As a result of the review of international eco-town developments and with an in-depth analysis of eco-town developments in Northwestern Europe, the author identified and conceptualized the six 'success factors,' which were associated with the development models of relatively more integrative and holistic eco-towns. These were found to be: **a.** the political commitment, **b.** the timing, **c.** the financial model, **d.** the physical qualities, **e.** the stakeholder involvement and **f.** the environmental model.

The second part of the review process further elaborated on examples of technical/technological innovative approaches that were found to align with the sustainable urban development goals, and underscored the social and societal implications of sustainable urban planning and implementation. It was found that bottom-up efforts were needed to establish environmental stewardship, strong community values and to provide better quality of life for the citizens. In that context, the community based initiatives such as the eco-villages and eco-neighborhoods, were highlighted for their relatively more thorough contextualization of social, physical and environmental values and aspects within their communities.

In light of these initial findings based upon the two-article literature review and in order to further gain insights into the perceived quality of life dimensions, an explorative study was designed and a survey was conducted. This research was focused upon attitudes and perceptions of residents of eco-developments and of residents from conventional urban settings, in order to determine, ***a.*** the similarities and differences in the QOL perceptions, and ***b.*** the aspects that influence the QOL perceptions with respect to the residential place in which to live (Chapter 4).

For that study, the relevant literature on the QOL concepts, approaches and the aspects that were found to be important in terms of measuring subjective well-being of urban dwellers were reviewed. Secondly, a comprehensive questionnaire of 84 closed and open-ended questions was developed and administered to obtain information on the experiences, reflections and insights of the respondents from the eco-developments and from conventional urban settings. Based upon the analyses of the data gathered from the questionnaire, the QOL of residents from eco-developments was found to be higher than the QOL of residents in normal urban developments. He ascertained the factors that most influenced the decisions of people to move into an eco-development. They were found to include but were not limited to the community characteristics and the natural environment more broadly.

In-depth analyses of the questionnaire responses revealed that the *sense of belonging*, *sense of place and community* were the key elements for the eco-town resident's higher QOL. These elements were found to provide a sense of satisfaction in part due to the shared community values, which led to a shared sense of purpose and high aspirations.

The personal responses to the questionnaire helped the author to elaborate on the important aspects such as the social interactions among community members, governance issues and the perceived contributions of the physical qualities, the presence of environmentally sound features and attributes of their developments. These were found to be highly relevant aspects in the context of eco-town planning and development processes, and were investigated and analyzed in-depth through the subsequent case study research. Together with the insights gained through the review of eco-towns' development frameworks and their processes presented in Chapter 3, the author analyzed five cases, three were from The Netherlands, and one each from Sweden and Germany, which are reported upon within Chapters 6, 7 & 8.

Based upon the conceptual framework of the eco-town's success proposed in Chapter 5, the individual and synergistic impacts of the six 'success factors' were comparatively analyzed through the case studies conducted on the Kattenbroek, Nieuwland and Vathorst developments in the city of Amersfoort (Chapter 6), the development of Hammarby Sjöstad in Stockholm (Chapter 7), and the Vauban development in Freiburg (Chapter 8), respectively. The main emphasis of those chapters was upon answering the thesis's overarching research question: *"Did the eco-town developments achieve their goals for improving the residents' quality of lives, provide support for their behavioral and cognitive adaptations and lead to appropriate policy changes?"*

In addition to the findings of the quality of life (QOL) research, which was presented in Chapter 4, the former part of this question was expanded upon in Section 10.2 of this chapter. In Section 10.3, a unified theory of the successful eco-town was proposed. Recommendations were made for planners, architects, policy-makers and potential future residents based upon the aspects that were found to be associated with the planning and implementation of successful urban developments. The strengths and limitations of the research methodology were discussed and a future research agenda was addressed in the concluding section of this chapter.

10.2 Eco-town development from the dwellers' perspective

As discussed in Sections 1.3 and 1.4 of Chapter 1, the author addressed the first two research questions in Chapter 2 of this thesis. The research presented in Chapter 3 was

contextualized to deal with research question 3, in which the sub-question 2 was answered. With regards to sub-question 1, the conceptual framework for the success indicators was developed in Chapter 5 and investigated through the case study research in Chapters 6, 7 and 8. Subsequently, the research sub-question 3 was explored within the cross case analysis presented in Chapter 9 of this thesis. One of the remaining research questions, which the author articulated here in light of the QOL survey and the cross case analysis, is research question 4.

> ***RQ 4:*** *How did the eco-town developments affect the perceived QOL of residents? What similarities and differences were there with regard to the elements influencing the perceptual and behavioral aspects in eco-developments and in conventional settings? Finally, how can the QOL dimensions help to develop successful eco-towns in different cultural and geographical contexts?*

The research conducted on the eco-town developments revealed that there were distinct differences in terms of their underlying visions, frameworks and contexts as well as the development processes and their outcomes. Although their objectives included both the environmental and social aspects among an array of innovative planning and design approaches, the technological aspects were more strongly emphasized in terms of operationalizing sustainability goals and objectives. More recently, research has been done that was focused on the residents' subjective views and upon the perceived QOL dimensions in which the social and societal implications of eco-town developments were addressed.

The research conducted on the QOL perceptions of residents (Chapter 4) aimed to gain an understanding of the social and psychological dimensions affecting the residents' subjective views of their surroundings as well as toward the eco-town features, compared to the residents living in conventional urban settings. More in particular: all physical, social and environmental aspects influenced the perceived QOL of residents and they also affected the extent to which the residents felt local attachment to their individual place of living and to the broader community environment.

With regards to eco-town goal achievement, which was discussed extensively in Chapter 3 and in the case study chapters (Chapters 6,7 and 8); the local attachment was found to be one of the key concepts or notions, which influenced the residents' behavioral changes and cognitive adaptations toward sustainable design and environmental measures.

For example, the 'neighborhood satisfaction', 'home-life satisfaction' and the 'sense of community' were found to be highly important elements in relation to the QOL perceptions of residents. The survey revealed that the physical, social and environmental aspects with respect to one's immediate surroundings, both for work and residential contexts, helped to

improve their perceived QOL. Additionally, their awareness of 'shared values' and 'common purpose' among the community members towards adopting sustainable lifestyles were additionally important aspects for developing increased levels of affective bonds to their home and community. These findings underscored what some social psychologists and other researchers have found about enhanced sense of connection among the community members, nature and the surrounding environment that strengthened the socially and environmentally sustainable lifestyles, and had positive impacts on community member's perceived QOL. As a result, the increased sense of belonging, affective concerns for one another within the community and for the residential environment influenced their pro-social and pro-environmental behaviors.

Another important finding from the QOL survey was that the pro-environmental behavior and the responsible use of eco-friendly building features were influenced by the degree to which the residents felt responsible for their residential units. This was also consistent with the findings from the case studies, that the 'sense of belonging' and 'local attachment' were crucial aspects in the attainment of sustainability goals. The participatory processes in which community members collectively planned their developments were found to feel more connected to the place and community.

While the QOL of residents in eco-towns/eco-developments was found to be higher than other contexts, their behavioral changes, consumption of energy and water, use of privately owned cars, were often very similar to residents in surrounding non-eco-town communities. Although QOL was one of the essential aspects in creating successful eco-towns, it was also found that it was not a *sufficient measure to determine their success*. The QOL survey showed that the community members who participated in the development processes or in the decision-making at some level were more engaged in the activities / tasks and responsibilities concerning their individual and collectively managed residential environments than those who had no opportunity to provide inputs at the planning phases.

With regards to the findings of the QOL research, the neighborhood satisfaction, the sense of community and satisfaction with home-life situation were found to be the aspects that influenced one's perceived QOL positively. These findings, however, were neither exclusive for the eco-towns nor deterministic for their overall success. In other words, the QOL dimensions were found to be highly subjective as the cultural and societal differences could affect the ways in which the sense of belonging and community or the sense of place would be established in a community. In spite of the limitations of the research conducted on the QOL perceptions of residents from eco-developments and in other residential settings, this thesis author concluded that the communities that gathered around the shared values and common purpose, had developed more interactive decision-making processes on issues affecting their QOL. In this context, sustainable approaches in planning and development

were found significantly more emphasized by the communities in which the stakeholder participation was formulated more extensively. The case study research also showed that residents' involvement in the development process had multiple impacts that were associated with the successful outcomes.

> ***Sub-question 4:*** *"What lessons can be derived from successful eco-town development processes with regards to their impacts on the residents' cognitive and behavioral responses toward more sustainable lifestyles?"*

The case study analysis revealed that the governance model with '*meaningful'* participation of all stakeholders (not only the interest groups but also the potential residents) yielded positive effects during the planning, development and occupancy stages. These insights and findings were expanded upon in Chapter 9, with emphases given to the roles of the six 'success factors' individually and collectively. The resident participation was found to influence pro-environmental behavior more positively if facilitated in the decision-making processes from the beginning of the planning phase and was continued throughout the development stages. It was found that the residents were willing to elaborate on their concerns, aspirations and desires with regards to the issues that concern their lives within their communities. Additionally, being part of the decision-making processes affected the physical and natural surroundings (including the physical planning of their homes) and further created a sense of belonging, which helped them to adopt more sustainable lifestyles.

The research among the eco-town development residents revealed that extensive stakeholder involvement also had some negative aspects due to; **a.** the financial costs and time invested in the decision-making processes, and; **b.** the competing ideals and personalities. Some of these issues were resolved through coordinating the interactions among stakeholders including the resident groups' involvement in the development processes. This empowered the stakeholders to participate effectively in the decision-making and encouraged collective solutions and actions both in the planning and development phases.

With regards to the residents' views about the sustainability measures in the eco-towns, the research revealed that the introduced solutions, measures or regulations were not always favorably perceived in regard to their expectations or hoped for lifestyles. In most cases, the 'physical qualities' significantly influenced the residents' choice of place of living, hence their sense of place. On the one hand, this was found to be an opportunity for the planners who can and should elaborate on the physical qualities as a bridge to establish affective bonds while also introducing smart solutions that can have both aesthetic values and function to promote more sustainable behaviors. On the other hand, physical qualities were found to be easily exploitable by the developers in order to create financial gains without proper emphasis given for the long-term integrity of the natural and built-environments.

In this context, the prospective residents' understanding of the social, environmental and physical qualities of their future place of residence is essential in terms of providing guidance for the decision-makers and planners on how to contextualize the eco-town's development processes more holistically.

Furthermore, the case study research conducted on similar geographical and cultural contexts revealed that the diverse models of governance can and often do result in different outcomes depending on how the stakeholders interacted or if the residents were involved in the decision-making processes. Within a community of shared values and purposes for sustainable lifestyles, the politicians as the '*meta-governors*' and the planners as the '*facilitators*', are some of the examples of the changing roles of actors that may take to more effectively achieve the eco-town's goals. The research findings suggested that the aspects that were investigated in relation to the 'success factors' and the additionally proposed governance model have notable effects on the level of eco-towns' desired outcomes. Another important finding derived from the cross-case analysis was the need to expand the mechanisms for '*learning and knowledge sharing*' among the communities so that behavioral changes and cognitive adaptations could be facilitated more effectively. In the context of Northwestern Europe, it was found that the cultural and historical elements played a great role in building awareness toward the implications of societal and environmental changes of QOL of individuals and communities.

The research on the eco-town developments further showed that the planning and decision-making processes are complex and dynamic in nature. Therefore, site-specific realities, such as but not limited to the cultural/societal, geographical, ecological and institutional contexts are essential to analyze prior to the eco-town's planning. Moreover, sociological and psychological dimensions should be included in the contextualization of the eco-town, so as to more effectively formulate the social, physical and environmental goals and planning guidelines in ways that can more effectively help to achieve positive results.

The research findings revealed that the QOL perceptions of eco-development residents were higher than the residents that lived in other urban settings. An important outcome of this study also showed that the community based initiatives were / have been more sensitive to planning and governance models with relatively more interactive, bottom-up committed participation in the decision-making whether on the issues that affected their QOL or the future well-being of their development as a whole. Both the review of relevant literature and the case studies showed that the eco-town developments were initiated, planned and developed mostly with top-down planning which had relatively less involvement of residents in the decision-making. It was also found that there were growing numbers of eco-town/eco-city developments around the world. While the Northwestern European nations have made use of the lessons and experiences of previous examples considerably more than

others, in the countries with emerging economies and rapid urbanization have provided little consideration for the perceived QOL aspects, especially in the context of sustainable urbanization.

10.3 Towards a theory of eco-town development

In Section 1.6, the eco-town development was defined as the achievement of social, physical and environmental goals, and subsequently, as the positive policy implications in urban planning and practices as well as the community's behavioral and cognitive changes toward sustainable lifestyles and consumption patterns. This broad definition of success includes multiple aspects, which were found empirically to influence the success of eco-town development.

As discussed in Chapter 3 and further investigated with regard to their impacts in the case studies, the 'success factors' were; *the political commitment, timing, financial model, physical qualities, stakeholder involvement* and *the environmental model*, all of which were found to influence the outcomes in terms of achieving successful urban developments. In Section 9.4 the conclusion suggested that the individual and synergistic impacts of these factors depended on how they were contextualized and formulated. Additionally, other important findings were found in relation to the achievement of sustainability goals of the eco-town, in particular the participation of all stakeholders, facilitating learning and education mechanisms and creating a sense of belonging and attachment within their home and community. In spite of the proper formulation of the initially identified 'success factors' in the development process, the additional aspects helped the author to further reflect upon the definition of success, hence on the roles of eco-towns to effectively help to accelerate the transition of urban populations to become sustainable, equitable, post fossil-carbon societies.

In light of the results of the literature review, the quality of life (QOL) survey, the case study research conducted on 'success factors' as well as the cross case analysis, a generic theory on successful eco-town development is proposed in Section 10.3.7. In Sections 10.3.1 to 10.3.6, the six 'success factors,' were reflected upon, this time with the emphasis upon their broader applicability in the urban developments of different scales and contexts.

10.3.1 Political commitment

Large-scale urban development projects are complex initiatives with various types of actor relations and policy adjustments that are required for their initiation, planning and implementations. Political commitment is essential for all institutional, public and civil support and for building consensus both in the planning and the decision-making processes, especially

in large-scale urban development initiatives that have short and long-term implementation trajectories. Furthermore, policy adaptations for regulatory measures and the capacity to mobilize resources (such as subsidies and other forms of incentives) make administrative powers even more integral within the context of sustainable urban developments. However, the form of political commitment also needs further clarification as the public and private parties increasingly engage in partnerships in the planning and implementation of large urban developments. In this context, the political establishment as the facilitator needs to ensure that the necessary mechanisms are put in place in order to safeguard the interests of all stakeholders. The shifting administrative powers could change political agendas, which may negatively affect the development processes and thus the outcomes. Therefore, the political commitment must be present for the long-term (regardless to the potential changes in the political views or administrations) and have clear agenda and responsibilities that are agreed upon from the very early stages.

Therefore, the political power should help to ensure that:

- *The necessary mechanisms for assessment, evaluation, planning and implementation are established;*
- *The institutional and financial resources are created and the needed policy changes and/or adaptations are facilitated;*
- *Fair, transparent governance and democratic participation of all stakeholders are provided;*
- *The necessary authority in terms of controlling the standards as well as the design and implementation quality on all physical, social and environmental goals is present.*

10.3.2 Timing

Timing proved to provide consensus-building elements in relation to the developmental aspects, such as the economic, societal and political dynamics, besides the events that might increase interest and awareness toward the sustainable urban initiatives. In spite of the positive impacts of timing on the development processes, the decisions to initiate large-scale urban developments require proper assessment of social, political and economic factors, which help to set the context for the new urban developments and/or re-developments. The research findings suggested that the timing of the actions could dramatically affect the outcomes positively or negatively. On the one hand, the initial decisions that were made based on sound evaluation of the above-mentioned dynamics built consensus, momentum and public acceptance, all of which are essential for the achievement of sustainability goals in urban developments. On the other hand, the poor timing that lacked resources, institutional and professional capacity to plan and develop the eco-town / urban developments, resulted in the perceived negative impacts. This was in part due to the potential misalignment of the expectations of potential residents and the real outcomes.

Therefore, the timing to initiate eco-town developments should:

- *Build upon sound evaluations of the present and future needs, and aspirations of the urban society;*
- *Create momentum towards the implementation of decisions with common purposes and shared values for all;*
- *Make use of the major events and other important urban attractions in order to build consensus as well as momentum for public acceptance.*

10.3.3 The Financial Model

With regards to the financial model, the research revealed that the perceived costs of sustainable urban developments have been one of the most significant barriers in terms of the extent to which the environmental plans/criteria and guidelines were established during the planning phases. It was found that both the public and private actors involved in the decision-making were influenced by the time and cost of extra environmental measures and/or the environmental supervision somewhat negatively, if the systems and technologies were less experimented with or integrated within the planning and development practices previously. Even so, there were found to be occasions during which the decision-makers opted for conventional planning and implementation rather than building upon the lessons learned as was observed in the case of Vathorst development. It was found that the long-term benefits of sustainability measures integrated in the physical planning and building were feasible not only financially but also socially and ecologically. Actors that are involved in the decision-making processes, such as but not limited to the energy, water, transport systems or the wastewater management companies are increasingly becoming privatized and thus act within their own economic frameworks and agenda in terms of providing infrastructure and services.

Although the long-term economic benefits of environmental planning and integration of ecologically and socially sound measures are well researched, the negative perceptions toward the financial benefits, in the short-term, often limit involvement of some interest groups. As reviewed in Section 4.5 of Chapter 3, the cost of implementing innovative approaches is often priced higher than the actual costs due to lack of experience and proper monitoring in the context of systems integration within large-s ale urban developments. Therefore the payback periods are anticipated to be longer and there are always uncertainties due to the need for unanticipated maintenance or replacement of equipment. In that regard, it is essential to obtain contingency funds, subsidies and low-interest loans to attract both the public actors and the private investors. Such measures should be designed increase interest among the developers among the professional building companies and among citizen-based groups.

In this context, the financial plan should include but not be limited to the following aspects:

- *Early allocation of funds, grants and subsidies for the additional environmental measures even before the planning has been initiated;*
- *Political commitments of the local, regional and the central administrations, which are essential for creating institutional capacity and momentum to facilitate usage of proper financial instruments;*
- *Thorough feasibility assessment of the integration of environmental measures in the proposed eco-development, with respect to social, environmental and economic cost and benefits.*

10.3.4 Physical qualities

The physical qualities had significant impacts on the perceived quality of lives of residents. With regards to the social, psychological and physical impacts, the author expanded upon the physical qualities in Chapter 9 (see Sections 9.2.4 and 9.3), as well as in the case study chapters individually. It was concluded that the physical qualities played a central role in terms of achieving success as the outcome of the developed area depending on the formulation, contextualization and the operationalization of the design goals. As discussed in sections devoted to case study research findings, the attractive surroundings, architecture, environment and other attributes such as the housing quality or urban characteristics were found to increase the potential residents' interest toward the area, thus they had positive impacts for rapid implementation and quick occupancy of the new facilities. While the physical qualities were found to influence the QOL perceptions, they also affected the residents' sense of place and therefore enhancing their local attachment.

With regards to the decision-making on issues regarding the physical qualities, the following aspects were highlighted:

- *Analyzing the needs and aspirations of the residents in ways that can accommodate future climatic, societal and demographic changes;*
- *The involvement of all interest groups, including the community representatives or potential residents, in the decision-making processes, especially starting from the very early stages of the planning and onwards;*
- *The design solutions in consideration of the local, site-specific conditions yielded better results in terms of designing and integrating environmental measures, thereby they reduced the internal, external and/or procedural goal conflicts;*
- *Diversity in terms of architecture, neighborhood characteristics and the physical planning of buildings helped to establish a better sense of place while responding to the needs of dwellers from different income groups or needs.*

10.3.5 Stakeholder involvement

Stakeholder involvement has been one of the factors that significantly affected the eco-town's success. This follows from the case studies and the literature review. Directly, and through its interrelatedness with other factors, it has a highly significant effect on the success of an eco-town development. As discussed in Section 9.2.5, both the '*width'* and the '*depth'* of participation were found highly important in the eco-town's interactive development process. The successful outcomes were achieved not only through stakeholder involvement in the development stage but also throughout the decision-making processes. Resident involvement in the planning and design stages, yielded positive results with regards to achieving reduced levels of energy consumption, water use and waste generation compared to other developments. Also, '*meaningful participation'* of residents in the development processes had resulted in the formation of affective bonds with relatively higher sense of place, community and belonging for the residential place and environment. These were all found to be central to the notion of success conceptualized for the sustainable urban developments in this thesis. The characteristics of effective participation of all stakeholders were found to be:

- *The involvement of all interest groups including the communities and/or future residents in the decision-making processes;*
- *Building awareness toward the potential benefits / opportunities as a result of active participation in the development processes;*
- *Providing resources (such as time, finances, place to gather or the platform in which to engage) to support the participation of stakeholders;*
- *Building trust among the engaged parties.*

10.3.6 Environmental model

The environmental model is a key element in the development of successful eco-towns. Conceptualization of the model requires sound formulation of the sustainability goals based on the vision and overarching objectives of the eco-town development. Integration of systems and technologies to working individually and synergistically is a complex task and thus, needs multi-dimensional approaches in characterization and design. The case study findings suggested that the priorities in framing the sustainability goals and objectives varied depending on the evaluations of physical, societal and environmental needs as well as in part due to the economic and political contexts. While the most significant ones included the energy, water, waste and wastewater management, some had more holistic visions and were designed to integrate social and physical aspects into the planning of the environmental models.

With respect to the approaches employed in establishing environmental models, several factors were found that impacted the outcomes directly and indirectly. For example, the

physical qualities were sometimes found to create conflicting results with the environmental goals if the architects/planners were less informed about the potential implications of their design choices. It was found that the decision-makers had tendencies toward satisfying the physical needs and aesthetic concerns primarily, rather than adopting holistic approaches that could provide long-term positive impacts for all. These were found to occur mostly due to the perceived costs, time constraints with regard to the overall planning and because of the lack of awareness and information about the long-term implications socially and environmentally. It was further revealed by the investigated cases that the early formulation of the operational goals was important in order to build consensus among the stakeholders including the resident groups. This affected the financial model, physical qualities, design and planning guidelines in ways that provided more clarity during the development phase and in the occupancy stage. With regard to the effective implementation of the environmental plan, the monitoring and gathering baseline data for further assessment of environmental performances was found to be integral and required proper consideration before, during and after the development phase of the projects.

Additionally, the analyses on the site-specific conditions or the locale were found to provide valuable information regarding the contextualization and conceptualization of the environmental model. In this context, the following aspects were highlighted with respect to the formulation of the environmental model:

- *Baseline data gathering and performance monitoring must be done;*
- *Commitment of the decision-makers with financial, institutional and moral support must be consistent and on-going;*
- *Early formulation of goals with extensive participation of stakeholders must be ensured;*
- *Environmental supervision and guideline planning for designers, architects, planners and developers must be done consistently and systematically;*
- *It is essential that assessment of local conditions of the site should be done before the environmental and physical planning are initiated.*

10.3.7 Final conclusion

Success, in this thesis, was defined as the achievement of social, physical and environmental goals as well as the attainment of positive policy implications within the urban planning and development practices (see Chapter 1). It was further described as the community's behavioral and cognitive adaptations to sustainable lifestyles, the dissemination of experiences and lessons gained through the development processes of eco-towns. In the cases investigated in this thesis, it was found that the real transformative changes as well as the spin-off effects from the eco-town developments were limited, as the concept of success was found to involve other social, psychological, ecological and other physical dimensions that need to be addressed in the context of successful change processes.

The six 'success factors,' used as the framework for evaluation in this thesis were found to be crucial for the success of the eco-town both individually and collectively. They interact with one another dynamically and sometimes they even cancel each other out depending on how they were contextualized and operationalized. Above all, they are crucial to the success of eco-town development, if they are synergistically and integratively formulated and implemented. However, it was found that other elements are needed to more thoroughly achieve urban transformations, to improve life quality and at the same to time create sustainable urban development models that are replicable in different societal, cultural and geographical contexts. The author concluded that some of these key aspects of the eco-town development through which success can be characterized involve 'good governance', and 'learning' by means of both the development phase and at the occupancy stage.

As emphasized in Chapter 9, governance in the context of deliberative and participative planning and implementation was found to influence the development process significantly, in part due to the changing roles of governments and due to the private parties in their engagement with the urban planning and development initiatives. The local authorities' partnerships with the private companies and their consortium on large-scale urban development projects was found to influence the decisions on all social, environmental and physical levels in which various complexities (with regard to goal formulation) were discovered. The financial models between the engaged parties and the degree to which the local / regional or central governments are involved in the development projects as shareholders require clear guidelines to safeguard the public interests from the potentially undesired implications stemmed from the commercial interests of the involved parties. In this context, neither the top-down authoritative nor the weak administrative powers were found to contribute positively to the goal achievement. In spite of the limitations of this research on the analyses conducted on the governance models, the public-community partnership was found to increase the level of achievements documented the most. In conjunction with ***governance***, facilitating the policy changes, stakeholder involvement, planning and/or establishing the environmental plan were among some of the important tasks found to be pivotal to achieve relatively successful eco-town developments.

Finally, this research underscored the importance of creating the conditions for ***learning*** during and after the development takes place. It was suggested in Chapter 9 that the adaptations to sustainable consumption behaviors and ecologically responsible lifestyles could be catalyzed experientially and also via the integration of theoretical and practical learning in the formal educational processes. It was found that the communities that were gathered around the shared visions, values and aspirations used the opportunities created by the urban development initiatives more wisely and improved upon the lessons and experiences more effectively whether these were in relation to the behavioral and cognitive adaptations, policy changes and/or on urban planning development and practices. Thus, the mechanisms

for learning in all ways should be expanded to include all members of the society in order to disseminate knowledge and information effectively among communities and across cultures.

With regards to the 'success factors,' which were proposed and further improved upon to achieve sustainable urban developments, this thesis author concluded that the social and psychological dimensions were highly relevant aspects in relation to the success of the eco-town development, hence the transitioning of cities into equitable, sustainable, post fossil-carbon societies. As a result of the consumer-oriented developmental context in which the human actions and behaviors evolved within the past century, the motivations and needs based on the perceived notions of well-being require rapid change towards actions and lifestyles that are incorporated with the ecological worldview. Therefore, the change of 'motivations and needs' and subsequently the behaviors, require constructing effective *links of knowledge* through formal education as well as experiential, *social learning* platforms. All of the 'success factors' investigated in this thesis, which were designed to explain the successful formulation of eco-town developments were found to be essential but were not necessarily enough in terms of explaining the success of the eco-town as a catalyst for the broader transformations into sustainable urban societies. In this context, this thesis author concluded that the eco-town developments are successful if they effectively facilitate and help to expand social learning during the development as well as during the occupancy stage. This was found to be possible within the parameters of meaningful participation of all stakeholders and good governance.

10.4 Concluding remarks

10.4.1 Reflections on the findings, their strengths and limitations

This thesis was initially designed to answer some of the author's many questions about the factors that influence the urban planning and development policies and practices toward sustainability and quality of life of urban dwellers. In light of this overarching research question, firstly, the historical evolution of the urbanization processes and trends after the industrialization began in 1800s were reviewed with the emphases given to sociological, economic and ecological aspects that were found to be directly and indirectly associated with the environmental problems today. In doing so, the author aimed at identifying the nations with relatively forward-looking urban development policies. As discussed in Chapter 2, the concepts of Ecological Modernization (EM) and Sustainable Development (SD) contributed much to the relative successes of the Northern and Western European nations in terms of their gradual changes in environmental policy implementations. It was found that their progresses also had much to do with historical, cultural and societal factors that were based upon active citizen participation, education, research and experimentation. While the

positive contributions of the earlier theoretical approaches were underscored, in the context of the dynamic and complex nature of sustainable urban developments, the concepts of regenerative development and positive development were highlighted as alternative, more holistic approaches. In this regard, the eco-town developments as part of the sustainable urban development initiatives were found to be valuable models to investigate as they offered lessons on all contextual, procedural and conceptual dimensions of their development processes.

In the second part of the literature review, the author expanded upon the eco-town developments that were initiated during and after the 1990s in the Northwestern Europe. In this part of the review process, the procedural, contextual and conceptual aspects were investigated. The similarities and differences were identified with the emphases given to their frameworks, governance models and development processes. The review findings suggested that there were factors that played significant roles into their successes and failures. These included the political commitment, stakeholder involvement, timing, physical qualities, financial models and environmental model, all of which were later defined as the aspects that needed further investigation to formulate successful eco-town developments. Additionally, the outcome of the review process was that the previous research and the eco-town initiators focused on aspects such as the environmental performances, technological innovations, actor formations or the development frameworks compared to the social dimensions and subjective views of the residents which are equally, and in some cases even more important aspects in relation to sustainability. In this regard, the relatively less discussed earlier eco-development initiatives with bottom-up efforts, environmental stewardship, strong community values, systemic thinking and the overall sense of respect for all inhabitants were essential in terms of achieving successful eco-town developments within the urban contexts.

For example, the author discussed in Chapter 3 about the urban development initiatives in the Asian and other rapidly developing geographies in which mega-city scale urbanization projects were documented. The aspects investigated and analyzed for the success of eco-town developments in this thesis require further elaboration, as the societal, political and economic dynamics in other settings also differ in ways that can affect the formulation and/or structure of the conceptualized notion of success as defined by this author. Furthermore, the formative concepts and approaches, which were discussed in the context of eco-town developments initiated during and after 1990s in the Northwestern Europe, may need contextualization and adaptations for different geographies with other climatic, cultural and societal realities. Although the green building principles, environmental design and assessment were developed to make improvements on resource consumption levels, these were found to represent restorative measures at best. The rapid increase in urban popula-

tions globally requires approaches with site-specific solutions in order to provide socially and ecologically positive gains.

10.4.2 Recommendations for architects, city developers, policymakers and dwellers

Through the research that investigated the integrative and synergistic impacts of the successful eco-town development's characteristics, the author of this thesis gained insights and knowledge that may be relevant for a number of actors involved in the planning, policymaking and governance of urban development processes. Additionally, the QOL study helped the author to gain further insights into the dwellers' perspectives in conjunction with the perceptual and behavioral aspects, which may contribute positively to the planning and development processes of new eco-towns and the urban developments more broadly. Although the research findings were based upon the analyses performed on the Northwestern European contexts, the following recommendations were drawn with their broader applicability in mind. It is however important to note that the local conditions including but not limited to the societal, physical and environmental contexts must be analyzed prior to adopting these and other reflections, which were found to be relevant.

Therefore, based upon the findings of this research, the author articulated this remaining research question and addressed his recommendations to the architects, city developers, policymakers and also the dwellers in the following sub-sections:

> ***Sub-question 5:*** *"What lessons can be learned from eco-town developments for the broader questions about urban redevelopment as well as for new urban developments?"*

10.4.2.1 Recommendations for architects

Firstly, the design paradigm in the sense that sustainable urbanism attempts to reconcile all economic, ecological and social dimensions (as suggested by the SD concept), requires further clarification and improvements that can more effectively operationalize the sustainable planning and design goals. In order for the architects and planners to more holistically design with an open systems thinking framework; the cultural, societal, psychological aspects and all climatic as well as site specific physical / biological conditions need to be evaluated before the planning is initiated.

Secondly, the architects should take into consideration the community's needs and aspirations. They need to learn how to communicate their inspiration toward the planning and to also adopt the role of the facilitator in a 'with-user' design process. This may increase the level of the sense of belonging, the sense of place and the attachment among the members of the community for the place in which they live and experience their lives in the eco-town.

Additionally, the architects often seek to meet an array of design criteria, most of which can create conflicts with the sustainability goals. Co-working with all actors involved in the planning will help to establish holistic solutions and to reduce these goal conflicts. Their role as the facilitator will help to formulate the needed policy changes, and create solutions that are aligned with the community's physical, social and environmental needs for the short and long-term future.

10.4.2.2 Recommendations for city developers

With regards to the city developers, investors and politicians; the research findings suggested that the financial constraints shaped the decision-making on physical design, environmental planning and development processes as well as the political will and commitment. As discussed in the case study analysis in Chapter 9, the public-private partnerships are increasingly becoming mainstream in the realm of urban planning and development in which the roles of city developers and their identities are intertwined. The developers' influence on the architects, urban designers, politicians and other actors involved in the development processes implicitly and explicitly affect the outcome unless the long-term benefits are factored into their overall business plan as well as within the broader visions to improve the lives of all members of the society.

In spite of the perceived costs and time requirements for proper physical and environmental planning with extensive stakeholder involvement, which are all instrumental for the successful physical design and development; the cases suggested that the actual financial impacts were negligible compared to the costs incurred by the future social and environmental problems when proper planning and implementation is or was lacking. The city developers, therefore, need to adopt ecologically, socially and economically ethical ways in which all actors can mutually benefit and co-work to achieve net positive gains.

10.4.2.3 Recommendations for policy-makers

The policy-makers are involved at many levels in all stages of the eco-town development. The decision-making on large-scale sustainable urban developments requires sound formulation, operationalization, implementation and monitoring of the policy goals and objectives. Policy-makers need to study and analyze the local capacity, conditions, needs and wants of the society prior to introducing policy changes and adjustments in the urban development strategies. Moreover, policy-makers should empower local administrations' roles in facilitating the mechanisms to operationalize and implement the policy decisions.

Society will often have diverse and even opposed opinions on issues that are arguably sustainable such as the decentralization of industries, development, densification of urban areas. Unless the developments are formulated within synergistic [design] frameworks, society's choices on policy-decisions will be based on prioritized aspects such as the energy

efficiency, ecology, social welfare or economy, which have consequential trade-offs. Thus, the policy-makers should understand the site-specific conditions similar to the architects and planners in order to formulate solutions that respond to the community's needs and aspirations for both short and long-term future.

10.4.2.4 Recommendations for eco-town dwellers

With regards to the residents' role in helping to establish successful eco-town developments, the sustainability goals were found to have been most effectively achieved, when the development processes included participatory governance and implementation. As discussed extensively in this thesis, stakeholder involvement from the early stages of the project planning provided designers with knowledge and information that were specific to the targeted community, hence their QOL improvements in the planned developments. In this context, the effective participation of the community in the planning affected the outcome, more significantly than in other phases of the development processes. The research findings revealed that the knowledge and awareness toward the sustainable approaches would foster efficient communication between the residents and the planners, thereby to influence the goal formulation positively. Whether these relate to the environmental measures, planning principles, housing qualities and/or all other physical and environmental characteristics; these aspects influence one's subjective view, perceptions and level of attachment to both the community and the place. Despite the conflicts that may/will emerge from participatory decision-making, building consensus on shared values and purposes contribute much to the success of the development, in the short and in the long term.

Finally, with regard to the residents' interactions, the communication and sharing of experiences were found to be key elements as the **social learning** among the communities help the effective dissemination of knowledge and lessons, which are valuable aspects for the decision-makers, planners and the communities for future developments.

10.4.3 Reflections on theory, on our understanding of what makes eco-town developments successful

'What makes a successful eco-town and how can it be achieved?' This overarching question motivated the author to explore eco-town development processes. As presented in the methodology chapter of this thesis, *success* was characterized as in behavioral changes and cognitive adaptations of residents, the dissemination of positive results and experiences, and the policy changes. Through the case study research on five developments in Northwestern Europe, the author focused on the impacts of the six 'success factors,' (see Chapter 3), which were found to be essential for the success of eco-town developments. The conceptual framework was initially designed through the comprehensive review process, which helped this thesis author in '*defining the meaning of success of eco-towns*' and in elucidating '*the factors that influenced success.*' Additionally, the author expanded his

findings within the theoretical framework for clarifying eco-town's roles as catalysts for accelerating the change toward more sustainable urban societies. This pathway became clearer, based upon the case study findings, and upon the results of the research process presented in this chapter.

As the initial step to explore the Northwestern Europe's gradual change in the urban policies, the EM theory's emergence and relevance for this work were investigated particularly because of its focus on '*the transformation of actual studies and practices of production and consumption'* in these nations (Mol & Spaargaren 2006, p. 40). Although, EM as a macro-theoretical model has provided valuable contributions for the urban development policies in the late 1980s and throughout the 90s in the Northwestern Europe, the emphases given to social changes, society-nature relations and equity were found to be significantly less, compared to its influence on the economic growth and environmental protection agendas.

Despite the EM's efficient operationalization as a concept, which helped some countries make significant progress in their urban development policies and practices, the increasing pressures of rapid urbanization and growth require more holistic approaches to deal with the emerging urban challenges at the global scale. In this context, Sustainable Development (SD) concepts are evolving and are being tested as the way to integrate the three tenets of economic, social and ecological dimensions with the time dimensions. Despite the much-criticized effectiveness of the SD concept, its application is providing motivation for political commitment by governmental leaders at local, regional, national and global levels. Important insights are being gained through research on these concepts in terms of the extent to which they are workable or even sufficiently operationalize able with respect to the urban challenges currently encountered and anticipated for the future.

While this author concluded that their synergistic impacts can be used to attain sustainability to some extent, sustaining the planetary ecological integrity will require the shift from a *fragmented to a whole systems model*, which Reed (2007) defined as the consumer society's much needed cultural leap (Reed 2007, p. 674). This comprehensive review of the literature on the urbanization trends and theoretical approaches helped this author to understand the complexities of achieving true sustainability from a wider perspective and in the context of urban policies, planning and development models, which influenced the debates on urban policies, the green design principles and the building practices for the past three decades. This author observed that current approaches were developed based on the reductionist frameworks, which Birkeland (2012) called a closed system view (Birkeland 2012, p. 182). Instead, she suggested a more positive and open design paradigm of net Positive Development which she posited that *'the natural life support systems must be*

increased in proportion to the population growth, pollution, biodiversity losses linked to the cities' (Birkeland 2014, p. 6).

Based on these findings, this author further investigated alternative concepts such as Cradle-to-Cradle (C2C) (McDonough & Braungart 2002), the Regenerative Sustainability (Lyle 1994; Hoxie et al. 2012; Mang & Reed 2012; Cole 2012; Reed 2007) as well as net-Positive Development (Birkeland 1993; Birkeland 2012; Birkeland 2014). Together with a more thorough understanding of the historical evolution of urbanization processes, and the conceptual and theoretical frameworks, it became clear that successful planning and implementation of eco-town developments requires integration of quality of life dimensions and aspects of the individual's motivations, needs, behavioral and cognitive adaptations to sustainable lifestyles. In this context, the *Theory of Change* (ToC), *Value-Belief-Norm Theory* and the *Motivation-Need based theories such as the Norm-Activation and/or Theory of Planned Behavior* were found to be valuable frameworks through which to explore the success of eco-towns as well as a tentative agenda for future research.

As clarified in this thesis, successful integration and operationalization of environmental planning in urban development requires in-depth studies of the social-psychological dimensions to achieve the social, physical and environmental objectives. Despite the best efforts to implement innovative design and technologies in urban development, the willingness to change and behave sustainably requires a complex and integrated set of approaches in the current development paradigm within which the social and societal constructs evolve. The Theory of Change (ToC) as a concept, was developed to explain the ways in which programs and initiatives can achieve social and political change, through environmental psychology, sociology and other disciplines.

With regards to the ToC's future contribution to the findings of this thesis; complex large-scale urban initiatives such as the eco-town developments require methods and evaluation tools to monitor and assess the impact of the environmental measures, design choices and planning principles and to further explain the behavioral changes based on the procedural and contextual factors found in the development processes. Additionally, the Value-Belief-Norm (VBN) as a theoretical approach can be used to explain the aspects that influence the individual's or the community's behaviors in the context of eco-town's planning and development processes. As noted by Juarez Nájera (2010, p.45), VBN was designed to help to explain the environmental activism, environmental stewardship, pro-environmental behaviors through investigating the causal chain of variables and factors that guide an individual toward a particular behavior (Juarez Nájera 2010; Stern et al. 1999; Stern 2000). Nájera reflected upon the social-psychological factors that affect the various types of behaviors motivated by pro-environmental intentions. Finally, the models developed within the framework of 'Motivation-Needs' based theories such as the Theory of Planned

Behavior (TPB) or the Norm Activation Theory (NAT) (Stern 2000; Stern et al. 1999; Juarez Nájera 2010; Steg & Vlek 2009), which are associated with VBN, can be used as alternative constructs to investigate moral, cognitive and subjective aspects underlying or promoting environmental behavior and for explaining individual and societal changes within the context of sustainable urban developments.

The research findings revealed that the communities accomplished better results in terms of shaping their built environment, socially, physically and environmentally if they took collective action on issues regarding the shared values and common purpose and built upon knowledge and insights into the environmental aspects historically and culturally. Although, the eco-town's immediate successes could be partially associated with the improvements in consumption levels of energy, water, waste or car-use or on the improved QOL perceptions of residents, the more encompassing representation of long-term success sis the potential to **change societies** into adopting ecologically responsible lifestyles. In this context, the eco-town's level of successes should be measured through their capacity to empower and enable individuals and the communities to learn and to construct effective links of knowledge with real world practice (Delambre 2010), thereby, they establish exemplars for urban development in cultural and institutional contexts. In order to do so, expanding the learning mechanisms within the communities both formally and experientially is pivotal. Therefore, cognitive and normative dimensions should be considered as integral parts of the social learning processes (Webler et al. 1995) of the eco-towns, in part, due to their roles as catalysts for broader, more sustainable urban transformations.

With regards to the concluding remarks on the theoretical approaches and explanation of the successful eco-town developments, the interactions and learning within the communities should be further explored in the context of 'communities of practice' in which the sense of identity, norms and relationships of mutual interests can be established (Wenger 2000, p.229). Wenger (2000) suggested that the 'communities of practice' were essential, social units of learning, on both the community levels as well as in the context of larger social systems. Therefore, eco-towns should be designed to encourage education, idea sharing and finding solutions collectively to improve lives and ecological support systems within and outside of their communities. As Webler et al. (1995) described it, social learning can be defined as the process by which changes occur in the social conditions; more particularly, the changes in the popular awareness and changes in one's perceptions towards how the individual interests were linked with the shared interests of others (Webler et al. 1995, p.445). Their approach in explaining 'social learning' referred to the communication processes that could affect the development of individuals positively and in a coordinated manner to agree on collective action to solve mutual problems.

As presented in Sections 9.2.5 and 9.3 in Chapter 9, the sense of morality, common purpose and shared values were found to be essential elements for creating a sense of belonging and place, through which relatively more sustainable communities could be established. Therefore, this thesis author concluded that **eco-towns** should be designed as '**communities of practice and learning'** so that they can effectively help to achieve the sustainability goals and objectives. In order for that to happen, meaningful participation of all stakeholders and democratic governance in the planning, development and living in eco-towns are integral. Additionally, understanding of the *motivational, structural and cognitive factors and processes* (Steg & Vlek 2009, p.315) for behavioral changes and adaptations are needed so that proper policy adjustments, planning guidelines and governance models can be developed and used.

10.4.4 Reflections on the research methods and methodology: strengths and weaknesses

The research strategy for this thesis was *explorative* and the methods that were deployed to achieve some or all of the research goals were *qualitative* in general. The research process evolved initially through extensive literature review-based data gathering on the urbanization trends, theoretical approaches and concepts. Therefore, the thesis was designed to explore the aspects that were found to be related to the urbanization processes and how or which factors influenced the developmental strategies, frameworks, and decision-making with respect to sustainable transformations of cities.

Together with the insights gained through the comprehensive review of the literature, the author developed the overarching research questions to be investigated. In this initial stage of the research, '*pre-knowledge*' on the concepts such as the Ecological Modernization and Sustainable Development was gained and discussed in an attempt to identify the geographical, political and cultural contexts where relatively more forward-looking urban policies emerged and were tested. Thereby, the author gained insights into the urban planning and development approaches employed by the Northwestern European nations and gathered information on the eco-town developments that were initiated as part of sustainable urban policy initiatives.

The in-depth review of the literature on the eco-town developments provided the author further insights into the similarities and differences in various development processes (see Chapter 3), frameworks and their technological, physical, social and environmental attributes. The second part of the review process helped the author to explore the procedural, contextual and conceptual aspects that were associated with the documented outcomes of the eco-town developments. In this phase, the gaps in the evaluation of the investigated cases were identified. The two-part series of literature reviews helped the author to formulate the subsequent research questions to gain deeper understanding of eco-towns' impacts

and contributions as well as how and in which ways they were or would be considered successful.

In the early literature review process, the quality of life (QOL) dimensions were relatively less emphasized, but as the research evolved to include new facets, a survey was designed to explore the similarities and differences in the perceived quality of life (QOL) of residents living in eco-developments and in conventional settings. This explorative study provided comparative insights and data into the QOL dimensions, and provided knowledge of the subjective views of the daily lives and experiences of residents from both contexts. The QOL research helped the author to understand the complexities of initiating, planning, developing and governing eco-town developments. Based upon the insights gained through the literature reviews and the QOL research the author contextualized and formulated the case study research of the five eco-developments studied in The Netherlands, Sweden and Germany.

With regards to the methods employed in the case study research, the case selection process involved the following criteria:

- Their similarity in terms of geographical, historical and cultural contexts;
- The availability and the number of interviewees that were required;
- Budget and time limitations in conducting the case studies.
- The availability of the ex-post evaluations on aspects that would otherwise be too time consuming for data gathering, hence the resources to be allocated to finalize the case study research.

With regards to the selection of the cases, the research on the three developments in Amersfoort revealed the sequential timeline of events during which significant urban policy changes were found in The Netherlands. The case study on Kattenbroek, Nieuwland and Vathorst provided extensive knowledge into the transitional period of Dutch urban development policies and implementations during the past two-three decades. Moreover, the three individual cases nested within Amersfoort, revealed the extent to which each development impacted the other, and how the governance models and the actor formations influenced the decision-making and the outcomes.

The case of Hammarby Sjöstad was equally useful to investigate because the analyses conducted on the environmental performances, development framework and the governance model, helped the author to evaluate the roles of the ‘success factors’ and to elaborate upon the aspects that were needed for the successful eco-town developments. Finally, the case of Vauban contributed much to the overall case study research findings due to the relatively different governance model, the decision-making processes and planning approaches employed throughout its planning and implementation phases. The public-community

partnership with the extensive involvement of residents was compared with the findings of the previous four cases, which had relatively top-down governance and implementation models.

Within these parameters, the analyses that were performed into the similarities and differences in the design and development frameworks, the governance models and into their level of successes helped the author to explain how the six eco-town 'success factors' influenced the outcomes. Although the findings helped the author to answer the thesis research questions, further insights could be gained into the life satisfactions of the residents, behavioral and cognitive aspects as well as their aspirations in the eco-town in which they live, via conducting multiple semi-structured interviews. In spite of these potential gaps in the research methods, the findings presented by this thesis author can provide useful insights for planners and decision-makers and for developing an agenda for future research presented in the following section.

10.4.5 Agenda for future research

This research was designed to gain insights into and understanding of the dynamics of the systems in which the urban planning and development policies and practices have evolved. The daily lives of urban dwellers are being affected by the implications of many of the urban processes, physically, physiologically, psychologically, socially, economically and environmentally. These aspects, which are all relevant, interrelated and synergistically affecting the actions and behaviors of all human populations in profound ways, are also impacting the eco-systems on which we all depend to survive. Even though the negative effects of the anthropocentric developmental policies are documented increasingly, the tangible changes toward sustainable urban development approaches at the local, regional and global levels are far from achieving the desired results. The initiatives of sustainable urbanism have been instrumental in terms of integration of environmental measures in the planning policies and design practices but the broader changes are needed in the rapidly urbanizing regions of the world.

The concepts such as EM and SD have provided valuable contributions to the nations with relatively higher level of awareness in the social and environmental problems caused by the development policies. However, in consideration of the shortcomings of the earlier concepts, new sustainability approaches are emerging, which are designed to help to more effectively establish sustainable and equitable societies more globally.

The insights gained by the author of this thesis have revealed that there is an array of complexities with regard to operationalizing these concepts both within the nations discussed in this thesis and among the broader spectrum of cultures and societies. In order for this to be possible within the desired timeline, a paradigm shift from a neo-classical economic to

a net-positive ecological development perspective is needed. The societies in which wealth increasingly defines and creates the identities of individuals, to establish some form of social acceptance and status; it is only expected that different forms of societal and political resistance will occur toward the realignment of the value systems with which the human actions are associated in an ecological framework. In this context, the **social / psychological** dimensions are central in terms of understanding the *cognitive, structural and motivational factors* and subsequently in establishing the constructs needed for sustainable behaviors and lifestyles.

Therefore, it is imperative that we expand all resources for social learning, formal education and scientific research with an ecological framework that engages all aspects of human actions including the urban development and processes. Thus, the agenda for further research should be to explore the ways in which to achieve *collective action* towards communicating the benefits of planetary ecological integrity through the social, educational, psychological, political and cultural contexts.

Although the earlier examples of eco development initiatives were relatively successful in terms of achieving some of these aspects when the environmental concerns emerged in the1960s and early 70s, the mainstream urban planning and development evolved within a mechanistic and technocratic worldview due to the rapid urbanization and growth policies. The eco-town developments in the urban contexts have, thus far, been experiential processes in which physical, technological, economic and policy level implications were explored. The new generation of eco-towns that were developed or were being planned in the Northwestern European countries were found to adopt and implement the lessons and experiences, yet with little understanding of their implications or potential for replication in the other cultural, societal, institutional and geographical contexts.

While it is essential to evaluate and use these lessons for the growing eco-city movement around the world, it is essential to adopt holistic and integrative approaches to co-create and regenerate the *social-ecological system* through *localized* design and engineering solutions (du Plessis 2012), which must be supported by sound scientific studies. Only then, regenerative and net positive developments and regions will be achieved and the human-nature relationship can be restored.

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Appendix I

Table 1. The Environmental Goals of Hammarby Sjöstad

	The revised version of the 'Environmental Goals' of Hammarby Sjöstad as excerpted from GlashusEtt (2007) *
ENERGY (p.17)	"District heating connection with exhaust air systems: 100, of which 20 kWh electricity/m2 UFA" "District heating connection with heat extraction systems: 80, of which 25 kWh electricity/m2 UFA" "The entire heating supply shall be based on waste energy or renewable energy sources." "Electricity shall be "Good Environmental Choice" labeled, or equivalent."
WATER & WASTEWATER (p.21)	"Water consumption shall be reduced to 100 liters per person per day." "95% of the phosphorus in wastewater shall be reusable on agricultural land." "The quantity of heavy metals and other environmentally harmful substances shall be 50 % lower in the wastewater from the area than in the wastewater from the rest of Stockholm." "Lifecycle analyses (LCA) shall be carried out to determine the suitability, from an energy and emissions viewpoint, of returning nitrogen to agricultural land and of utilizing the chemical energy present in the wastewater." "Drainage water shall be connected to the storm water network and not to the waste- water network." "Storm water shall primarily be treated locally." "The nitrogen content of the purified waste- water shall not exceed 6 mg/liter and the phosphorus content shall not exceed 0.15 mg/liter." "Storm water from streets with more than 8,000 vehicles per day shall be treated."
WASTE (p.27)	"Energy shall be extracted from 99 % by weight of all domestic waste from which energy can be recovered by 2010. Reuse or recycling shall, however, be prioritized." "The amount of domestic waste generated shall be reduced by at least 15 % by weight between 2005 and 2010." "The amount of domestic bulky waste disposed of in landfill sites shall be reduced by 10 % by weight between 2005 and 2010." "The amount of hazardous waste generated shall be reduced by 50 % by weight between 2005 and 2010." "By 2010, 80 % of food waste by weight shall be handed in for biological treatment which utilizes its component nutrients for plant cultivation and also utilizes its energy content." "A maximum of 60 % (vehicle km) of waste transports and transportation of recycled materials within the area shall involve the use of heavy vehicles, in comparison with the amount transported using conventional waste management transportation." "A maximum of 10 % by weight of the total waste generated during the construction phase shall comprise waste that is disposed of in landfill sites."
TRANSPORTATION (p.11)	"80 % of residents' and workers' journeys shall be by public transport, on foot or by bicycle by the year 2010." "At least 15 % of the households in Hammarby Sjöstad shall be signed up to the carpool by 2010." "At least 5 % of the area's workplaces shall be signed up to carpools by 2010." "100 % of heavy transportation shall be by vehicles that meet current environ- mental zone requirements."

Table 1. The Environmental Goals of Hammarby Sjöstad (continued)

	The revised version of the 'Environmental Goals' of Hammarby Sjöstad as excerpted from GlashusEtt (2007) *
CONSTRUCTION (p.12)	"Routines shall be drawn up for choosing the best materials from resource-related, environmental and health protection viewpoints, before the planning work begins." "Pressure-treated timber may not be used." "Copper may not be used as ducting material in horizontal or vertical piping trunks in the tap water system, either indoors or out. This does not apply to wet rooms and their connections within the apartment." "Galvanized materials in the external environment shall be surface-treated." "Use of newly extracted gravel and sand shall be minimized." "Recycled materials shall be used wherever it is indicated for environmental and health reasons, provided that it is technically and economically feasible."
LAND USE (p.10)	"There shall be at least 15m2 of courtyard space and a total of 25–30m2 of courtyard space and park area within 300m of every apartment (equiv. 100m2 BTA)." "At least 5 % of the courtyard space shall be sunlit for at least 4–5 hours at the spring and autumn equinoxes." "Development of undeveloped green public spaces shall be compensated for in the form of biotopes that benefit the biological diversity in the immediate area." "Natural areas of particular value shall be protected from development."

* The environmental goals as included in '**Appendix I**' were excerpted from the document obtained from the GlashusEtt's website titled *"Hammarby Sjöstad – a unique environmental project in Stockholm"* published in 2007. This document can be accessed from the following web link: http://www.hammarbysjostad.se/inenglish/pdf/HS_miljo_bok_eng_ny.pdf

Appendix II

Hammarby Sjöstad in the City of Stockholm, Sweden: Background Study

1. Brief introduction

Background history of the urban development in Stockholm

Stockholm was founded in the mid 13th century as a small settlement in southeastern coast of Sweden. Due to the region's historical development as an active trade hub, it became one of the most populous cities in the Scandinavian region today. Currently, close to 900,000 inhabitants (*2013*) [86] live in the city of Stockholm, which covers a land area of 188 km^2. In total, the Municipality of Stockholm has an area of approximately 215 km^2 of which 27 km^2 consist of water. Although the political jurisdiction of the city, as a unitary municipality, was formalized in 1971, the city has been included within the administrative boundaries of the Stockholm County since 1968. The municipality is comprised of fourteen boroughs and districts (that were reduced from the previously designated eighteen districts) all of which are administered by their appointed councils (see Figure 1).

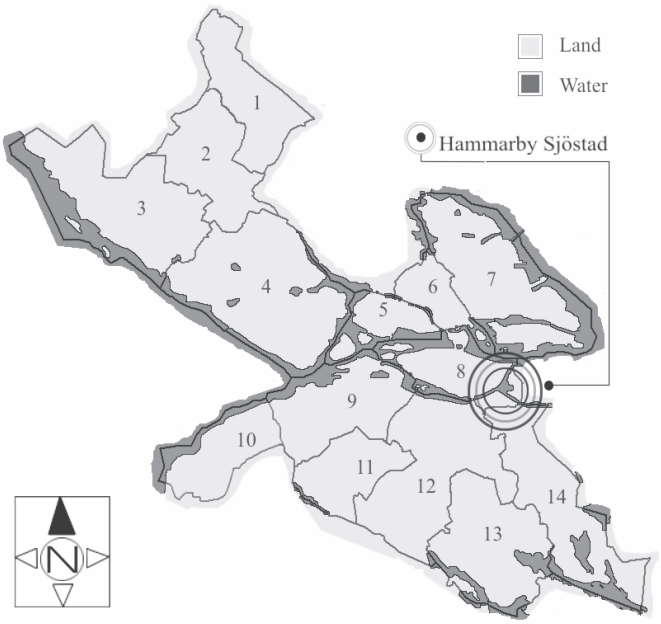

Figure 1. Stockholm City's map showing its 14 boroughs and districts. *1. Rinkeby-Kista, 2. Spånga-Tensta, 3. Hässelby-Vällingby, 4. Bromma, 5. Kungsholmen (borough), 6. Norrmalm (borough), 7. Östermalm (borough), 8. Södermalm (borough), 9. Hägersten-Liljeholmen, 10. Skärholmen (borough), 11. Älvsjö (borough), 12. Enskede-Årsta-Vantör, 13. Farsta (borough), 14. Skarpnäck (borough)*

86 http://statistikomstockholm.se/temp_eng/a-tabeller/images/tv.07437.delayed?t=a1&sprak=eng Accessed on July 22, 2014 – According to the Statistics Database of Sweden (SCB) the population of Stockholm Municipality was 897,700 in 2013, which can be accessed from this link: http://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BE__BE0101__BE0101A/BefolkningNy/table/tableViewLayout1/?rxid=6196045a-f640-43ec-b352-15912706b016 Accessed on July 22, 2014

Topographically, Stockholm is composed of mostly lowlands and plains, intertwined with waterways that formed unique sets of urban development challenges and also opportunities for its inhabitants throughout its history. While the city grew in terms of population and in physical terms, the water resources, lakes and waterways had become polluted and brownfield sites had occurred due to industrial and domestic solid and hazardous wastes and to wastewater discharges. With regards to the built environment, the city also had to resolve problems associated with mass migration from other cities and countries; a trend that began in the late 1800s and which continues to the present due to industrial activities, and prosperity. The urban challenges in the Stockholm area increased together with Sweden's post WWII housing shortages in the 1950s. Although Sweden avoided entering into that war, rapid urbanization occurred due to growing economic success, which fostered further migration and the need for high quality housing in its cities (Hall & Vidén 2005). While new housing projects were being planned, efficient transport systems among the urban nodes had to be planned and implemented, which required long-term political, and economic and engineering investments.

Stockholm's expansion in terms of urban development involved numerous phases since the early 1950s. After mid 20th century, Sweden had begun experiencing rapid changes on social and economic levels, which led to increased societal restlessness (Miller & Kraiisliaat 1979). This was, in part, required industrial restructuring to further improve efficiency and competitiveness that resulted in improved prosperity in the region. As a result, shortsighted urban development policies led to uneven progression of the metropolitan areas and high levels of housing shortages occurred during the following decade(s) (Miller & Kraiisliaat 1979). According to Miller and Kraiisliaat (1979), the crowding of metropolitan areas gained momentum due to '*the government and trade union policies of increasing labor mobility'*. While this provided a relatively acceptable level of welfare initially, in the late 60s, it became increasingly difficult to maintain growth without making adjustments in the tax regime. This was one of the reasons that eventually caused the loss of public trust and support for social democratic policies (Miller & Kraiisliaat 1979; Hibbs 1978). Housing demand in the rapidly growing urban locations was only one of these issues that were considered as politically problematic for the Swedish government at that time.

In order to meet the post WWII era housing demands and to ease the tensions toward government policies, the parliament proposed and subsequently initiated the '*Million Homes Program'*. This program was designed to provide 100,000 new dwellings that would be built each year between 1965 and 1974 (Hall & Vidén 2005). Together with the high rate of residential construction that began already in the early 1960s, the program helped to alleviate the growing housing shortage both in the Stockholm area and throughout all of Sweden. However, with regards to the physical quality in terms of architecture and surrounding amenities around the newly developed locations, the monotonous style, the lack of services and infrastructure caused much criticism and '*alienation*' by the middle of that program (Hall & Vidén 2005).

Box 1. Public reaction towards the urban development policies and lack of citizen involvement in decision-making in Stockholm, Sweden.

In 1960s and 70s, Sweden experienced the so-called 'new social movements' as in many parts of the world during that time. These were mainly protests driven by participatory and anti-authoritarian ideas with mostly leftist tendencies (Stahre 2004). In Stockholm however, the social movement (urban movement) emerged in 1968 as a result of the massive restructuring of the city (Stahre 2004). Subsequently, the neighborhood movement, mostly led by the young activists and academics, began in order to establish a more humane urban environment as well as to enable citizen participation in the city planning of Stockholm.

According to Miller and Kraiisliaat (1979), the urban planning and development policies were much criticized in terms of the motivation and implementation models that caused citizen protests in the form of militant actions towards the government. Collective action taken by environmentalist groups and the media quickly resulted in the revision of massive plans of exploitation of land for urban projects at the expense of natural habitat. This led to a rapid political response with a series of legislative changes including the promotion of effective citizen participation and consultation in the planning and decision-making processes that concerned all urban development and public administration.

One of the most significant events that is associated with this social / urban movement in Stockholm is the 'Battle of Elms' in central park of Kungsträdgården, which occurred on May 12, 1971. The public got together and successfully defended a group of elm trees (Passow 1973; Stahre 2004) that were planned to be cut down for the building of a metro station. Similar protests also took place throughout Sweden until the end of 1970s, which was the decade of increasing demands for citizen participation, democratic governance and environmental activism as illustrated by the Elms Battle of Stockholm.

As Gullberg and Kaijser (2004) noted that the urban development trends in Stockholm were influenced by three main factors. First of these was identified as the geo-political conditions. They suggested that the local government's early land acquisitions of large farmlands toward the south and west of the city were added within the municipality's administrative boundaries for future development and potential expansion. Secondly, the national government policies and parliamentary decisions such as the 'Million Homes Program' had profound impact on the urban development trends and the ways in which the cities grew. Third factor was suggested to be the technical / technological requirements to provide district heating to the scattered single-family houses through nuclear powered electricity (especially after the oil crises in 1973) (Gullberg & Kaijser 2004).

In the early 1970s, the housing stock had already exceeded the initial need and created surpluses in terms of the number of built units compared to the initially anticipated demand. This was in part due to the economic slowdown as well as due to the increase in the rising popularity of single-family homes for which generous subsidies were made available, similar to the similar incentives for developing multi-family units (Gullberg & Kaijser 2004). As a result, the shift from the mass housing projects toward more client-oriented developments occurred; this defined the housing market trends through the late 70s and 80s. However together with the high rate of urbanization, as in many parts of Sweden and beyond, negative environmental impacts on soil, water and air increased until the beginning of 1990s

after which relevant environmental legislation in Sweden was developed and implemented, which significantly improved the sustainability and sustainable urban development policies (Sandström 2002).

Thus, densification became the new focus for future urban development policies rather than exploiting green belts or undeveloped hinterlands. In the new legislation, promotion of environmental well-being, biodiversity, energy efficiency and sound urban planning were addressed with emphasis on the green infrastructure that was especially adopted for the entire metropolitan area of Stockholm and its neighboring municipalities. While the 80s were relatively calm in terms of urban development conflicts and controversial large-scale projects, Stockholm's urban policies changed significantly throughout the 1990s onwards. Stahre (2004) suggested that the City's strategic decision to become competitive among the European cities and beyond played an important role in its restructuring [87] and changed its economy through rapid advances in the service sector, information and communication technologies and various other sectors such as the media, marketing and finance. As a result, Stockholm's housing shortage re-emerged in the early 1990s; which required further developments not only for those willing to pay much higher rates to live in the city center but also for those who had to move to suburbs due to the rapidly increasing living costs in the center of the city (Stahre 2004). [88]

According to *The Organization for Economic Co-operation and Development*'s (OECD) report in 2013, the population in the City of Stockholm is expected to increase by 1,000,000 new residents by 2024 (compared to the population of 863,000 in 2011) and furthermore 100,000 new housing units in excess of the projected housing capacity (including already under construction and planned developments) will be needed by the year 2030 (OECD

87 Stahre (2004) also noted that the restructuring of Stockholm in seeking to become competitive as a city in Europe or as a global city was influenced much by the 'Dennis package' which is a comprehensive plan to improve the traffic routes and the railway system and the infrastructure, in general, that was agreed jointly by the city and county councils of Stockholm in 1992. The former director of the Bank of Sweden, Bengt Dennis who was the primary promoter of this initiative, proposed large investments for the communication and infrastructure related projects in order to strengthen the city's status as a global player as an economic powerhouse (Stahre 2004). This agreement was heavily criticized due to the lack of participation and engagement of broader public and environmentalist groups. One of the most significant infrastructure projects was the ring road around the central Stockholm area that was left unfinished until 2012 during which the project was resumed to finish half of the initially designed route. (http://en.wikipedia.org/wiki/Stockholm_Ring_Road Accessed on June 22, 2014)

88 The transformation of the urban planning and development approaches in Stockholm as well as in Sweden began in late 1980s and early 90s as a result of the reaction towards the modernists' international style, hence the negative social, physical and environmental impacts in general. As quoted by Bylund (2006), the compact city concept as a planning approach became the "*fusion*" in terms of addressing the "*environmental concerns*" and the "*reaction against the zoning and functional separation of modernism* or *functionalism*" (Bylund 2006, p.74). With regards to the policy change; adapting ecological modernization into the urban planning and development strategies began relatively earlier than the Hammarby Sjöstad development in Stockholm.

2013). In the same report, one of the critical issues in terms of the future challenges in urban development was identified as the 'population density'. As suggested by the OECD (2013), a '*polycentric regional vision*' to develop the Stockholm area in relatively lower densities in urban nodes outside the city centre will require, ***a***. more green undeveloped land and, ***b***. a well designed regional transport system that is connected not only to the city center but also that connects the nodes to one another.

Besides the need for further land development, interrelated impacts of urbanization and the requirement for fresh water, secure and clean energy and adequate food productions were all considered urgent aspects in the city of Stockholm where the population grew by 33% between 1990 and 2013 (SCB, 2014). In contrast with the exponential increase in the number of residents and residential units in Stockholm, the OECD report (2013) suggested that per capita CO2 emissions were reduced by 30% [89] despite the 22% increase in the total energy consumption (OECD 2013) since 1990 [90]. Two main reasons for this finding were identified in the same document as; **a.** the use of district heating and cooling generated through renewable sources and, **b.** low-emission electricity, 71% of which comes from hydropower and nuclear energy (2009). However, Sweden's total primary energy supply (TPES) is comprised of a mix of different sources such as, renewable(s) (35.5%), nuclear (32.5%), oil (25.3%), coal (4.1%), natural gas (2.4%) and other sources (2.8%) (IEA 2013). While this nation's overall progress has been praised internationally compared to other countries in the region, there is yet room for improvement to more effectively make changes needed for sustainable urban forms and systems.

For example with regards to the electricity generation in Sweden in 2011, based on the findings documented in the report jointly published by the IEA/OECD in 2013, within 150.5 TWh annual production, 44.1% came from hydropower, 40.5% from nuclear, 8.5% from biofuels and waste, 4% from wind, 1.2% from natural gas, 0.8% from coal, 0.5% from oil and 0.4% of the electricity was generated from peat (IEA 2013). Based on the current energy supply mix and the reported numbers on electricity generation methods, it is estimated that Sweden's dependency on fossil fuels can / should be reduced significantly through increasing the efficiency of district heating systems in general (OECD 2013). In Stockholm, almost one fifth of the district heating system was found to use fossil fuels (coal, 16% and oil, 4%) and the remaining majority energy share for the district heating was derived from waste (23%) and biomass (30%).

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89 The CO2 reduction only from fuel combustion was reported to be around 0.5% annually since 1990 (IEA, 2013).

90 According to a report *(Stockholm action plan for climate and energy 2012–2015 With an Outlook To 2030*) published by the City of Stockholm, the GHG emissions were reduced by 23% compared to the 1990 levels. This level is higher than the 20% committed in the European mayors' agreement Covenant of Mayors that targeted the reductions would be achieved by 2020.

Sweden's municipalities, especially the City of Stockholm have been working not only toward increasing energy efficiency through minimizing its fossil fuel use but also towards mitigating other negative impacts of urbanization through a number of urban policies and initiatives since early 1990s. These included but were not limited to the improvement of transport systems, congestion charging, improvement of solid waste processing, protection of clean water supplies and urban densification and regeneration through implementing eco-developments such as Hammarby Sjöstad, Royal Seaport, West Liljeholmen and several other new districts and projects throughout the country. As discussed in previous paragraphs in this section, the city officials have been working toward creating a competitive city within the European and international contexts. Besides the numerous infrastructure and transport related projects to promote all economic activities in the city, attracting popular events such as the Olympic Games, concerts and festivals were also encouraged in order to improve the image not only for Stockholm but also for Sweden at large. As a result, Hammarby Sjöstad was contextualized as an environmentally sustainable urban development, initially for the redevelopment / remediation of a brownfield site and in part as an Olympic village for the athletes based upon the strong anticipation of winning the bid to host the Olympic Games in 2004. In spite of the high expectations, the city of Athens, Greece was awarded the Olympic Games of 2004.

In this thesis case study, the Hammarby Sjöstad development was explored through the elements that were previously characterized for their roles in helping to create successful eco-developments in the Northwestern European context. These factors were expanded upon in Chapter 3 of this thesis as the *political commitment, financial plan, timing, physical qualities, environmental plan and stakeholder involvement.*

In the following sections, this thesis author expands upon the data gathered to determine the level of success of Hammarby Sjöstad based on the criteria selected to evaluate the overall performances comparatively with the initially desired project goals and objectives. These evaluations were made primarily based on the indicators identified in the following three groups, which were: **a.** *dissemination of positive results and experiences*, **b.** *community's behavioral and cognitive adaptations* and, **c.** *policy changes and adjustments*.

2. The analysis of the overall process of the Hammarby Sjöstad development

Despite the '*decentralized'* governance, the development and decision-making processes in Hammarby Sjöstad started relatively top-down in terms of governance as the project was championed by the City of Stockholm. As briefly stated in Section 7.3 of Chapter 7, subsequent to the decision to develop the Hammarby Lake area, the preliminary work to develop the master plan was coordinated by a group of planners and city officials from

the municipality's own planning department (Kasioumi 2011; Toussaint 2012). Although the design team's initial work began in the early 1990s, the environmental program was developed in 1996 as a result of the decision in 1995 to transform the area into a sustainable urban development model. Initially, an Australian firm was commissioned to work on the environmental program of Hammarby Sjöstad partly due to their previous experience in consultancy for the Olympic Games in Sydney. The team in charge of the program as well as the original version of the program has changed during the evolving political situation since the commencement of the development. As a result, the environmental program for Hammarby Sjöstad was formulated, stating that the *" the city district should be "twice as good" as the state-of-the-art technology available in the present day construction field"* (Vernay 2013). Moreover, the City of Stockholm emphasized the importance of planning and building the district with the principles of 'natural cycles', which would require '*joint solutions*' in achieving the desired *synergistic effects* with regard to energy, water, wastewater management, the metabolic flows in general (Vernay 2013).

According to the Vernay (2013), the City of Stockholm neither had the capacity nor the expertise to carry out the environmental ambitions that were designed / conceptualized, thus they decided to establish a team, which consisted of two sub-groups. The first group included the City's head of planning, an environmental manager, project manager and a chief of development. This group (the 'Project Team') in charge of environmental management consisted of members from the City's 'Office of City Planning', 'Office of Environment' and the 'Office of Roads and Real Estate' (Svane 2007b; Svane et al. 2011). The second group was composed of the representatives from the City of Stockholm and the City's infrastructure companies, which were expanded upon in Section 7.4.6. This two group committee was assembled to work under the City of Stockholm's Executive Office (Vernay 2013) and was put in charge of the application / bidding process for the Olympic Games as referenced in Section 1 of Appendix II.

Although the framework through which Hammarby Sjöstad was developed was not initially clear in terms of the governance model, the actors in the overall process provided a great deal of political support throughout the implementation process, that was valuable for maintaining the strong commitment during the course of project's design and development. On the other hand, involving a majority of high-level power figures in the decision-making, especially those who worked under the City's own establishments, made the project's overarching vision vulnerable to changes in the political climate, thus creating potential conflicts (Svane 2007a; 2007b) with other actors (such as the developers). As Rutherford (2008) noted, together with the change of majority in the city council in 1998, these conflicts occurred in the form of land ownership as well as in implementation of environmental agenda, which affected negotiations with the developers.

In summary, almost all elements that were found to be critical in terms of initiation, design, development and management were dynamic. Therefore, it is valuable to address the significant events that affected the decision-making in order to more clearly understand the framework, to evaluate the process and the subsequent outcomes.

The timeline of significant events that were found to influence the Hammarby Sjöstad development in Stockholm:

1- In early 1990s, Sickla Udde was already divided into development zones, and the majority of the land was owned by private entities. After the initial decision to develop the surrounding area of Hammarby Lake, potential developers were identified and through a preliminary land designation, these developers were confirmed with official contracts. Together with the decision to develop Hammarby Sjöstad as a demonstration eco-development, the 'Detailed Plans' for Hammarby Sjöstad were formulated. Subsequently, ten contracts for Sickla Udde with (these) developers were negotiated and signed in the spring of 1998 (Svane et al. 2011). [91] With regards to the comprehensiveness of these contracts however, strict environmental measures were not included with respect to the new vision of Hammarby Sjöstad as an environmentally and technologically driven demonstration project (*as was decided in 1997 when the Parliament passed the Environmental Program that was designed to support Stockholm's bid for the Olympic Games in 2004*).

2- Between January and September 1997, Svane et al. (2011) suggested that the planning and organizational efforts of the project team has become more toward '*consensus-seeking*' and even '*conformist*' in terms of conducting the negotiation process with developers and contractors (Svane et al. 2011). Especially during the period before the Olympic Games were awarded for Athens, Greece to host in 2004, the project team has evolved into what was referred as a 'meta-governing' body or meta-governor, whereby the actors were relatively more independent of the City's politicians, hence their influence on the project's management. Svane (2011) also suggested that the project team acted as an *operative organization* that was committed to deliver a given program with its appointed members / representatives from the city administrations and companies (Svane 2011). This was found similar to Sorensen's description of a 'hands-on' type of meta-governance (Sorensen 2006). [92]

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91 According to Svane (2011), the City of Stockholm identified potential developers during the initial phase of the development and negotiated ten contracts. He added that the signatories consisted of private and municipal companies as well as Stockholm's Association of Housing Cooperatives. In the negotiations, an officer appointed from the Road's and Real Estate Administration was in charge of managing the negotiation process on behalf of the City (Svane (2011).

92 Sørensen (2006) defined the term 'meta-governor' in contrast to the traditional means of political entities who are expected to control some or all aspects of governing processes through their power over state bureaucracy and their monopolization of laws through political power, whereas meta-governance leaves significant autonomy for the stakeholders to govern themselves, which in turn the ability of politician(s) would be reduced in terms of influencing / controlling the governing process. With regards to the models of

3- The decision to develop Hammarby Sjöstad as an environmentally sound sustainable urban district was given in 1995, which was mostly inspired by the anticipation of hosting the Olympic Games. The Environmental Program (of June 17, 1996) as well as the Quality Standards for design and development were all developed and decided upon in less than two years following the decision to embark upon the development of a truly sustainable Olympic Village. Together with the negative outcome of the bidding process in September 1997, the motivation and the commitments were lost to the extent that the environmental measures became tentative goals rather than binding during the subsequent negotiations with prospective developers.

4- Furthermore, the actual Environmental Program that was used to guide development was established much later in the project and was not part of the negotiation process during the land acquisitions, at least during the ones that were conducted in the early 90s. Moreover the Environmental Plan was not fully discussed and agreed upon by the developers and other stakeholders through a participatory process, which in turn affected the Project Team's as well as the City's authority over incorporating these measures (in the negotiations) especially after the Olympic Games were awarded to Athens.

With regards to the framework through which Hammarby Sjöstad was developed, it was concluded that the City of Stockholm and the appointed Project Team played important roles as the 'project champions.' The 'project team' acted externally in following the guidelines within the vision that was established before the decision of 2004 Olympic Games was concluded, however this was also found to have changed in the latter stages as the ambitions gradually faded. The developers and the politicians developed differing views over the environmental measures. Moreover, the authority with regards to enforcing these measures necessary to achieve operational goals was challenged. This aspect is further discussed in Sections 7.6 and 7.7 of Chapter 7. However in order to more clearly identify the structure of the framework, a brief summation of the sequential events were presented in Table 1, to help the reader to understand the dynamic nature of the development of Hammarby Sjöstad.

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meta-governance as identified by Sørensen, 'hands-on' fashion within which the (project team) acted as one of the actors seeking to negotiate a number of collective solutions for shared problems, yet with potential influence on the outcome. However, in order for this to happen, the pre-determined / self-constituted rules (such as the environmental / development program) should be in place for the meta-governing body to participate and to seek results.

Table 1. Hammarby Sjöstad's historical evolution and development timeline gathered from significant events and agreements.

1991		The presentation of the first comprehensive development plan of the Hammarby area was developed by the Stockholm City's planners;
1995		The City of Stockholm decided to bid to host the Olympic Games of 2004; The City increased efforts to obtain control over the land ownership and development rights in the area and began increasing their right of possession;
1996	June	The "Environmental Plan" was developed;
1996	Autumn	Initial presentation for the environmental model made by the eco-cycle companies was rejected by the City officials;
1997	January	The project team was established that consisted of the Head of Office, a Secretariat, seven representatives from the city administrations and companies, namely the City Planning Administration, The Roads and Real Estate Administration and the Environmental Administration. (Svane 2011); ('*…heads of the city's 'heavyweight' administration departments and municipal infrastructure companies established the team as the city's main coordinating and executive body for Hammarby Sjöstad.' Svane et al. 2011*)
1997	April	Second presentation for the new environmental plan was made and received positive feedback;
1997	September	The City of Athens won the Olympic Games for 2004;
1997	December	The environmental model was finalized by the Stockholm Energi AB, Stockholm Vatten AB, and SKAFAB, which had jointly developed a proposition for an energy supply, water and drainage supply and waste-management system (Bylund 2006);
1998		New municipal council was elected with a majority from the right wing political party contrasting with the left wing who strongly supported the environmental measures. [93] 4
1998	January	The City of Stockholm applied for state subsidies for its Local Investment Program (LIP or also referred as SLIP) for an amount of SEK 662,647,000 to be used between 1998 and 2000 (Bylund 2006). (This amount was equivalent to nearly 60 million Euros according to European Central Bank (ECB) Database of January 4, 1999);
1998	March	The government granted SEK 610 million for the SLIP from which SEK 400 million was allocated for Eco-cycling Districts (Bylund 2006);
1998	May	The Government allocated and additional SEK 25 million.

Together with the financial commitments, the future of the development and its decision-making process became clearer, especially after the LIP was initiated in 1998-1999. Within this new formation, the LIP was kept significantly under the control of the government through the Ministry of Environment, which, as a result, became central in terms of the decisions that were made for the systems and for the technical artifacts used in achieving project goals and measures. It is critical to understand the ways in which the program was

93 According to Vernay (2013), the project was headed by the 'executive office' until this election and the head of the executive office was removed (or resigned according to Svane et al. 2011) from his position and was replaced by the Real Estate and Public Works Administration. The Executive Office was subsequently sub-divided into three departments of 'Waste & Traffic', 'City planning & exploitation' and 'Building & urban planning.' This was the crucial time after which the municipality became less powerful in terms of its authority towards the construction companies. The new head(s) of the project team developed a more refined version of the comprehensive environmental plan that resulted in reducing the environmental objective and it became a more vague vision document.

designed and worked. Based on Bylund (2006)'s findings as to how the LIP influenced the actor formation and the management of the Hammarby Sjöstad's development process, the following diagram was developed, similarly with his illustrative hierarchy of power (see Figure 2).

Figure 2 The diagram illustrating Hammarby Sjöstad project's formative topography *(Derived and adapted from the representation suggested by Jonas R Bylund (2006, pp. 87)'s research paper titled "Planning, Projects, Practice: A Human Geography of the Stockholm Local Investment Program in Hammarby Sjöstad."*

The Ministry of Environment acted as the authority / regulatory body, reviewing the procedural and contextual relevance of the subsidy applications that were submitted by the City of Stockholm. Furthermore the LIP was contextualized to serve for the overarching vision to establish sustainable developments in Sweden more broadly. The City of Stockholm acted within the same framework, however, the focus evolved toward financing and managing the process of Hammarby Sjöstad development. With regards to how the *Stockholm's Local Investment Plan* (SLIP) was translated into the actor formation and the systems integration; this aspect is further explored in Section 7.4.5 of Chapter 7.

In brief, the local actors consisted of municipalities and other involved parties such as the contractors, developers or service providers [94] acted within a somewhat obscure context, in terms of the established guidelines, rules & regulations. On the one hand this was criticized largely due to the vagueness of the overall effectiveness. On the other hand, it was praised because the municipalities had the freedom or flexibility to promote innovative ideas and systems designed for local needs despite the risk of negative outcomes (Bylund 2006).

As a result, the project was formulated in 15 areas, each of which was further subdivided for smaller plots for developers. Each project team, according to Svane (2011), represented a temporary form of organization that consisted of a developer, consultants and/or a contractor and acted within the framework as illustrated in Bylund's (2006) work scheme (see Figure 3). According to the City's 'Facts and Figures' (Cederquist 2010), a total of 41 developers and 29 architectural firms were engaged in the overall design and development work of these areas. The local actors were given the opportunity to create, develop and introduce technological innovations to achieve environmental goals and ambitions (*Svane et al. (2011) associated with the Ecological Modernization (EM) concept in the context of Stockholm's vision of developing eco-districts*) and acquiring subsidies for promoting environmental measures as guided by the Environmental Load Profile (ELP). (See Section 7.4.6 in Chapter 7 for ELP's strengths or limitations).

In brief, ELP was developed to serve as an assessment tool with which the environmental performances of buildings, 'soon to be built' real estates or urban systems for districts could be measured and compared to the reference values (Forsberg 2003). Furthermore, ELP served as a benchmarking tool in the accreditation of the submitted proposals / projects, as to whether the goal to become "*twice as good*" could be achieved in comparison with the

94 Together with the government's appointment of an 'Eco-cycle Commission' in 1993, more emphasis was given to developing concepts to adapt closed-loop systems into the urban planning and development. While this was the motivation behind the environmental model of Hammarby Sjöstad, the initial work on designing and supporting implementation of the idea began in 1996 after which the Municipality (City of Stockholm) invited its infrastructure companies and service providers such as the Stockholm Energi (1), Stockholm Vatten (2), and Skafab (3) to find ways to develop a novel approach that could be operationalized as an exemplary environmental model specifically tailored for Hammarby Sjöstad. *The main actors that worked in the development of the program were:* **Stockholm Energi AB** (later acquired by Fortum): Stockholm's energy company also managing the Högdalen CHP plant and the thermal plant of Hammarby; **Stockholm Vatten AB:** Also the City's company in charge of the Henriksdal wastewater plant; **SKAFAB:** The City's waste recycling company.
These three companies and their representatives worked together in the development of the first proposal that was based on the existing infrastructural solutions. In autumn 1996, this first proposal was rejected after which the City officials invited eco-cycle companies to work on new proposals through organizing workshops and gatherings that helped to brainstorm and develop a new working model. In April 1997, an improved version of the model was submitted, which was built upon partly the existing infrastructure / system (Pandis Iverot et al. 2012).
After the second presentation in 1997, the environmental model was found only acceptable and the companies were advised to work further to improve upon the model that became to known as the Hammarby Model.

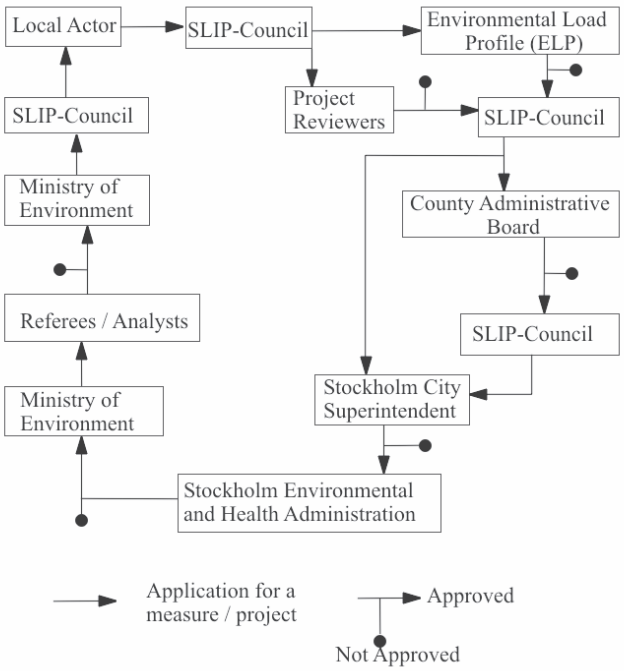

Figure 3 The 'Local Actor' subsidy application process as illustrated by Bylund (2006). *(Excerpted and adapted representation from Jonas R Bylund (2006, pp. 95)'s research paper titled "Planning, Projects, Practice: A Human Geography of the Stockholm Local Investment Programme in Hammarby Sjöstad."*

environmental performances recorded in 1990s. As illustrated in Figure 3, Bylund (2006) described ELP as one of the acting entities placed within the framework of the development process of Hammarby Sjöstad. Forsberg (2003), in her thesis, provided a more in-depth analysis of how the ELP worked (see Box 2).

Box 2. The Environmental Load Profile (ELP) tool

Since the overarching theme in developing the vision of Hammarby Sjöstad revolved around improving environmental performance levels by at least twice the conventional levels found in 1990, an assessment method and tool was required in order to evaluate the effectiveness of the proposed projects before and after implementation. This tool also known as the Environmental Load Profile (ELP) was developed and could be used to process activities from individual sources such as cooking, washing / laundry, use of electricity, water, gas etc and to more broader applications in real estate development (materials, transportations, construction activities and such) or services in general. The tool provided the means to 'aggregate data' from these activities and helped to achieve comparative analyses from personal to district level activities / projects ***(Forsberg 2003).***

Based on the data obtained from ELP analyses, and also depending on the feedback from the reviewers and analysts, final decisions were made by the Ministry of Environment in terms of approving any particular project for subsidies / financial assistance. This nationwide organizational approach in the approval process was also used as the basis of the development framework, in terms of the "actor" (Bylund 2006) formation, through which Hammarby Sjöstad was developed.

Additionally, the *GlashusEtt* [95], which is the information center mostly known for its environmental aspects in Hammarby Sjöstad, has been working toward establishing residential participation and communication among all actors for ways to more efficiently and effectively increase environmental performances of the buildings. It also served as an important facilitator for informing the visitors and served as an educational facility for researchers. During the initial phases of the project, *GlashusEtt* organized seminars and knowledge sharing gatherings to disseminate information and create ecological / environmental awareness among the architects, engineers and other stakeholders (Kasioumi 2011).

Moreover, *GlashusEtt* helped developing the ELP through which the environmental performances of designs and buildings could be assessed prior to the actual implementations. However, it was found that the communication with regards the goal achievements and actual performance levels was unsatisfactory (Toussaint 2012). This was further emphasized by another group of researchers (Faller et al. 2010) who conducted interviews with officials from the GlashusEtt. They concluded that the residents that moved into Hammarby Sjöstad received invitations from the GlashusEtt to participate in the information sharing gatherings. However, only very few of the residents attended those meetings. It was not clear whether this was due to the hours during which the organization operated or merely because of the lack of interest shown by the inhabitants (Faller et al. 2010).

The outcome of the Hammarby Sjöstad development process

Based on the overwhelming amount of analyses obtained through the review of the literature and reports published on the evolving development of Hammarby Sjöstad in Stockholm since the early 2000s, the earlier literature focused on the development process and its novel attributes with regard to the environmental model, which was discussed in *Section 7.4.6 in Chapter 7*. The studies conducted in the latter stages of the development were relatively more critical and analytical in terms of the goals and objectives that were achieved or fell short, compared to the initially desired targets, which were evaluated and

95 In Swedish, the word 'GlashusEtt' means the Glass House that was used as the information center in Hammarby Sjöstad, which functioned as an educational facility designed to disseminate knowledge for the residents and visitors.

expanded upon in their respective sections in this case study. In spite of some problems, in general, the development's outcome in terms of its contribution to the urban planning and development in Stockholm and the region has been significant with important lessons learned and shared for future projects and urban policies.

Due to the project's ambitious Environmental Program (see Section 7.4.6 of Chapter 7) and the initially desired operational goals (see Appendix I for an updated version), the overall process have been scrutinized and criticized with respect to the procedural and conceptual aspects some of which are explored and discussed in the following sections. However, with regards to the overall conceptualization and the initiatives to introduce innovative urban systems and technologies, Hammarby Model (see Section 7.4.6) is exemplary in terms of the systems integration that was designed and implemented at district size developments.

To some extent, the overarching goal to become 'twice as good' could be possible to achieve if most or even some of the initially planned systems were implemented such as the building integrated PV systems, solar heaters [96], or the design attributes and resident behaviors that could have been better managed. The initially desired 'circular urban metabolism' has not been achieved as the current system is based upon the infrastructure that existed prior to the development of Hammarby Model (Pandis Iveroth et al. 2013). According to Rutherford (2013), water processing is done at the Norsberg (60%) and Lovö (40%) plants which obtain water from Lake Mälaren. With regards to the electricity production, it was found that the production level within the development could not be properly assessed since the electricity is produced, distributed and sold based on the Nord Pool System.[97] With regards to waste management, the Högdalen CHP plant has been working to fulfill its core responsibility through incinerating almost all household waste which is then used in district heating and electricity production (Pandis Iveroth et al. 2013). The district heating is further supported by the wastewater treatment that is done in the Henriksdal plant that also existed previously. This plant not only helps in generating district heating but also provides cooling with the help of heat exchangers installed at the Hammarby thermal power plant. The leftover sludge from the Henriksdal plant is then used to produce biofuels / biogas as discussed in Section 7.4.6 (Pandis Iveroth et al. 2013).

As analyzed and reported by the researchers including but not limited to those cited in the paragraph above, the ambition to implement and demonstrate novel urban technologies

96 According to Rutherford (2013), the total installed solar capacity is about 55 kW in Hammarby Sjöstad. Besides the lack of initial interest from the Stockholm Energi during the design of the Environmental Program, Rutherford (2013) also cited the lack of proper feed-in tariff regulations in Sweden, which in turn prevented the sales of energy to the grid; hence the implementation of integrated decentralized energy systems.

97 Nord Pool System or also found as the Nord Pool Spot, is the leading power market in Europe and 20 countries with 370 companies currently annually process and sell 493 TWh. http://www.nordpoolspot.com/About-us/ Accessed on July 31, 2014

in this size and scope has helped to establish a valuable body of knowledge and it raised important research questions about the limitations of 'systems integration' (Pandis Iveroth et al. 2012) and optimization in the level of efficiency for all environmental, financial and institutional reasons. Opting out of the small-scale building integrated / decentralized energy systems only made the 'systems integration' less realistic and as a result some of the proposed facilities were never built. However, based on the studies conducted on the Hammarby Sjöstad, there were reported encouraging results in latter phases of the development, in terms of proactive participation of the residents in seeking to transform Hammarby Sjöstad into a truly sustainable self-sufficient development. This and other improvements are presented in Sections 7.5 and 7.7 of Chapter 7.

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Appendix III

Vauban in the City of Freiburg, Germany: Background Study

1. Brief introduction

Background history of the urban development in Freiburg, Germany

The City of Freiburg, also know as '*Freiburg im Breisgau*' [98] is situated in the State of Baden-Württemberg in the southwest part of Germany. The population was 224,191 inhabitants[99] (Destatis 2012) in 2010. The city of Freiburg **(1)** covers a total area of 153 km^2 (see Figure 1) and situated between the Districts of *Emmendingen* **(2)** and *Breisgau-Hochschwarzwald* **(3)**.

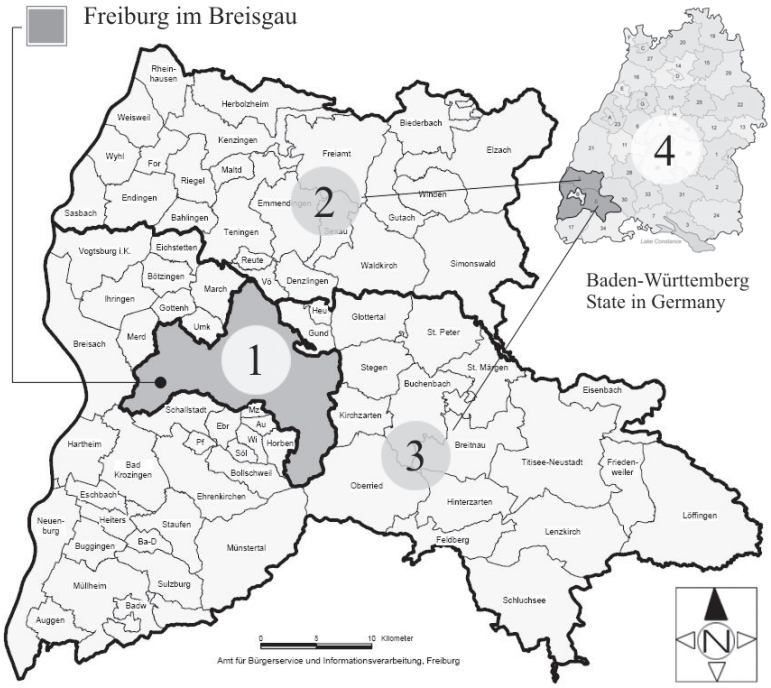

Figure 1 Map of villages and towns including the City of Freiburg. (1) in southwest section of Baden-Württemberg State (4), in Germany. Image retrieved from this link on August 03, 2014: *http://wiki.stadt.freiburg.de/webkatalog/karten/Karte_Gemeinden_Region_FR.pdf . Also, (4) "Cities and Districts in Baden-Wuerttemberg" by AxG - Own work using: Landkreise Baden-Wuerttemberg.svg by NordNordWest. Licensed under Creative Commons Attribution-Share Alike 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Cities_and_Districts_in_Baden-Wuerttemberg.svg#mediaviewer/File:Cities_and_Districts_in_Baden-Wuerttemberg.svg Accessed on August 4, 2014.*

98 Breisgau is the area located between the Rhine River and the forest surrounding Freiburg. Besides Freiburg im Breisgau, other districts whose administrative boundaries also fall in the Breisgau region include Breisgau-Hochschwarzwald and Emmendingen. (http://en.wikipedia.org/wiki/Breisgau Accessed on August 3, 2014)

99 https://www.destatis.de/EN/Publications/Specialized/Population/StatYearbook_Chapter2_5011001129004.pdf?__blob=publicationFile Accessed on August 20, 2014

Historically, Freiburg has been the commercial hub of the Breisgau region since it was founded by Konrad and Duke Bertold III of Zäringen as a free market town in 1120. Throughout the many sieges and revolts for centuries in history, the region prospered and grew rapidly due to its rich silver deposits in the nearby Black Forest of Breisgau. The city's history was rendered with wars and disputes between the residents and its rulers for 150 years after which rich citizens bought Freiburg's freedom and placed themselves under the rule of Habsburgs in 1368. The following two and a half centuries were relatively more peaceful and much progress was made in terms of economic growth.

During the Thirty Years' War (Dreißigjährigen Krieg) fought between 1618-1648 [100], the population decreased to approximately 2,000 people and most of the built environment was destroyed. In this period, the city was claimed and ruled by many including but not limited to the Swedes, the Austrians, the Bavarians and the French until 1805 [101] when Napoleon annexed Freiburg and reinstated under the newly established Grand Duchy of Baden.

Freiburg survived several wars and conflicts throughout its history including the WWII bombing campaign by the Allied Forces, which almost destroyed everything. After the end of WWII, the French Army occupied the city in 1945 and established a city administration in 1946, which was then merged into the State of Baden-Württemberg in 1952 [102]. French Military remained here until 1991 after which their presence in the city as well as in Germany ended effectively.

Freiburg's formative years in becoming a pioneer in environmental planning and sustainable governance began together with the protests that occurred in Whyl, which is a small community in Kaiserstuhl located at 25 kilometers from Freiburg. The citizen protests and demonstrations were held in 1972 [103], only a year after the decision to build a nuclear power plant was announced. Soon after the earthworks began in 1975, the citizens of Whyl occupied its site in order to stop the construction (Freiburg 2011a), thus faced brutal reaction from the police force which later became a nationwide news coverage. A second round of protests was organized on February 23, 1975 further supported by 30,000 residents of Freiburg and this resulted in the withdrawal of the project's license on March 21, 1975 [104]. Subsequent protests including those against 'North Atlantic Treaty Organization' (NATO)'s decision to deploy more middle-range nuclear weaponry in Western Europe (also known

100 http://en.wikipedia.org/wiki/Thirty_Years%27_War Accessed on August 3, 2014
101 http://www.britannica.com/EBchecked/topic/218801/Freiburg-im-Breisgau Accessed on August 3, 2014
102 http://en.wikipedia.org/wiki/Freiburg_im_Breisgau Accessed on August 3, 2014
103 http://www.vauban.de/themen/geschichte Accessed on August 5, 2014
104 http://en.wikipedia.org/wiki/Anti-nuclear_movement_in_Germany Accessed on August 4, 2014

as the "Double-Track" [105] decision) in 1979 [106] contributed to the foundation of the Green Party in politics.

Currently, Freiburg is governed by the Green Party with a majority of eleven seats, followed by the Christian Democrats, the Social Democrats, the Leftist Party and other less significant political entities. Due to its wide recognition for environmental achievements such as the installation of early warning system for smog and ozone pollution, ban on pesticides, measures for reusability on packaging or for its traffic and transport policies, the city has been honored as the 'Environmental Capital' of Germany in 1992 (Freiburg 2011b). Furthermore, Freiburg has been named the 'Federal Capital for Climate Protection' and subsequently crowned as the 'European City of the Year' for its comprehensive strategy in CO_2 reductions in 2010 (Freiburg 2011b). According to the report published by the City of Freiburg (2011b), the most significant factors influencing the city's successful integration of high environmental standards in urban development policies and governance included all political, economic, geographical and behavioral dimensions, which the same report referred as the "Freiburg Mix" (City of Freiburg 2011b). Freiburg is also known to support research and development of solar technologies and also funded industrial activities of various green technologies in order to establish ecological modernization through various initiatives and programs since 1986 [107]. As also pointed out by Scheurer & Newman (2009), Freiburg's innovative urban planning approaches already have a history of almost four decades. Since the 1970s the city have been working to build capacity toward research and establishing "*entrepreneurial culture ready to capitalize on commercial opportunities of sustainable technologies and practices*" (Scheurer & Newman 2009). Besides continuous education, training and knowledge sharing, the city's initiatives additionally included funding and encouraging expansion of solar technologies, funding innovation towards

105 According to the NATO's archived memos dated in 1979, Soviet Union's rapid deployment of SS-20 multiple-warhead intermediate-range nuclear missiles potentially targeting the Western European countries initiated the talks and meetings between the NATO Foreign and Defense Ministers on December 12, 1979. In this meeting, a double-track solution was proposed, also known as the double-track decision. Based on this, the first step would include the deployment of 572 US Pershing II missiles with extra other weapons by NATO. The second step (the second track) was to take a number of initiatives including the withdrawal of 1,000 nuclear warheads from Europe, upon which mutual trust would be established between the NATO and Warsaw Pact Nations in order to improve security and cooperation in Europe. (See http://www.nato.int/docu/update/70-79/1979e.htm Accessed on August 4, 2014)

106 http://en.wikipedia.org/wiki/NATO_Double-Track_Decision Accessed on August 4, 2014

107 Freiburg's citizens have initiated a campaign to take progressive steps in order to establish environmentally sound and secure energy production following the Chernobyl Nuclear Power Plant accident that occurred in 1986. http://www.vauban.de/en/topics/history/281-timeline-abstract (accessed on August 5, 2014).
The 'Chernobyl' (named after the city of Chernobyl or города Чернобыль in Russian) nuclear power plant exploded and caused the release of large quantities of radioactive particles into the atmosphere. The disaster occurred on April 26, 1986 and it is accepted as the worst nuclear power plant accident in the history with a maximum International Nuclear Event factor of "7". The only other such disaster is known to be the Fukushima Daiichi disaster in 2011). The information was retrieved from: http://en.wikipedia.org/wiki/Chernobyl_disaster and https://ru.wikipedia.org/wiki/Авария_на_Чернобыльской_АЭС (accessed on August 5, 2014).

water and climate protection, renovation and retrofitting of old buildings with up-to-date environmental standards as well as through experimenting via novel urban development projects two of which are Rieselfeld and Vauban developments (Freiburg 2011b).

Based on the '*Expert Panel's Evaluation Work & Final Recommendations*' report (2009) for Freiburg's application to the European Green Capital Award of 2010, the city was found to have achieved a number of environmental goals and ambitions. The Panel praised Freiburg's transportation policy, green space use and accessibility, water and waste management and the strong solar program. Furthermore, improvements were acknowledged including the expansion of district heating system through additional combined heat and power (CHP) plants, improvements on infrastructure as well as implementation of energy efficiency measures for old and new buildings in the city. Their criticisms mainly included the relatively high per capita emissions with less than expected reductions compared to 1992 (13%), lack of firm action plans and budget allocations (at least reportedly) with regards to improvements on water system, noise prevention and sustainable land use policy (EGC-Report 2009). The City of Freiburg improved upon these criticisms and suggestions provided by the Expert Panel's report of 2009, which were further addressed in the comprehensive Environmental Policy document published in 2011.

In this report (Freiburg 2011a), some of the significant achievements with regards to environmental adaptation were addressed and these were expanded upon in the following paragraphs.

Previously, the city's 60% electricity need was provided through nuclear power. In 2011, according to Freiburg's utility company '*badenova*'[108], less than 10% of the electricity became nuclear powered and over 60% has been generated through renewable sources. Within the overall production, combined heat and power (CHP) took the majority share with over 50% of the use in Freiburg. Despite the early trend to integrate renewable and green technologies in providing energy for Freiburg however, there was found very little impact in terms of CO_2 reduction between 1992 and 2010 (Freiburg 2011a). Therefore the City administration has set a new target in 2011 to reduce CO_2 emissions by about 40% by the year 2030 (Freiburg 2011b).

With regards to waste management; the same report suggested that between 1992 and 2009, the amount of recycled/recyclable waste increased from 17,000 tons to around 60,000 tons while the total amount of household waste (including bulk, rubbish and other) was reduced from 52,000 tons to about 27,500 tons for the same years. It was further suggested that 69%

108 'badenova' is a regional energy service and environmental utility company with a gross annual turnover of 850 million Euro and based in Freiburg. It is owned by the community with only 33% share belonging to the City of Freiburg (City of Freiburg 2011b).

of the waste produced in Freiburg were recycled. Moreover the report (City of Freiburg 2011b) claimed that the citizen awareness was the most effective tool in achieving sustainable waste management. Based on another report published by the Federal Statistics Office (Destatis) dated 2014, the household waste in Germany generated per person was 456 kg in 2012 compared to 445 kg per capita household waste in the State of Baden-Württemberg in 2012 (Destatis 2014). The daily average water consumption per person (drinking, bathing, cooking, washing etc.) in Germany [109] in 2010 was found around 121 liters, which was 23 liters less compared to the amount used in 1991. [110] As also emphasized in the EGC Report (2009), the water consumption levels have been found exceptionally low even without the full metering. While the same report addressed the lack of firm planning for further environmental measures and future commitments in terms of water saving, energy savings in relation to water provision or potential benefits on incentives in the water pricing policy (EGC-Report 2009), the City of Freiburg expanded upon future improvements on all these aspects in their Environmental Policy document published of 2011. As a result, Freiburg was found to have been highly credited and shown exemplary not only for the European cities but also in the international context with regards to the continuous policy improvements in sustainable land-use implementations and practices (Buehler & Pucher 2011).

> *"Since more than three decades, the city of Freiburg, located in the southwest of Germany, counts as a prominent and well-established example for sustainable urban development."* (Freytag et al. 2014)

Furthermore, the two eco-developments of Vauban and Rieselfeld in Freiburg were acknowledged in terms of energy, water and waste management, land-use planning and implementation principles, which were highly referenced as some of the best-practice models for adopting wide range of environmental goals and sustainable urban development principles (Freytag et al. 2014).

2. The analysis of the overall process of the Vauban development

The framework that was employed for the overall development process

Vauban's development process has been much researched and analyzed due to the environmental measures and innovations that were integrated relatively successfully and in a participatory way that is exemplary for the time and context during which this project was introduced. As previously discussed in Chapter 8, Section 8.3.1, the formation of the

109 http://www.umweltbundesamt.de/daten/private-haushalte-konsum/wasserverbrauch-der-privaten-haushalte Accessed on August 6, 2014

110 https://www.destatis.de/EN/FactsFigures/NationalEconomyEnvironment/Environment/EnvironmentalSurveys/WaterSupplyIndustry/Tables/RateConnectionWaterSupply1991_2010.html Accessed on August 6, 2014

project as an NGO-initiative began in collaboration of the volunteers comprised of students and environmentally conscious people who were committed to collectively create this new development (Sperling 2002).

As Sperling (2002) analyzed, together with political, economical and social contributors, the three acting bodies as expanded upon in Chapter 8, Section 8.4.5 (Forum Vauban, GRAG and the Project Group) were central in terms of establishing the project goals and objectives. Subsequent to receiving funds from the City of Freiburg, the Federal Environment Foundation (DBU) and the European Union LIFE Program [111] in 1996, Forum Vauban launched its publicity campaigns and more importantly organized several public meetings including the presentation of the project to international audience during the UN Habitat II conference in Istanbul in 1996. After the wide recognition of the project as Germany's Best Practice, around 1,500 households were registered with expression of interest in either renting or building homes in Vauban (Scheurer & Newman 2009). These potential residents were then contacted and informed via printed periodicals and workshops, which led to the formation of the much needed popular support for innovative approaches in design and planning of the Vauban. Scheurer and Newman (2009) further suggested that this initial support contributed to the momentum, hence the consensus required for the potentially conflicting issues such as the reduced car ownership, car-free development or the emergence of owner cooperatives (Baugruppen), and communal / non-profit developers. These and other unconventional aspects were claimed to have been resolved and integrated in the planning process through the Forum Vauban's proactive role that facilitated the citizen involvement in the decision-making process.

Within this framework, the local authority's approach in actor formation was defined as the "managed market concept" through which the government (City of Freiburg) maintained control over the outcomes while '*leveraging the potential benefits of private sector involvement*' (Toussaint 2012; MEFL et al. 2011). In doing so, the commercial investors were to some extent restricted from certain areas of the development further allowing the co-building groups to establish specific structure and identity within their communities (Sperling 2002). With regards to the social work in the district, special committees were also established in order to communicate the aspirations and the needs of 'target groups' while also supporting '*grassroots'* initiatives while managing conflicts that occurred in this process (Sperling 2002).

111 LIFE Project is the European Union's (EU) financial instrument for supporting environmentally sound climate action projects throughout the member nations of the EU. According to the latest data obtained from the program's website: http://ec.europa.eu/environment/life/index.htm (Accessed on August 17, 2014), LIFE has co-financed around 4,171 projects and contributed approximately €3.4 billion to the protection of environment and measures to mitigate climate change since 1992. LIFE Project in Vauban was carried out jointly by the Forum Vauban, City of Freiburg, FEW, ICLEI and GENOVA Housing Association for a period of just over two years in performing exemplary ecological measures in the areas transport, energy, consulting and construction (Forum-Vauban & Öko-Institut 1999)

The outcome of Vauban development process

As Williams (2013) suggested in her paper, "*the success of collaborative approach in delivering Low-Carbon Infrastructure (LCI) is highly dependent on the context*" (Williams 2013). She further noted that elements such as the subsidies, political support and commitment, the local cultural context in which the development takes place, the municipal ownership / control over resources and the institutional structure, all provide the necessary conditions for adopting low-carbon infrastructure as demonstrated in the case of Vauban (Williams 2013).

Based on the information gathered from various sources as well as the City of Freiburg, the goals of Vauban in terms of energy efficiency, traffic/mobility, participation/ social interaction and integration of innovative concepts and solutions in building were successfully put into practice (City of Freiburg 2013). Researchers such as Williams (2013), Scheurer and Newman (2009), Kasioumi (2011) and others have also concluded positively and further acknowledged the exemplary approach and management deployed by the City of Freiburg in relation to the overall goal achievements.

> *"In Vauban, however, it was understood from the outset that a healthy and livable neighborhood on track with environmental innovations and self-governance structures will not thrive if delivered in an exclusively top-down process, and the challenge was catalyzed into an exceptionally rich and synergistic participatory planning process."* **(Scheurer & Newman 2009, p.8)**

Besides the general consensus on the achievements attributed to the socio-ecological model, some of the other notable and more specific outcomes of Vauban's development process were found to include but not limited to the following:

With regards to the energy production in Vauban, a wood-chip burning co-generation plant is claimed to provide CO2 neutral heating and electricity for 700 households. According to the studies conducted by Scheurer and Newman (2009) and Reeve (2014), the amount of reduction in CO2 emissions were 60% through the use of CHP plant and this generates about 65% of the electricity needs of the district (Reeve et al. 2014; Scheurer & Newman 2009). In the report published by the City of Freiburg (2011) it was also noted that the building integrated photovoltaic panels generated over 621,636 kWh electricity per annum, which was enough for the energy demand of around 200 households in 2007 (Freiburg 2011a). This capacity was also claimed to increase each year with around 90 systems (a total capacity of 662 Kilowatts) which was an indication reported for 2008 only.

In terms of the green space and natural habitat, the development was planned to include almost all existing large trees kept along the green corridors within and around the area,

which contributed much to the healthy microclimate of Vauban. The St. Georgen stream running along the southern skirts of the development was declared as a biotope and was protected by law. Together with the preserved natural habitat, the architectural design and urban planning were also adapted to support the eco-system via filtering rainwater through the green roofs and collected in carefully crafted paved gutters and through canals. The collected rainwater in the cisterns is then used for watering gardens, flushing toilets or running washing machines in homes (Freiburg 2011a).

The waste management in Vauban was found similarly efficient as it was reported for Freiburg in general. As a result of citizens' commitment to sorting of waste and use of modern technology, 69% of waste is claimed to have been recycled. Organic waste is collected separately and converted into biogas upon which electricity is generated for more than 3,000 households in Freiburg (Freiburg 2011a). The waste generation per capita in Freiburg in 2009 was 124 kg compared to the national average of 143 kg in Germany for the same year. Details with regards to the consumption levels are discussed further in Sections 8.5.1 and 8.5.2.

As for the technical / technological evaluation of the outcome of Vauban's development, the study conducted by Scheurer and Newman (2009) revealed their preliminary insights into the success. Based on their research:

> *" The city has achieved its carbon neutral status in stationary energy, it has extremely high water and waste recycling, it has reduced material consumption and highly sustainable buildings within a transport system that is radically less car dependent than most new areas built in the past 50 years. As a model of how to reduce ecological footprint it is a clear success."* **(Scheurer and Newman 2009)**

Despite the initial discontent of a fraction of the residents in terms of the mobility management concept as it was initially adopted, the housing cooperatives have successfully managed to mediate between the conflicting parties over issues such as:

- *The impracticality of no longer-term parking of vehicles on streets other than only pick-up and deliveries;*
- *The strict measures / ban on parking vehicles in front of houses; that was perceived discriminating for disadvantaged residents, especially single parents;*
- *The doubts and suspicions of some residents misinforming the authorities as to whether they owned a vehicle in order to not pay the extra fee (fixed and monthly) for parking space;* [112]

112 According to Simon Field's study of Vauban in 2011, the overall residential parking space allowance was found to be less than 0.5 per household and the parking lots were provided in three different sections of the

- *The not so user-friendly parking space for guests (especially before the completion of the tramline).* (Scheurer and Newman 2009)

These and other conflicting aspects were resolved through a well-organized public-community partnership (PCP) model that became exemplary together with Vauban's unique approach in implementation of environmentally sound urban district. The energy, the reduced traffic through encouraging walking, cycling and public transport-use were only some of the goals that were achieved. The overall design and planning allowed the citizens to integrate further innovations in water management and encourage to reduce and recycle their waste. These were found due to both the established culture in environmental management and governance in Freiburg as well as the inclusive design process that was demonstrated in the development of Vauban.

Besides much credit attributed to the success of Vauban, there were however found some criticism as well. A recent study published by Freytag et al. (2014) investigated a less researched aspect of Vauban's innovative urban development model in which they presented valuable insights not only as researchers but also from residents' perspectives. Their study stemmed from the narratives found largely on the Solar City (known as Solarsiedlung) (see "3" in Figure 8.1 in Chapter 8), which are commonly used and associated with Vauban in Freiburg (Freytag et al. 2014). [113]

Besides the economic and environmental benefits, surprisingly the social aspects were claimed to have been less emphasized in the overall design process whether these concerned Vauban or Solar City's overall achievements. For example, Freytag et al. (2014) discussed much about the homogeneity and exclusiveness of the neighborhood referring to the socioeconomic/socio-professional formation of the residents. According to their in-depth study, most of the social fabric in Solarsiedlung was composed of inhabitants with similar statures that were mostly well-educated people from leading positions within the

development both underground and on street locations. While there are car-free blocks available for the residents who enter into contractual agreement with the Car-free Living Association, others are offered a parking space for a total of between 18,500 euro and 22,500-euro initial fee with a further monthly fee of 70 euro for maintenance. There are reportedly 470 parking spaces available for these households. However there are also incentives for those willing to live without owning a car in Vauban. These include reduced cost for public transport and membership for car sharing, which requires 350 euro per person or 600 euro per household. Most effective tool for reducing use of private vehicles however, is that the tramline which was completed in 2006 connects the development to the city center 14-15 minutes. Each home is designed to be in a distance of maximum 400 meters in order to facilitate the mode of commuting toward using public transport if not by walking or cycling (Field 2011).

113 'Solarsiedlung' is the development located in the eastern part of Vauban and consists of 59 housing units designed by the architect Rolf Disch . The housing units use less than 20kWh/m2 energy for heating and electricity is generated through integrated solar panels. A standard home in Solarsiedlung with an area of 137 m2 was claimed to use only 79 kWh/m2 average per year while generating 115 kWh/m2 supported by 49m2 of photovoltaic panels (Freytag et al. 2014).

society. While some opinions favored such homogenous composition, others argued as to whether sustainable urban development should reflect a cross-sectional representation of the society (such as in Freiburg or Germany).

> *"The seclusiveness and exclusiveness of the neighborhood is a characteristic that does not necessarily match with the general idea of social sustainable urban living, which is widely based on the principle of social integration in the sense of a mix of residents with different socioeconomic and cultural backgrounds"* **(Freytag et al. 2014, p. 656)**

They further noted that:

> *"It is striking, that in Freiburg, architects, urban planners and political decision-makers have clearly focused on the ecological and economic aspects of sustainability and widely left out any form of social life or social transformation."* **(Freytag et al. 2014, p. 657)**

In the development of initiatives with extensive participation of community, future residents and politicians are found to carry great importance in terms of bringing together all economic, environmental and social aspects as was reportedly done in Vauban's case. In spite of the critical views, the valuable lessons are found in terms of residents' perceptions of their immediate surroundings both in the short and in the long term. However as Freytag et al. (2014) suggested, further studies are required in order to better understand the social/societal implications of the development processes with community-led approaches, comparatively with those similar to Solar City, which tend to gather demographically similar individuals. This underscores the critical difference between community-led design process as was demonstrated in other parts of Vauban; and 'developer-led' approaches as implemented by Rolf Disch in his development of the Solar City. The Freiburg Statement on New Urban Neighborhoods (1995) underscored the "*importance of learning from the traditional wisdom of city making, and avoid the errors of modern peripheral urban development*" with emphasis given to "heterogeneity" in its first principle in establishing social compositions (Barton 1998).

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Appendix IV

Quality of Life Survey: Assessing the level of well being in urban developments

Dear Respondent,

This online questionnaire is designed to guide your reflections about the 'Quality of Life,' in your community. Most of the questions provide a range of comparative options for your answers. However,

I invite you to add your personal comments, which will greatly expand and deepen the lessons I will learn from you.

Thank you for sharing your insights and recommendations about your Quality of Life. Your inputs are essential for this Ph.D. thesis research. I will be happy to send you a copy of my thesis when it has been defended in Erasmus University, in Rotterdam, The Netherlands.
Sincerely,

Part I - General

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1. **What is your gender?**
   - Male
   - Female

2. **What is your age group?**
   - 15-25
   - 26 – 35
   - 36 – 45
   - 46 – 55
   - 56 – 65
   - 66 – 75
   - 76+

3. **What is the highest level of education you have completed?**
   - High School
   - Associate's degree (Specify your speciality.)
   - Master's degree, (Specify your speciality.)
   - Ph.D. (Specify the speciality. Also what was the title of your thesis?)
   - M.D (Specify your specialty.)
   - LLD (Specify your speciality.)

4. **What is your current work/ occupation?**

5. **Do you work for an employer or do you run your own business?**
   - Employed
   - Self Employed / Business owner

6. **How many hours do you work in an average week?**

7. **How satisfied are you with your current work/occupation?**
   - Completely dissatisfied
   - Somewhat dissatisfied
   - Neither satisfied nor dissatisfied
   - Somewhat satisfied
   - Very satisfied

8. **How do you usually travel to and from work? Do you;**
   - Drive alone
   - Carpool or rideshare
   - Take a bus or train
   - Bicycle, walk

9. **Do you own a private car?**
   - Yes
   - No

10. **How many cars in total are privately owned in your household?**

11. **Which of the following best defines your household structure?**
    - Living on your own
    - Living with your partner
    - Living together as wife and husband
    - Living with your immediate family members (such as your parents or your partner with children or both)
    - Living with your flat mate(s)

12. **How many people are in your immediate household, including yourself?**

13. **How many people in your household are under the age of 18?**

14. **How satisfied are you with your current annual income?**
    - Completely satisfied
    - Somewhat satisfied

- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Completely dissatisfied

15. How do you best describe your overall economic situation compared to others in your neighborhood?

- Too low
- Moderately low
- About right
- Moderately high
- Too high

16. How important is your economic situation to your overall Quality of Life?

- Not important at all
- Somewhat not important
- Neither important nor unimportant
- Somewhat important
- Very important

17. With regard to your overall health, do you agree that compared to those in your age group, your health is;

- Extremely good
- Good
- Neither good nor poor
- Poor
- Extremely poor

18. How about this? With regard to physical fitness, how often do you engage in activities such as sports, walking, running, swimming, gardening or other similar activities, for at least 30 minutes per day?

- Everyday or nearly everyday
- 2-4 times a week
- Once a week
- Once a month
- Never

19. How satisfied are you with regard to your free time?

- Completely satisfied
- Somewhat satisfied

- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Completely dissatisfied

20. How much would you say you feel "stressed above average" during your daily life?

- Always
- Very frequently
- Occasionally
- Very rarely
- Never

21. With regard to health care facilities such as clinics, community health centers and hospitals in your community; they are:

- Very adequate
- Somewhat acceptable
- Average
- Somewhat below average
- Very inadequate

22. Have you or any members of your household needed and used the health care facilities' services during the past year?

- Yes
- No

23. Overall, how satisfied are you with your health?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

Part II - Residential Quality

This part of the survey is designed to invite you to share information and attitudes about your current residence and about the surrounding community.

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24. How do you best define the area you currently live in?

- Urban

- Suburban
- Rural

25. How long have you lived in this area?

26. Which one of the following best describes the type of development in which you live?

- Eco-village / eco-town
- Gated community
- High-rise / Mixed-use residential development
- Low-density neighborhood

27. How long have you lived in your current residence?

28. Do you own or pay rent for your house/apartment/shared accommodation?

- Own
- Rent

29. How many rooms are there in your house/apartment?

- One bedroom apartment/studio
- 2+1
- 3+1
- 4+1

30. How satisfied are you with the size and quality of your home?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

31. How satisfied are you with the quantity and quality of the open spaces in your development/housing complex (or the garden of your house)?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

32. With regard to heating and cooling, what technologies are used in your dwelling?

- Passive solar design of the structure
- Standard air conditioning/heat pump
- High efficiency air-to-air heat exchanger
- High efficiency geothermal heat pump
- Natural gas heating
- Oil heating
- Coal heating
- Community heating system
- Flat plate water heating
- Photovoltaic system for generation of electricity
- Wind power for generation of electricity
- Small scale hydropower for generating electricity

33. With regard to these features, how satisfied are you with the quality & reliability of the services provided?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

34. With regard to annual costs of heating and cooling, my opinion is that they are:

- Too low
- Moderately low
- About right
- Moderately high
- Too high

35. With regard to water use efficiency systems in your home, what water saving equipment is used?

- Normal flush toilets
- Water efficient toilets
- Waterless composting toilets
- Normal showerheads
- Water efficient showerheads
- Normal dishwashers
- Water efficient dishwashers
- Normal clothes washers
- Water efficient clothes washers
- Grey water reuse for watering the landscape and garden plants

36. With regard to water efficient equipment, how satisfied are you with the quality of the systems installed?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

37. With regard to the overall utility costs, my opinion is that they are:

- Too low
- Moderately low
- About right
- Moderately high
- Too high

38. With regard to maintenance costs of your home, the costs are:

- Too low
- Moderately low
- About right
- Moderately high
- Too high

39. How satisfied are you with life in your home?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

40. How important are the physical elements of your home for the Quality of your Life?

- Not important at all
- Somewhat not important
- Neither important nor unimportant
- Somewhat important
- Very important

Part III - Neighborhood Quality

The following section is designed to invite you to share your insights and attitudes about your neighborhood and about the ways you are affected by its social and physical attributes.

41. Which of the following elements influenced your decision to move to your current neighborhood? (Check that are all relevant.)

- Housing costs/good value for money
- Convenient to shopping
- Close to high quality schools, kindergarten to university levels
- Close to healthcare facilities
- Reasonable, high quality recreational facilities
- Attractive appearance of the neighborhood
- Size of the community
- Friendly and open people
- Familiar with the area (Local attachment)
- Close to natural areas (woods, ponds, streams, etc)
- Openness or spaciousness of the area
- Close to family and friends
- The option to have a private garden or to participate in a community garden

42. Are there any other factors that influenced your decision to move to this neighborhood?

43. With regard to the proximity of your neighborhood to the city's main attraction points, you are:

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

44. With regard to your current residence, how well connected do you feel you are with the surrounding city?

- Very strongly
- Somewhat strongly
- Neither
- Somewhat poorly

- Very isolated

45. What is your opinion of the statement?
"Your area provides many cultural amenities such as plays, museums, exhibitions and musical events."

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

46. With regard to your decision to move to your current neighborhood, how important was the quality of the environment?

- Not important at all
- Somewhat not important
- Neither important nor unimportant
- Somewhat important
- Very important

47. During the past year, how often have you visited one of the parks in your region?

- Once or twice
- 3-6 times
- More than 6 times
- Almost everyday
- Never

48. How do you usually travel in your neighborhood?

- Walk
- Use a car
- Bicycle

49. What is your response to the statement, 'This neighborhood is a walker and cyclist friendly place to live.'

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

50. With regard to the facilities available to you for daily / weekly shopping within your neighborhood, you are:

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

51. How many kilometers/ miles do you have to travel from your home to the nearest fullsized shopping facility?

52. Which of the following modes of transportation facilities are available in your neighborhood? (Check all that are relevant.)

- Automobile and truck roads
- Buses and bus stations
- Metro and metro stations
- Trams and tram stations,
- Bicycle paths
- Walkways

53. How often do you use the public transportation that is available in your neighborhood?

- Daily or almost every day
- One to three times a week
- One to three times a month
- Less than once a month
- Very seldom
- Never

54. What is your opinion about the statement, 'Without public transportation in my neighborhood, it would be very difficult for me to conduct my daily routines.'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

55. If it were possible for you, which three of the following options would you use for transportation the most?

- I would walk

- I would bicycle
- I would take the bus
- I would take the tram
- I would take the metro
- I would take a boat

56. With regard to the recreational facilities for young children in your area, you are;

- Completely satisfied
- Somewhat satisfied
- Neither
- Somewhat not satisfied
- Not satisfied at all

57. From a teenager's point of view, how satisfied are you with the recreational facilities around your home area?

- Completely satisfied
- Somewhat satisfied
- Neither
- Somewhat not satisfied
- Not satisfied at all

58. Overall, how satisfied are you with the recreational facilities in your neighborhood?

- Completely satisfied
- Moderately satisfied
- Neither satisfied nor unsatisfied
- Moderately unsatisfied
- Completely unsatisfied

59. With regard to solid waste separation facilities, is recycling encouraged in your community?

- Yes
- No

60. Are the appropriate source separation facilities available in your neighborhood?

- Yes
- No

61. Do the members of your household practice waste minimization and waste separation?

- Yes
- No

62. Are individual or community composting facilities available in your community?

- Yes
- No

63. Do the members of your community use the composting facilities in your neighborhood?

- Yes
- No

64. What is your response to the statement, 'this neighborhood is an ecofriendly place in which to live.'

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

65. Do you now or have you ever lived in an EcoVillage or Ecotown? If so, please share in one or two sentences, your experiences.

66. If you have not lived in an EcoVillage or Ecotown, have you known anyone who has or is living in one? If so what were their experiences in living in such a development?

67. How important is your neighborhood for your overall quality of life?

- Very important
- Somewhat important
- Neither important nor not important
- Not very important
- Not important at all

Part IV - Government services

The purpose of this part of the survey is provide you the opportunity to reflect upon the availability and the quality of the services provided to you by the Local Authorities.

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68. What is your reaction to the statement? ' I feel safe living in my neighborhood.'

- Fully agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Fully disagree

69. What is your reaction to the statement? 'The crime level has decreased within the past two years in my neighborhood.'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

70. What is your reaction to the statement? 'The local government provides adequate policing services in and around my neighborhood.'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

71. What is your reaction to the statement? 'The local government maintains facilities such as roads, public buildings, parks, sport facilities and schools in good condition.'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

72. Have you, for any reason, contacted the governmental officials within the last year?

- Yes
- No

73. What is your reaction to the statement? Public officials in this community pay attention to what we ask them to do for us.'

- Strongly agree

- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

74. What is your reaction to the statement? In regard to issues affecting this neighborhood's wellbeing, our community residents can influence governmental decisions.'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

75. Do you agree that the educational facilities in this neighborhood are adequate?

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

76. Do you agree that the healthcare services are adequate and effective in your community?

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Part V - Social Cohesion and Perceived Quality of Life

This is the final section of the survey, which is designed to help you to reflect upon your perception of the community in which you live and to gather information on how you feel about your 'Quality of Life,' in general.

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77. Is there a neighborhood association that is active in managing and improving your neighborhood?

- Yes
- No

78. How often do you attend meetings of my neighborhood association,

- Frequently,
- Sometimes
- Never

79. Are/were there community projects which you participate within your neighborhood?

- Yes
- No

80. What is your opinion of the statement? 'There is a strong sense of community in this neighborhood?'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

81. What is your opinion of the statement? 'Having a vibrant and active neighborhood is important to my/our quality of life.'

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

82. What is your opinion of the statement? This neighborhood will become a much better a place in which to live within the next five years'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

83. What is your opinion of the statement? I/we are completely satisfied with the quality of life in this neighborhood?

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree

- Strongly disagree

84. What is our opinion of the statement? I am/we are completely satisfied with our quality of life, in general.'

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Thank you for completing my survey!

As stated before, the responses are collected anonymously. For further information, you may also link to: 'The SurveyMonkey's Privacy Policy' (http://www.surveymonkey.com/privacypolicy.aspx) and the Security Statement (http://www.surveymonkey.com/Monkey_Security.aspx) to learn more about how the respondent's data is handled on the survey's collectors' behalf.