Placing Sustainability: Geo-Historical Entanglements of Grassroots Innovations and Place-Making Politics in Taiwan

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The cover image is part of a photo taken by Hsu Cheng Tang on the embankment in Taihsi Village toward the 6th Naphtha Cracker Complex.

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To my grandparents

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Acronyms

AFNs	Alternative Food Networks
ASEAN	Association of Southeast Asian Nations
BOE	Bureau of Energy
CE	Community Energy
CHP	Cogeneration plants
COA	Council of Agriculture
CPC	Chinese Petroleum Corporation
DCDA	Dongxing Community Development Association
DPP	Democratic Progressive Party
EJ	Environmental Justice
ERCEA	Eastern Rukai Culture and Education Association
FIT	Feed-in tariff
FP	Formosa Plastics Group
GDP	Gross domestic product
HSP4	Fourth expansion phase of the Hsinchu Science Park
HSTP	Houlong Science and Technology Park
HUCC	Homemakers Union Consumers Co-op
HUF	Homemakers Union Foundation
ICCA s	Indigenous and Community Conserved Areas
ITRI	Industrial Technology Research Institute
JAC	Japan Aluminium Corporation
KMT	Nationalist party
LNG	Liquefied natural gas
MOI	Ministry of the Interior
NGO	Non-governmental organization
NPP-1	The 1st nuclear power plant
NPP-4	The 4th nuclear power plant

NSC	National Science Council
OECR	Office of Energy and Carbon Reduction
PRC	People's Republic of China
PV	Photovoltaic
PVC	Polyvinyl chloride
PV-ESCOs	Solar energy service companies
ROC	Republic of China
RPC	Regional Planning Committee
SMEs	Small and medium-sized enterprises
SML 1	Sun Moon Lake 1st hydroelectric power station
SNM	Strategic niche management
TEC	Taiwan Electricity Company
TEPU	Taiwan Environment Protection Union
TGHPA	Taihsi Green Energy and Health Community Promotion Association
TNCs	Transnational corporations
TRENA	Taiwan Renewable Energy Alliance
TRF	Taiwan Rural Front
VOC	Dutch East India Company
WCDA	Wanbao Community Development Association
WWII	Second World War

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Abstract

Bottom-up collective actions for 'alternative' social experiments with greener technologies, such as alternative food networks and community renewable energy projects, have emerged around the world to address various socio-ecological and development challenges confronting different places and societies. Grassroots innovations as an encompassing concept to describe such collective actions have been a primary focus in civic-oriented studies on transformative pathways towards a more socially just and ecologically sound future. Nevertheless, conventional grassroots innovation studies often adopt a socio-technical systemic approach, whereby the local context of each grassroots innovation is often neglected in favour of a focus on establishing a somewhat universal guideline on expanding and replicating grassroots innovations across places. Grassroots actors' aspirations, mobilization efforts, and visions beyond the scope of certain socio-technical transitions are largely left off by this predetermined research agenda.

This thesis proposes a place-centered enabling approach that foregrounds site-specific needs and place-based politics to better capture the nature and transformative potential of grassroots innovations. To address the theoretical inclination to adopt a sector-orientated research scope and the de-contextualization tendency of the socio-technical systemic approach, it first reconceptualizes a grassroots niche as 'a hybrid space' grounded in dynamic socio-spatial contexts and networked politics and mixed with elements of incumbent socio-technical regimes. Drawing inspiration from political ecology and human geography, it then recasts grassroots innovations as grassroots place-making actions similar to other forms of place-based activism and analytically focuses on three constituents: the development history of the host community, outstanding place-framings, and internal and/or external place-making politics. In so doing, it can investigate the grassroots actors' experiences, motivations, and aspirations in relation to a community's socio-spatial transformation and the underlying politico-economic structure, thereby facilitating a potential dialogue between grassroots innovation studies and critical social studies on grassroots activism for social change.

To examine the value of this approach, this research draws on evidence from three cases of energy and agri-food grassroots innovations in Taiwan: the Taromak 100% Green Energy Tribe Initiative, the organic agri-food initiatives in Wanbao

Village, and the Taihsi Green Energy and Health Community Initiative, which each address important problems emerging from modern capitalist development in Taiwan, including the violation of indigenous rights, resource grabbing, and industrial pollution. Empirical evidence was built through a comprehensive data collection, in-depth interviews, and participant observation over the course of 11 months in 2016 and 2017 in addition to three annual post-fieldwork visits in the following three years.

The empirical findings suggest that the formation of a grassroots innovation is often strongly motivated by the geo-historical processes that communities are subjected to, co-evolve with, and may seek to change in line with other defensive and/or innovative actions. This finding is important: it is not only essential for understanding the meanings and objectives of bottom-up social experiments from the perspective of the main executors and intended beneficiaries; it also helps unpack the structural challenges underlying the site-specific concerns that require solutions beyond certain socio-technical systems which are also prone to the structural lock-ins. More importantly, overlooking these unmet site-specific needs and ends that motivate grassroots actors to carry out a grassroots innovation contributes to a problematic gap in knowledge production for policymaking, which can unintentionally consolidate the injustice a community has faced and seeks to redress.

This research thus argues that grassroots innovation scholars can better specify the meanings and the transformative potential of grassroots innovations by linking the agendas of socio-technical transitions to the visions for socio-spatial transformations aiming to address geo-historically produced concerns. In so doing, this research joins the call for a geographical and political turn in transitions theories. This synergetic perspective can help policymakers, activists, and scholars develop more contextualized and concrete support for grassroots innovations by offering in-depth understanding of grassroots innovations' geo-historical contexts, their interplay with place-based politics, and site-specific challenges and objectives for future community development. It can also enrich the meaning of 'sustainability' in Taiwan's context and in general by expanding the scope from socio-technical transitions to socio-spatial and structural transformations from a grounded, bottom-up perspective, which I argue, is vital to reach a real 'win-win' balance between 'sustainable' community development and 'sustainable' socio-technical transitions.

Samenvatting

In de hele wereld ontstaan bottom-up bewegingen van mensen die 'alternatieve' sociale experimenten met groenere technologieën opzetten, zoals alternatieve voedselnetwerken en lokale projecten voor duurzame energie. Deze initiatieven vormen een antwoord op diverse sociaalecologische en ontwikkelingsvraagstukken die op verschillende plaatsen in samenlevingen spelen. Deze bewegingen worden grassrootsinnovaties genoemd en vormen het hoofdonderwerp van maatschappijgericht onderzoek naar transformatieve routes naar een sociaal rechtvaardigere en ecologisch verantwoordere toekomst. In conventioneel onderzoek naar grassrootsinnovatie wordt echter vaak een sociaal-technische systeembenadering gekozen, waarbij de lokale context van een grassrootsinnovatie vaak wordt genegeerd en de nadruk ligt op het vaststellen van een enigszins universele richtlijn voor het uitbreiden en repliceren van grassrootsinnovaties op verschillende plaatsen. Wanneer de aspiraties, inspanningen om mensen te mobiliseren en visie van de initiatiefnemers buiten het kader van bepaalde sociaal-technische transities vallen, worden deze door deze vooropgestelde onderzoeksagenda grotendeels buiten beschouwing gelaten.

In dit proefschrift is een plaatsgerichte benadering gekozen waarin lokale behoeften en plaatsgebonden politiek op de voorgrond staan. Op deze manier worden de aard en het transformatiepotentieel van de grassrootsinnovaties beter zichtbaar. Als antwoord op de de-contextualisatie van de sociaal-technische systeembenadering waarbinnen vooral sectorgericht onderzoek wordt gedaan, wordt een grassroots-niche allereerst opnieuw gedefinieerd als 'een hybride ruimte' die gestoeld is op een dynamische sociaal-ruimtelijke context en op netwerkpolitiek en ook elementen van de gevestigde sociaal-technische modellen bevat. Geïnspireerd op de politieke ecologie en menselijke geografie worden grassrootsinnovaties in dit onderzoek opgevat als grassroots-placemaking-activiteiten die vergelijkbaar zijn met andere vormen van plaatsgebonden activisme. Het onderzoek is gericht op drie componenten: de ontwikkelingsgeschiedenis van de gastgemeenschap, opmerkelijke gevallen van plaats-framing en interne en/of externe placemaking-politiek. Hierdoor kunnen de ervaringen, motiveven en aspiraties van de lokale initiatiefnemers onderzocht worden en in verband gebracht worden met de sociaal-ruimtelijke transformatie

van een gemeenschap en de onderliggende politiek-economische structuur. Dit vergemakkelijkt een potentiële dialoog tussen onderzoek op het gebied van grassrootsinnovatie en kritische sociale studies op het gebied van grassrootsactivisme voor sociale verandering.

Om de waarde van deze aanpak te onderzoeken, zijn in dit onderzoek drie gevallen van grassrootsinnovatie op het gebied van energie en agro-voeding in Taiwan onderzocht. Dit zijn het *Taromak 100% Green Energy Tribe Initiative*, de initiatieven op het gebied van biologische landbouw en voeding in Wanbao Village, en het *Taihsi Green Energy and Health Community Initiative*. Deze initiatieven zijn alle drie bedoeld om belangrijke problemen aan te pakken die voortvloeien uit de moderne kapitalistische ontwikkeling in Taiwan, waaronder de schending van inheemse rechten, het afpakken van hulpbronnen, en industriële vervuiling. Het empirisch onderzoek omvatte uitgebreide dataverzameling, diepte-interviews en participerende observatie gedurende 11 maanden in 2016 en 2017. Daarnaast zijn de plaatsen van het veldwerk jaarlijks bezocht in de daaropvolgende drie jaar.

De onderzoeksresultaten wijzen erop dat grassrootsinnovaties sterk aangemoedigd worden door de geo-historische processen die gemeenschappen ondergaan, waarmee ze evolueren en die ze mogelijk proberen te veranderen in het verlengde van andere defensieve en/of innovatieve acties. Dit is een belangrijke bevinding, die licht werpt op de betekenissen en doelstellingen van bottom-up sociale experimenten vanuit het perspectief van de belangrijkste uitvoerders en de beoogde begunstigden. Bovendien worden hierdoor de structurele uitdagingen zichtbaar die ten grondslag liggen aan de lokale problemen die oplossingen vereisen die verder gaan dan bepaalde sociaal-technische systemen, die ook structurele beperkingen met zich meebrengen. Nog belangrijker is dat het over het hoofd zien van deze onvervulde lokale behoeften en doelen, die lokale initiatiefnemers aanzetten tot grassrootsinnovaties, bijdraagt aan een problematische lacune in de kennisproductie voor de beleidsvorming. Hierdoor kan het onrecht dat een gemeenschap heeft ondervonden en probeert te herstellen onbedoeld geconsolideerd worden.

In dit proefschrift wordt daarom gesteld dat wetenschappers op het gebied van grassrootsinnovatie de betekenis en het transformatiepotentieel van grassrootsinnovaties beter kunnen beschrijven door de agenda's van sociaal-technische transities te koppelen aan de visie van sociaal-ruimtelijke transformaties die erop gericht zijn om geo-historisch gegroeide problemen aan te pakken. Daarmee wordt de oproep tot een geografische en politieke wending in transitietheorieën in dit proefschrift onderschreven. Dit synergetische perspectief kan beleidsmakers, activisten en wetenschappers helpen meer gecontextualiseerde en concrete steun te verlenen aan grassrootsinnovaties door diepgaand inzicht te bieden in de geo-historische context van grassrootsinnovaties, de wisselwerking daarvan met plaatsgebonden politiek, en in lokale uitdagingen en doelstellingen voor de toekomstige ontwikkeling van de gemeenschap. Het kan ook de betekenis van 'duurzaamheid' in de context van Taiwan en in algemene zin verrijken door de

reikwijdte uit te breiden van sociaal-technische transities naar sociaal-ruimtelijke en structurele transformaties vanuit een gegrond bottom-up-perspectief. Dit is essentieel om een echte win-winbalans te bereiken tussen duurzame gemeenschapsontwikkeling en duurzame sociaal-technische transities.

1 Introduction

Taiwan is well known for the rapid economic growth it experienced during the latter half of the twentieth century; its high economic growth levels between the 1970s and the 1990s have been considered an 'economic miracle' and have earned it a place at the top of the Human Development Index.[1] However, the environmental consequences of Taiwan's economic success are becoming increasingly and acutely evident. Underlying its rapid economic growth has been the degradation of the environment (Chou and Walther 2016, Hsu, S. et al. 2016, O'Connor 1998). Dwindling natural resources and deepening capitalist industrialization have also resulted in growing conflicts over the appropriation of resources such as agricultural land and water to fuel industrial development (Chang, S. 2014, Chou 2017, Hsu, P. 2014, Lan and Lee 2015), as well as a low degree of food and energy self-sufficiency.[2] Moreover, as Taiwan is a densely populated, urbanized, and highly industrialized island exposed to multiple natural hazards (Dilley et al. 2005), the socio-ecological impacts of climate change, including a rising sea level and increased frequency of extreme weather events, are expected to be severe in the following decades (Academic Sinica 2011). The need for a transformation to an ecologically sound and socially just development pathway seems greater than ever.

Opportunities for positive change in this regard have been opened up in Taiwan by its active and vibrant civil society and democratic political system (Grano 2015). The country has witnessed increasing social momentum in challenging the current development pathway and the fossil fuel-intensive energy and agri-food systems over the past few decades. Many community-based innovation initiatives, including community-based renewable energy projects and community-supported agriculture, have proliferated along with the resurgence of nationwide social movements since 2008 (Chen, P. 2014, Chou, K. et al.

[1] It ranked 21st on the Human Development Index in 2018 (DGBAS 2019).

[2] The caloric food self-sufficiency ratio in 2014 was 34.1% (COA 2015), whereas more than 98% of its energy was imported in the same year (BOE. 2020).

2019, Ho, M. 2014b, Lii 2011, Tsai, P. 2015, Tsai, P. and Liu, C. 2012). Many scholars exploring transformative pathways to 'sustainability' have stressed the importance of bottom-up collective action in enriching the discourse, knowledge, and action repertoire and in democratizing transformative politics that are often dominated by political and business interests (Leach et al. 2012, Scoones 2016, Smith and Stirling 2018, Stirling 2011). As such, the transformative potential and challenges of these grassroots initiatives in Taiwan in building a pathway toward a more socio-ecologically benevolent future become a valuable and urgent topic for investigation.

Studies on *grassroots innovations*, understood as "bottom–up solutions for sustainable development" (Seyfang and Smith 2007: 585), have led the civic turn in sustainability transitions studies since the mid-2000s. These studies offer a promising entry point for such investigations, often employing a 'systemic' approach (Scoones et al. 2018) that focuses on the opportunities and challenges of grassroots innovations in facilitating macro-level transitions of specific socio-technical systems, such as energy and transportation systems. Together, they have covered a wide range of grassroots social experiments, including community energy (Hielscher et al. 2013, Seyfang et al. 2013, Seyfang et al. 2014, Smith et al. 2016), organic and local food sovereignty programs (Kirwan et al. 2013, Seyfang 2006, Smith 2006), community currency systems (Seyfang and Longhurst 2013), and civic climate actions (Feola and Nunes 2014).

While this line of studies has generated many valuable insights regarding how to enhance grassroots innovations' contribution to 'sustainability transitions' in socio-technical terms, its attention to "the local situation and the interests and values of the communities involved" to which grassroots innovations seek to respond (Seyfang and Smith 2007: 585) often gives way to the accentuation of establishing a somewhat universal guideline for expanding and replicating grassroots innovations across places. An important, yet underexplored question then arises: *How can a grassroots innovation in a specific context be understood from the perspective of the people to whom the project belongs and aims to serve*?

This research aims to answer this question and address relevant research gaps in conventional grassroots innovation studies by proposing a place-centered approach that brings to the fore grassroots actors' concerns, aspirations, and mobilizing actions in carrying out a grassroots innovation. Specifically, it reconceptualizes a grassroots green niche—where grassroots innovations can emerge and grow—as a 'hybrid space' anchored in a historically produced place. Inspired by a relational place-making framework proposed by Pierce et al. (2011), it recasts grassroots innovations as grassroots place-making actions and then examines site-specific needs and place-based politics underlying a grassroots innovation by regarding three analytical constituents: the development history of a community of place, its place-framing, and its place-making politics.

In so doing, it can unpack the dynamic, networked politics of place linked to obtaining resources for establishing and nurturing these initiatives.

This thesis is also a timely attempt to investigate grassroots innovations in Taiwan in relation to its much-needed transformation in socio-technical, socio-spatial, and structural terms. Based on the findings of three cases of community-based grassroots innovations in Taiwan considered in this thesis, the main empirical argument of the research is that the formation of a grassroots innovation is entangled with the structural positionality, socio-spatial conditions, and place-based political dynamics of its host community, and is often accompanied by other place-based oppositional and/or innovative actions to address the development challenges facing the community. The key theoretical implication is that linking the trans-local imperative of socio-technical transitions to site-specific needs and ends is analytically productive in that it helps better specify the meaning of 'sustainable development' and the transformative potential of grassroots innovations from a grounded, bottom-up perspective. Moreover, it is ethically important in helping avoid scarifying 'sustainable development' of disadvantaged communities for nationwide 'sustainability transitions' in a certain production-consumption system.

In the following sections, I will first critically reflect on the conventional systemic approach to studying grassroots innovations by identifying the pitfalls of a sector-based orientation and the tendency to decontextualize commonly found in transitions theory. I then reconceptualize grassroots niches to address these gaps in the second section, proposing an alternative place-centered approach for the study of grassroots innovations, and discuss the ways in which it can facilitate dialogue between grassroots innovation studies and critical studies on grassroots activism for social change. In the third section, I lay out the objectives and research questions of the thesis. This is followed in the fourth section by an introduction of the fieldwork in terms of its guiding principles, research methodology, research methods, and ethical reflections. The chapter closes with a structural outline of the thesis.

1.1 Reflections on conventional grassroots innovation studies

Grassroots innovation studies emerged from sustainability transitions research, reflecting the growing call among sustainability transitions scholars for taking into account civil society as "a source of (grassroots, and predominantly social) innovative activity" (Smith 2012:181, Stirling 2011). Civil society, echoing Smith (2012), is understood as

> … an arena that encompasses the collective activities by which associations of people develop and assert shared values, identities and interests, without direct recourse to market transactions or the authority of the state in the first instance.

To stress their rootedness in civil society, these scholars conceptualize grassroots innovations as in contrast to government- or firm-led 'sustainable innovations' that dominate conventional transition theories (Table 1.1). Unlike the latter innovations, which are mainly profit-driven and market-based, grassroots innovations are embedded in a social economy that prioritizes the wellbeing of the community over the maximization of individual interests and emphasizes the social, ethical, and culture diversity of its members. Their civic characteristics are also embodied by the flexible, creative, and diversified forms of organization—ranging from co-operatives to social enterprises—to the extent that they are characterized by innovation in social practices rather than by innovation in technological terms (ibid.).

Table 1.1: Comparison between sustainable innovations and grassroots innovations

	Sustainable innovations	**Grassroots innovations**
Leading sector	Market	Civil society
Economy type	Market economy	Social economy
Innovation type	Technological	Social and/or institutional
Primary motivation	Profit	Social need and ideological commitment
Protected by	Market regulation and subsidies	Alternative values and culture
Constitution	Firms	Diverse organization forms, often community based
Source of material support	Commercial income	Grant funding, volunteer labor, mutual exchange and limited commercial activity

Source: Compiled by the author based on Seyfang and Longhurst (2013: 883) and Seyfang and Smith (2007).

This line of grassroots innovation studies focuses on exploring the role of civil society in facilitating socio-technical transitions, often drawing on insights from civil society theory (Cohen and Arato 1992, Edwards 2009, Habermas 1996) and the multi-level perspective (MLP) in transition theories (see Box 1.1. For

more discussion, see Geels 2002, 2011, Geels and Schot 2007, Kemp et al. 2001, Rip and Kemp 1998, Smith et al. 2010). Grassroots innovations are often taken as citizen-led niche alternatives (Smith 2012),[3] which in time and through careful management and contingent favorable conditions can grow at the niche level, be upscaled to meet community aspirations, and potentially be diffused to influence the incumbent regime. Socio-technical transitions can take place to various degrees and assume various forms when grassroots innovations manage to help reform, transform, compete, or co-exist with dominant socio-technical practices (Seyfang and Longhurst 2013).

Box 1.1

The Multi-Level Perspective

The multi-level perspective (MLP) emerged in the late 1990s as a broader analytical perspective applied to explain technical transitions as a result of dynamic niche-regime-landscape interactions. It has been widely adopted by sustainability transitions scholars, as it provides a relatively clear and flexible heuristic outline of how a transition may take place, although the framework remains subject to debate and further development (for an overview of the criticism and responses, see Geels 2011). Central to this perspective is the concept of a *socio-technical regime*, the deep structure that stabilizes the configuration of dominant artifacts, infrastructures, actors, and institutions such as the rule set, norms and knowledge in a specific sector (energy, food, transportation, etc.) that together form the systemic 'mainstream'. A regime is relatively stable and prone to path dependency. It is capable of generating mild, gradual changes and innovations in accordance with 'normal' patterns of reform. A *socio-technical niche*, by contrast, is the protected space (markets, application domains, etc.) where radical innovation can be nurtured and developed without being suppressed by the prevailing regime. An example is the feed-in tariff mechanism that helps accelerate the development of renewable energies by ensuring price certainty and long-term energy contracts. Niches can be strategically created and niche-innovations can be managed to allow them to eventually enter the mainstream through three key processes (Kemp et al.

[3] For other approaches concerning civil society in transition theories, see Avelino and Wittmayer (2016) for a discussion on the multi-actor perspective through which shifting power relations between state, market, community, and the third sector in the transition process can be viewed, and Hargreaves et al. (2011) for a discussion on changes in the daily socio-technical practices of citizens.

1998, Schot and Geels 2008): articulating promising expectations of the innovation that can address certain social problems, building new actor networks that include a wide spectrum of social groups, and evolving through constant social learning processes from multiple experiments, which can lead amongst others to a metacognitive and fundamental questioning of mainstream assumptions. Both niches and regimes are situated in a *socio-technical landscape*, which can be understood as a highly structured context comprising broader-features, such as geographical landscapes, environmental resources, demographic conditions, the global political economy, shifts in political ideology, and the development of scientific and socio-cultural paradigms. The landscape sustains the development of a socio-technical regime, but can also serve as the source of pressure to destabilize it. Transitions occur when regime shifts take place. This is often triggered by the tension created within a regime or in its interactions with other regimes and the landscape, which produce breakthroughs for promising niches to compete with it.

Even if they fail to transform the incumbent regime, these grassroots alternative practices can serve as a political means to reshape public recognition of incumbent practices, for example nuclear energy, by providing alternative visions of the future in combination with experimentation through learning-by-doing (Seyfang and Haxeltine 2012, Smith et al. 2016). They can contribute to the 'transformative politics' fighting against path-dependence and systemic lock-ins by enriching discourses and practices of 'sustainable development' in ways that complement and/or challenge state- or firm-led, market-oriented sustainable innovations. Famous examples can be found in Denmark, where grassroots wind energy projects have successfully contributed to the development of a world-leading wind energy industry and pioneering renewable energy policies (Toke 2011a, 2011b).

This MLP-based approach to studying grassroots innovations, although very insightful when it comes to understanding the opportunities and challenges of these in facilitating systemic transformation, is not without significant theoretical gaps that give rise to questions about its adequacy for understanding the nature of grassroots initiatives and their transformative potential. I identify two interrelated assumptions underlying this approach that warrant critical reflection.

1.1.1 Rethinking a sector-based orientation

The first assumption, as hinted at above, concerns the predominance of a *sector-centered research scope*. As Markard et al. (2012) suggest, sustainability transitions studies by definition investigate the modes of production and consumption in certain socio-technical systems, such as a switch to renewable energies in the electricity system to transform the energy sector. While this scope is very useful and important in analyzing shifts in a specific sector, it is likely to fall short in grasping the organic, multi-dimensional nature of grassroots innovations in at least three ways.

First, the 'technological bias' of conventional niche theories that "privileges the *technological* over the *social*" (Seyfang and Longhurst 2013: 888, italics in original) makes such theories inherently unsuitable for examining grassroots innovations that by nature prioritize the social over the technological (Seyfang and Smith 2007). Unsurprisingly, several empirical studies have suggested that the performance and outcome of grassroots innovations can fundamentally diverge from those suggested by mainstream transition theories. For example, in terms of the niche development trajectory (diversified rather than unified and consolidated), the interaction with regimes (involving multi-regime transformations rather than targeting a single regime), and the learning process along with knowledge production (unpredictable and unrepeatable rather than linear and cumulative) (Seyfang and Haxeltine 2012, Seyfang and Longhurst 2013, Smith et al. 2016). The conventional, single-sector-oriented approach is likely to obscure the complexity and flexibility of grassroots innovations more than it can reveal these.

Second, this sector orientation may run the risk of creating and consolidating an asymmetrical relationship between the researcher and the 'researched' by uncritically privileging the predetermined research agenda (on macro-level socio-technical transitions) over the motivations and aspirations of the grassroots actors engaging in grassroots innovations. For instance, many community energy projects in the United Kingdom emerged not in pursuit of 'sustainable' energy, but, instead, for the sake of community health, food waste management, or other community issues (Smith et al. 2016). Even when expanding considerably or when being scaled up, they remain "part of a wider vision and practical figuring out of what vibrant sustainable community requires" (ibid.: 424).

However, the emphasis placed on sustainable systemic transitions may unintentionally downplay grassroots actors' motivations, subjectivity, and agency in carrying out the initiatives, on the one hand, and sideline the place-based agenda for sustainable community development, on the other. Such a sector-oriented bias can thus lead to a problematic epistemic gap between those who implement grassroots innovations and those who produce the knowledge that informs policymaking regarding the forms of institutional support the former

can receive. Paradoxically, grassroots perspectives and experiences may find themselves at odds with the institutional understandings of and policy support for these bottom-up innovations built on knowledges that serve a top-down agenda.

Third, this line of study tends to investigate the transformative potential of grassroots innovations in sectoral terms in a way that seldom considers broader societal transformations. This may explain why grassroots innovation studies thus far have engaged little with critical studies on place-based struggles aimed at generating structural change, such as those challenging the capitalist economic systems that are intrinsically linked to the pressing socio-ecological challenges of our time (Escobar 1992a, 1996, 2012, Peet and Watts, M. 1993, 1996, McMichael 2010, McMichael and Morarji 2010, Moore, J. 2015). While the need for the redistribution of politico-economic power in favor of grassroots actors and for critical political actions to challenge the structure underpinning a socio-technical regime has been recognized (Smith et al. 2016), the focus is still confined to sectoral transformation, such as how to cooperate with extra-local oppositional social movements to facilitate energy transitions. Little attention has been paid to broader societal transformations beyond the socio-technical arena that grassroots innovations may strive for. The emancipatory power for civil society to destabilize the capitalist development agenda, which from a structural perspective lies at the core of 'unstainable' status quo (Springett and Redclift 2015), tends to be overlooked in the pursuit of socio-technical 'sustainability transitions'.

1.1.2 Rethinking spatiality

The second assumption to reflect on concerns the *spatiality of grassroots innovations*. By spatiality, I refer to the recognition of the 'situatedness' of these initiatives in the specific geo-historical context of a place with which they co-evolve. Sustainability transitions studies have been criticized for being geographically insensitive (Lawhon and Murphy 2011, Smith et al. 2010). Despite the use of 'geographical' terms such as 'space' and 'scale', true geographical connections seem to be absent in the literature employing a MLP lens, as well as transition theories in general (Lawhon and Murphy 2011, Markard et al. 2012). When empirical evidence is drawn on, the focus is often not on how a niche innovation is situated in and co-evolves with a specific place, but for the greatest part on how it performs and grows (or not) *across* places to change the sectoral topography.

This a-geographic tendency is exemplified in the conventional conceptualization of niches based on sustainable innovations in a market context. Socio-technical niches are conventionally defined as 'protected (protective) spaces' passively or actively shielding innovative practices from institutional selection

pressures that favor incumbent regimes through various means (for example by means of government subsidies or geographical barriers) so that alternative 'sustainable' technologies can grow through real world experimentation (Geels 2011, Kemp et al. 1998, Smith and Raven 2012). A niche space can be embodied by certain social spaces in which the innovative practice under scrutiny is carried out (the 'local' dimension), which may aggregate into an emerging field that translates local experiences into abstract and generic knowledge and cognitive rules (the metaphorically 'global' dimension) (Geels and Raven 2006).

Significantly, these 'local-global' dynamics of niches are understood in the 'socio-cognitive sense' rather than in a spatial manner (Geels and Deuten 2006, Truffer and Coenen 2012)—the 'local' stresses the relative isolation of each grassroots practice at the preliminary stage of knowledge building, whereas 'global' refers to the entire socio-technical system and is "concerned with defining de-contextualized, shared theories and models independent of their local context" (Coenen et al. 2010: 296, Dóci et al. 2015). The focus is on generating somewhat standardized guidance and abstract knowledge through aggregation activities of intermediary actors, such as renewable energy advocates, so that these innovative practices can be defused or replicated across places (Geels and Deuten 2006).

This conceptualization of niche spaces as protected spaces can be problematic in the case of grassroots innovations. First, grassroots innovations in reality often enjoy less 'protection' than their state- or firm-led counterparts, partly due to less political support available and partly due to their poor 'institutional fit' in the incumbent funding regimes that favor large-scale, market-oriented projects (Ribbe et al. 2015, Seyfang and Longhurst 2013, Seyfang and Smith 2007: 595, Smith et al. 2014, Strachan et al. 2015). Consequently, "the struggle to maintain a viable sustainable socio-technical space within a wider unsustainable regime" remains an arduous task for many grassroots innovations (Seyfang and Longhurst 2013: 883). While these empirical findings necessitate customized policy support for grassroots initiatives, they also suggest that a grassroots niche as 'a protected space' is not an empirical fact as much as it is theoretically desired.

Second, instead of being a somewhat closed space owing to protective measures, a grassroots green niche may be more akin to an open space formed by creative and dynamic connections with actors and elements at multiple levels and sectors so as to mobilize sufficient resources and support for nurturing innovations. With fewer resources at hand, grassroots actors may have to rely largely on the existing socio-physical infrastructure and appropriate elements in the targeted socio-technical system, such as support from powerful regime ac-

tors, to build their own projects (Dóci et al. 2015). Consequently, the boundaries between grassroots niches, regimes, and landscapes are likely blurrier and more permeable than conventional niche theories suggest.

This suggests that grassroots niche spaces may be created and sustained not as much by shielding themselves from the competition of socio-technical regimes, but rather by strategically situating themselves in and navigating the broader politico-economic contexts that enable and constrain regimes. As Seyfang and Longhurst (2013) note for the case of communal currency systems, grassroots niche-building activities "are more explicitly entwined in politics and values" than market-based sustainable innovations. Smith et al. (2016) in addition note that it is almost impossible for community energy projects in the United Kingdom to remain apolitical, as they all face structural challenges inherent to regimes that impede their scaling up.[4] It is thus questionable to follow the conventional theoretical assumption that grassroots niches emerge and grow in a somewhat geopolitical vacuum.

Third, the focus on the formation of a universal, abstract 'global niche' has contributed to the general neglect of the specific place where a grassroots innovation emerges and develops. Although grassroots innovations by definition are associated with communities with place-specific situations, interests, and values (Seyfang and Smith 2007), grassroots innovation studies in general have paid scant attention to what 'local community' means and how it operates, which existing socio-economic relations and political dynamics it is entangled with, and which site-specific needs and ends it strives to meet. The focus is often on the potential and challenges of grassroots innovations to facilitate systemic transformations, despite the recognition that these initiatives may have little to do with this trans-local agenda but concerns more about the place-based objectives of a community. As such, these studies often engage with 'local community' and place in a passive and partial manner, subsuming them under a decontextualized notion of civil society or as background conditions discussed only when being relevant to a socio-technical transition, instead of studying them as a subject characterized by geo-historical complexity that co-evolves with a community's grassroots innovations. The complex dynamics between community, place, and grassroots innovations remain largely underexplored.

[4] These challenges can be institutional (e.g. a lack of policy support), geographical (e.g. how to replicate localized experiences in other places), teleological (e.g. how to thrive in the incumbent system that it aims to change), and of scale (e.g. how to generate structural transformations with small-scale solutions) (Seyfang and Smith 2007, Smith, A. et al. 2014).

1.1.3 Reflections on community energy and alternative food networks studies

Separate lines of study have emerged on grassroots innovations anchored in specific socio-technical systems that are relevant for this thesis, such as community energy (CE) studies and alternative food networks (AFNs) scholarship. Derived from different theoretical traditions and often involving multiple disciplines, these sector-oriented grassroots innovation studies have discussed place, community, and localism to various degrees that are worth some exploration and reflection.

Following Seyfang et al. (2013), CE can be understood as decentralized energy production and/or consumption initiatives that entail a high degree of local engagement in terms of ownership, benefit distribution, and decision-making. In a pioneering CE study, Walker et al. (2007) have noted that a community is a socio-cultural construction that can be "strategically deployed and locally manifested in many different and often complex forms". Such geographical sensitivity, however, remains absent in many CE studies that situate CE in an energy-transitions-for-climate-mitigation research agenda, especially those employing a quantitative research methodology (for instance, see Bamberg et al. 2015, Bauwens 2016, Kalkbrenner and Roosen 2016, Sloot et al. 2019). Place and space in this line of studies are often taken as a universal, passive background devoid of internal dynamics and geo-histories, in favor of comparisons between CE projects across places using standardized and quantified factors like 'financial incentives' and 'environmental concerns' to explore the incentives for participation.

By contrast, a group of studies often adopting an in-depth qualitative analysis technique have aimed to unpack the grounded motivations and rationales of grassroots actors for initiating CE (for instance, see Jeong et al. 2012, Simcock et al. 2016). While this line of study does not necessarily highlight the role of place, it has demonstrated the contribution of place-based elements such as collective identity, pre-existing social relations and community spirit, and place-based activism prior to the CE initiative in instigating, enabling, and shaping CE. Several studies on CE in Scotland, where rural development is the primary goal for many CE initiatives, further stress the need for distinguishing place-based CE from those involving multiple sites and for remaining sensitive to diverse forms, meanings, and priorities of CE that have less to do with ethical energy transitions and more with local development needs (Bomberg and McEwen 2012, Slee 2020, Van Veelen 2017). Despite these important insights, these studies tend to take the place-based elements as useful resources to be exploited and pay less attention to how they—like place and the host community—co-evolve with the development of CE.

Recently, with growing attention being paid to energy geographies (Bridge et al. 2013, Calvert 2016), scholars have increasingly interrogated CE by drawing on various concepts and dimensions of space and place, including scale (Hill and Connelly 2018), the socio-materiality of energy resources (Armstrong and Bulkeley 2014), and energy-induced place reconfigurations (Ahlborg 2018). Despite differences in focus and theoretical tools, studies that deploy a relational place-associated approach to CE generally agree on the appreciation of "space, community, and energy as mutually co-constitutive" (Aiken 2018: 135). Süsser et al. (2017) for instance argue that the meanings and emotional bonds attached to a place can affect community members' acceptance of the spatial changes brought about by CE. Van Veelen and Haggett (2017) further investigate place attachments and attitudes toward CE projects, highlighting the tension between community members with competing place visions. Yet both studies follow a project-centric framework that emphasizes local responses to the development of CE, instead of how CE was initiated, embedded in, and co-evolved with different framings of the place and broader political dynamics in situ.

By contrast, place has been a central concern in AFNs studies (Bosco and Joassart-Marcelli 2018, DeLind 2002, DeLind and Bingen 2008, Feagan 2007, Harris 2010, Maye et al. 2007, Maye and Kirwan 2010, Schnell 2013, Schrager 2018). In parallel to critical reflections on globalization in human geography, a common theme and strategy in the advocacy of AFNs has been to embed agri-food networks—farmers' markets, community-supported agriculture, and fair trade initiatives—in 'local' places to resist the 'placelessness' characterizing 'global', corporate-dominated, industrialized agri-food systems. Consequently, significant academic attention has been paid to the critical examination of the discourses and practices related to 'localization' and 'alterity' in order to avoid the romanticization of AFNs (DuPuis and Goodman 2005, Feagan 2007, Goodman 2003, Hinrichs 2003, Kirwan et al. 2013, O'Neill 2014, Watts, D. et al. 2005, Winter 2003).

Place in this literature and advocacy is seen as co-constitutive of food, shaping the tastes of, meanings of, and ways in which food is produced, consumed, exchanged, and wasted (Barham 2003) while being partly constructed by food-related facilities such as restaurants and open markets, as well as through everyday practices (Joassart-Marcelli and Bosco 2018). As such, alternative agri-food practices are not only socio-ecologically embedded in a place; they also significantly contribute to the formation of biophysical landscapes, place-based social relations, and place identity.

Two interrelated assumptions underlying this body of literature constrain the analytical scope of place-food co-constitution processes, however. First, the conceptualization of 'localization' and 'embeddedness' in the AFNs scholarship is largely confined to a 'local/global' dialectic. Although this framing captures

an important feature of modern agri-food systems, it nonetheless risks overlooking other capitalist forces and processes at play in agriculture and rural development, such as industrialization and urban sprawl, which are usually considered 'national' issues. Second, AFNs studies tend to focus on geographical aspects that fall within agri-food systems (for instance, see Lamine et al. 2019) instead of embedding agri-food systems in their broader geo-historical contexts. Insufficient attention has been paid to the broader politico-economic contexts crucial for the continuous formation of agri-food systems and place, such as the marginalization of agriculture and rural areas that occurs alongside the expansion of industrial capitalism.

Overall, both lines of sector-oriented grassroots innovation studies have generated significant insights regarding place, community, and localism that can shed light on the ways of incorporating spatiality into conventional grassroots innovation studies deriving from transition theories. However, the research continues to focus mostly on grassroots innovations' performance, contributions, challenges, and pitfalls in relation to more socio-ecologically benign energy or agri-food production and consumption practices. The sector orientations of these studies tend to limit the geographical imaginary of these studies by confining the discussion of place to the scope of the projects and the socio-technical systems per se, rather than situating the latter in the place entangled with diverse geo-historical trajectories, broader political-economic structural forces, and existing internal politics. Despite some CE studies investigating the grounded incentives and objectives, questions remain about how grassroots innovations are envisioned differently by community members across time and how they shape and are reshaped by these place-based elements. This suggests a need for an approach that not only explores grassroots innovations' contribution to place visions beyond systemic transitions, but also their dynamic co-evolution with a place and a community with geo-historically produced development challenges.

1.2 An alternative approach to the study of grassroots innovations

To address the gaps and pitfalls of the socio-technical systemic approach identified above, I propose a place-centered approach to better understand grassroots innovations' transformative potential and politics from an 'insider' perspective (instead of from a managerial, functional, 'outsider' ontology) (Smith and Raven 2012). Such a new framework in a dynamic manner brings to the fore grassroots agency and site-specific elements in the making of niche spaces and grassroots innovations, such as local concerns, visions for the community, networked politics, socio-cultural infrastructure, and the biophysical environment. This research theorizes that a bottom-up perspective could help better

grasp these "novel bottom-up solutions for sustainable development" (Seyfang and Smith 2007: 585).

This place-centered approach is not intended to replace or reject the socio-technical systemic approach in grassroots innovation studies, whose contribution to the understanding of the opportunities and challenges facing grassroots innovations in facilitating systemic transitions are extremely valuable and urgently needed for redressing various systemic unsustainabilities and injustices we currently face, such as those linked to fossil fuel-intensive energy and agricultural systems. What the approach seeks to do is to provide an alternative way of studying grassroots innovations that can unpack other important dimensions often neglected by a systemic perspective and research agenda, which, I argue, is equally important in the search for pathways to 'sustainability'. Moreover, while grassroots innovation scholars have demonstrated the inadequacy of the analytical tools based on state- or firm-led sustainable innovations in studying grassroots innovations, a more appropriate framework to study the latter remains to be established.

Thus, this place-centric approach can be taken as one possible way to carry out the task, or as a critical complement to conventional grassroots innovation studies. It aims to advance a more sophisticated understanding of grassroots innovations, especially in relation to site-specific concerns related to equality, identity, rights, livelihoods, and other issues that "are deeply intertwined with patterns of unsustainability" (Scoones 2016: 303). It also echoes the call for a geographical turn in sustainability transitions scholarship (Coenen et al. 2012, Coenen and Truffer 2012, Hansen and Coenen 2015, Longhurst 2015, Raven et al. 2012, Truffer and Coenen 2012, Truffer et al. 2015) that has yet to engage grassroots innovation studies (for a pioneering attempt, see Murphy 2015).

1.2.1 Re-conceptualizing grassroots niches as 'hybrid spaces'

"Niches do not emerge out of nowhere", quipped Raven et al. (2012: 71). This is an observation at the heart of this thesis. As grassroots innovations are often carried out by a community in a specific place, it is vital to conceptualize grassroots niche spaces by elaborating what a community of place means in the first place. I take as a starting point that grassroots niche spaces are 'hybrid' spaces in which grassroots innovations and communities of place 'intra-act', meaning 'becoming-with' each other through their entanglement in a web of relationships (Collard 2015, Haraway 2008, Neely and Nguse 2015). Seeing grassroots niche spaces as such allows researchers to investigate the formation and development of grassroots innovations through their 'intra-action' with place-based communities in the making (instead of regarding 'interaction' between pre-defined, discrete entities).

Following the insights of political ecology, I understand a community as a heterogeneous, dynamic, place-based assemblage of people who are socio-cognitively bonded by a shared sense of belonging.[5] It is characterized by organic networking of its members with multiple interests, value systems, and identities, and involves an uneven distribution of resources and asymmetrical power relations among them (Watts, M. and Peet 2004). A community is not a clear-cut or independent entity with a well-demarcated boundary, but is "simultaneously place-based and networked across places" (Escobar 2008: 62, Massey 2005). Thus, it cannot be merely taken as an administrative unit (a village), a scale ('local'), or as a synonym for civil society (existing alongside the state or market) to be compared abstractly without taking into account site-specific experiences. A community can serve as the basis for a grassroots niche where grassroots innovations can emerge and grow through active engagement with the complex configurations of actors, other beings, and power relations in place, which in turn are reshaped in the process. As such, a community is co-constitutive of grassroots innovations, and is always in the making (Walker et al. 2010).

A grassroots niche can be tentatively described as follows: Unlike a conventional niche for sustainable innovations framed as a protected/protective space more or less exempted from selection pressures, a grassroots niche space is more akin to a *hybrid space* in two senses. Socio-technically speaking, it is an open space that shares many systemic elements enabling and constraining multiple socio-technical regimes (Dóci et al. 2015), which may passively or actively facilitate (or hinder) the emergence and development of grassroots innovations. Socio-spatially speaking, it is composed of networked actors with diverse interests, concerns, and priorities, as well as socio-cultural norms, biophysical features, and political-economic dynamics of and beyond a place where it comes into being. Instead of favoring the abstract over the concrete, this reconceptualization highlights the situatedness of grassroots innovations in a place constantly in the making through place-based activities (including grassroots innovations themselves) and broader geo-historical trajectories. Like the community of place, a grassroots niche is an ongoing product of the intra-action among/between networked actors and forces across multiple spatial-temporal scales that pre-exist and co-evolve with the development of grassroots innovations.

By stressing the hybridity of grassroots niches, the research focus can be redirected to the often-overlooked politics among actors inside a 'local community' and across spatial scales to shield, nurture, and empower grassroots

[5] For the purpose of this thesis, I focus on 'community of place' instead of 'community of interest', although they sometimes overlap and are often interrelated (Bauwens 2016, Süsser et al. 2017).

innovations. As aforementioned, a favorable milieu involving "a particular form of geographical protection for the emergence of different forms of sustainability experiment" (Longhurst 2013, 2015: 184) cannot be presumed as always existing in a community. Thus, the creation of grassroots niche spaces inevitably requires strategic navigation and links to place-based power relations exceeding the domain of a socio-technical system, such as rural politics dominated by certain local factions, so as to mobilize more support and resources deemed necessary for the formation and development of grassroots innovations. In this sense, grassroots innovations are inherently political, not only in socio-technical terms as stressed in some grassroots innovation studies (e.g. challenging a socio-technical regime with oppositional social movements or through collective discursive activities) (Farla et al. 2012, Smith et al. 2014, Smith et al. 2016); it is political also in socio-spatial terms: As a place-based collective action, it involves constant negotiation, integration, and contestation among community members with multiple interests, diverse visions for community development, and different positionalities in the socio-political and economic structures.

As such, a grassroots innovation can contribute to the transformative politics in relation to 'sustainable development' in socio-spatial terms, in addition to that in facilitating a socio-technical 'sustainability transition'. In calling for a "spatially informed, co-evolutionary transition model", Truffer and Coenen (2012: 11) argue that socio-technical niches and regimes "arise from an inherently asymmetric process of regional development". This holds true, if not more so, in the case of grassroots niches. I argue that investigating transformative politics in socio-spatial terms is important, as it foregrounds the site-specific needs stemming from the uneven socio-economic development that have been recognized as important, yet have not been fully explored in conventional grassroots innovation studies. It is particularly useful to unpack the transformative potential of 'internally oriented' grassroots innovations that are focused more on 'intrinsic benefits' in situ than on the geographical expansion of the grassroots innovation model (Dóci et al. 2015, Seyfang and Smith 2007). In so doing, the reconceptualization of grassroots niches as hybrid spaces opens up an opportunity to explore the intersections between the transformative politics in the socio-technical realm and those in the socio-spatial realm in a specific geo-historical context.

1.2.2 Introducing a place-centered enabling approach

To unpack the formation and development of grassroots innovations in hybrid niche spaces and their transformative potential, I propose a place-centered approach inspired by Pierce et al.'s (2011) relational place-making framework.[6] It starts by recasting a grassroots innovation as a *grassroots place-making endeavor* embedded in a *place-making process*, which can be understood as the on-going intra-action within and between the community of place (including its daily economic activities, place-based social norms and relations, culture and value systems, and biophysical conditions) and the broader politico-economic trajectories. It comprises three main analytical tools: (1) the development history of a community of place, (2) place-framing processes, and (3) place-making politics. As the interrelations, foci, and articulations of these constituents can vary from case to case, their application in empirical studies needs to be flexible in terms of order, format, and degree in order to capture the place-making dynamics in a specific geo-historical context.

Place is understood here as a combination of 'locale' (i.e. biophysical settings), 'location' (in connection with the extra-local world), and 'sense of place' (i.e. subjective association with a place) (Agnew 1987). From a relational perspective, a place is not merely a site, a clear-cut territory with intrinsic features, or a passive background; rather, it is a temporary bundle of space-time trajectories that is always in the making through dynamic networks of social relations and everyday activities in that place and elsewhere (Massey 1997, 2005, Pierce et al. 2011). A place is inherently political, subject to the negotiations among and between community members and actors elsewhere about the imaginaries of its past, present, and future, the terms of its openness, and the ways to address its interrelations with wider settings (ibid.). A place is also historical in the sense that it involves the geo-historical trajectories that paved the way for the current assemblage of socio-economic relations, biophysical settings, and psychological attachment to place. As Massey (2005: 130) suggests, "[i]f space is rather a simultaneity of stories-so-far, then places are collections of those stories, articulations with wider power-geometries of space".

The development history of a community of place in which grassroots innovations are embedded is thus a key analytical constituent; it can be understood as the socio-spatial transformation experienced by a community, or the place-making process that has taken place to date and has been collectively experienced, albeit with individual differences. More specifically, it refers to the

[6] This framework has been introduced to the sustainability transitions field by Murphy (2015). It relates to the MLP approach and the technological innovation systems approach, which focuses on supporting the diffusion of niche innovations. It is not yet widely applied in grassroots innovation studies, and this thesis therefore can be seen as among the first to explore its applicability in this field.

key time-space trajectories co-constituted by broader politico-economic forces (such as colonization and urbanization) and grassroots responses to them that have made a community's 'stories-so-far'. In line with the problem-oriented historical approach in political ecology (Davis 2015), I suggest applying a critical historical analysis drawing on multiple data sources to unpack the key geo-historical trajectories that co-shape the current status of a community of place that its members seek to change through collective action.

Identifying these key geo-historical trajectories is important for studying grassroots innovations. It can link a grassroots innovation to a broader socio-spatial transformation, such as the uneven development associated with industrial capitalism, that sets the stage for its emergence and development. For instance, an indigenous community's dialectical interrelations with the modern state and its policies to transform the community into an administrative unit of state space can have long-term effects on the socio-political relations within the community, which in turn enable or constrain the creation of grassroots niches. Moreover, to make sense of the site-specific needs and ends that a grassroots innovation seeks to meet requires understating the specific geo-historical contexts that endow them with particular significance to the grassroots actors. These geo-historically produced meanings are also important for a researcher (usually an 'outsider') to understand the grassroots innovations' role in place-making dynamics from the perspective of grassroots actors ('insiders').

Examining the host community's *place-framing* can shed light on the geo-historically produced concerns, visions, and the way in which a grassroots innovation is situated in this specific context. Place-framing refers to a process of making sense of a place through collective negotiation among community members to achieve certain socio-political aims, which according to Pierce et al. (2011) involves (1) key place-frames that define the scope of the shared concerns, collective identities, and perceptions of the place's stories-so-far and what it can become, (2) key actors and institutions that produce and contest these place-frames, and (3) the place/bundles, referring to the ongoing reconfiguration of heterogeneous elements (social, economic, biophysical, etc.) strategically selected from the space-time trajectories in accordance with the networked actors' objectives.

A place-framing process is thus inherently political, as it includes deciding what and whom should be included (or not) in the process to meet certain socio-political ends. Additionally, place-frames can help justify place-based activism against a perceived threat, whereby they become 'collective action frames' that help establish a place-based collective identity—a place identity—to mobilize heterogeneous interests toward the same goals (Benford and Snow 2000, Martin 2003, Snow and Benford 1988). While the relational place-making framework typically focuses on conflicts, I expand its application to grassroots

innovations—another form of place-based activism—to investigate, first, how grassroots actors initiate and conduct grassroots innovations in relation to their place visions and, second, how specific place-based frames strengthen and legitimize their request for the external support of these initiatives.

Investigating *place-making politics* can help understand how grassroots innovations engage and are simultaneously shaped by the existing political dynamics in a specific place. I conceive place-making politics as political dynamics that co-evolve with the process of the discursive and material construction of a place, including those related to and reflected in the place-framing process. Internally, it involves competition among community members with different interests, positionalities, perceptions of the place, and visions of its future development. Externally, it unfolds through the dialectics between daily practices in situ and exogenous politico-economic forces or projects that will affect the place in ways that are at odds with the community's collective imaginaries of and visions for a place. From a critical perspective, this external place-making politics concerns "the localization by capital, state and technoscience" and the "subaltern strategies of localization by collective mobilization of citizens" (Escobar 2008: 32).

Both internal and external place-making politics can take place inside and/or outside the political system, for example in elections, local and extra-local struggles or disputes over community affairs, and are often interlinked in organic and surprising ways. A grassroots niche can be a result, a form of leverage, and an arena of these political dynamics, whereas its development requires strategic navigation and engagement with place-making politics across scales.

By examining the development history of the host community, place-framing processes, and place-making politics, the place-centered approach can thus explore the formation and development of grassroots innovations in a geo-historically produced hybrid space and their intra-action with place-based politics along with that with the politics of promoting socio-technical transitions.

1.2.3 Rethinking sustainability: potential dialogues between grassroots innovation studies and critical studies on social change

Scoones et al. (2018) point out two existing broad approaches that can be applied to understand the transformative potential of grassroots collective actions that diverge from the systemic approaches followed by conventional grassroots innovation studies. One approach influenced by a Marxist political economic lens focuses on radical changes in fundamental social, politico-economic structures, yet risks sidelining localized actions and cultural politics. The other draws on insights from both systemic and structural approaches by assuming a process-oriented (rather than outcome-based) focus on "agency and the capacities

of actors to open up opportunities" (ibid: 11). Such 'enabling approaches' that foreground actors' agency, capacities, diversity, and uncertainties in the transformative process are likely to be a better option for unpacking the variant grassroots experiences, motivations, and visions for transformative change.

The place-centered approach is designed in the spirit of enabling approaches. It can facilitate a response to the call for building fruitful dialogues between the systemic approach and structural approaches adopted in critical social studies for social change, such as political ecology and regional studies (Lawhon and Murphy 2011, Truffer and Coenen 2012). Specifically, this can be done by taking into account insights of critical studies in unpacking the underlying politico-economic structures and the transformative politics of 'sustainability'.

Unpacking politico-economic structures

Critical social theories have generated many valuable insights regarding the socio-spatial differentiation and unequal power relations resulting from capitalist industrialization and capital flows that can be applied to understand characteristics of the situatedness of grassroots innovations in a capitalist society, such as those relating to the concept of spatial fix (Harvey 2001), uneven development (Smith, N. 1990 [1984]), and metabolic rift/shift (Foster 1999, 2000, 2013, Moore, J. 2015, 2017). They highlight the need for a historical analysis of general structural forces (Best and Kellner 1991), the foregrounding of the voices of the marginalized, including women, ethnic minorities, and nature, tracing the root causes of the 'unstainable' status quo in the development of industrial capitalism, and demanding structural changes as solutions (Adams 1993, 2001, Arsel and Büscher 2012, Bryant and Bailey 1997, O'Connor 1998, Peet et al. 2011, Redclift 1987, Thrupp 1993).

Following these insights, the primary objective of investigating the development history of a community of place is not just to understand the socio-spatial transformation experienced by a community, but also to unpack the underlying politico-economic structure and forces, such as industrial expansion and state building. In this way, a grassroots innovation can be taken as a response to the consequences (i.e. site-specific concerns) of this historical, broader place-making process, which in turn enables and constrains its development.

I would like to suggest—and will show in Chapter 2—that an understanding of the structural shift toward industrial capitalism in Taiwan and elsewhere is important for studying socio-technical transitions, as such a structural shift entails the reconfiguration of socio-technical systems to facilitate the functioning and expansion of capitalism. Put differently, a socio-technical system is also embedded in a geo-historically produced structure and has evolved alongside

the process with the socio-spatial transformation. This implies that to challenge the systemic lock-in in a certain socio-technical regime, such as a lock-in in a fossil-fuel-dominant energy system in a capitalist society, will involve re-accommodating the underlying structure through a reformist approach or confronting it through a transformative approach.

Expanding the analytic scope on the transformative politics of 'sustainability'

By expanding the analytical scope for studying grassroots innovations to include socio-spatial and structural dimensions, the discussion on 'sustainability' and grassroots innovations' transformative potential can be further developed in at least two ways.

First, this approach helps advance the *epistemology* of 'sustainability' in the sustainability transitions literature, which is surprisingly ambiguous in its elaboration of this highly contested term. Sustainability transitions studies in general seem to follow a pragmatic view of 'sustainability' that places a greater emphasis on workable solutions and actions, such as how a transition occurs and how to manage it, with less attention paid to defining problems and the value systems underlying the incumbent development pathways, such as what makes the status quo 'unsustainable' and what 'sustainability' ought to be. Simply put, the research focus tends to be placed on 'transitions' more than on 'sustainability'. For instance, an often-cited definition refers to sustainability transitions as "long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to a more sustainable mode of production and consumption" (Markard et al. 2012: 956). Without deliberating on what is meant by 'sustainable', this definition bypasses the contestation of the notion as if it were self-evident and somehow automatic (i.e. that 'sustainability' will necessarily follow once a socio-technical transition occurs).

While this ambiguity may be reasonable in formulating a generic description of this inherently heterogeneous research community, it is problematic for studying the discourses on and practices in the name of 'sustainability' in two senses. For one thing, if not carefully reflected on, this line of study risks confining 'sustainability' to a single socio-technical system, thereby overlooking the transsectoral nature and other dimensions of 'sustainability'. For another, this leads to a value relativism that fails to take into account transformative politics in (re)framing 'sustainability' to challenge the hegemony of the capitalist episteme (Springett and Redclift 2015). Divergent attitudes toward industrial capitalism exist in the transitions literature, ranging from a transformative stance that calls for a departure from the capitalist system to a reformative one that enrols it as part of the solution (van den Bergh et al. 2011). From a critical perspective, this makes room for neoliberal co-optation of 'sustainability transitions', as in the

case of the mainstream conceptualization of 'sustainable development' over the past three decades (Bryant and Bailey 1997, Arsel and Büscher 2012).

Have that said, this thesis is not arguing for a concrete, one-size-fits-all definition of 'sustainability', which has proven futile and problematic in the case of 'sustainable development' (Fowke and Prasad 1996, Kates et al. 2005, Redclift 1987, Springett and Redclift 2015). The preferred solution to "ambiguities around 'sustainability'", in Stirling's (2011: 85) words, "lies not in avoiding (inevitable) ambiguity and contention in 'placing' concreteness, but in deliberate, pluralistic reflection over conditions and implications." This implies maintaining the discursivity of the term by taking it as a "site of political context" (Springett and Redclift 2015: 20), whereby epistemological emancipations can occur through engaging grassroots discourses and practices in relation to specific contexts that are alternative to the pro-capitalist conceptualizations of 'sustainability' and 'sustainable development' (Escobar 2012, Watts, M. and Peet 1996, McMichael 2010, McMichael and Morarji 2010, Scoones 2016).

This provides another reason for adopting a relational place-centered approach that investigates what grassroots actors talk and do about 'sustainability' in their context. For instance, one can examine how a grassroots innovation is envisioned and designed in accordance with the grassroots visions for 'sustainability', and how the experiences and consequences of existing development pathways are interpreted in the place-frames for mobilizing community members to engage in the grassroots innovation. Moreover, grounding these 'alternative' discourses and practices of 'sustainability' can also help avoid a romanticized, binary framing of their complex interrelations with capitalist systems (Escobar 1992b, Forsyth 2004, McCarthy 2002, Rangan 2004), which even in the neoliberal form involves variegated manifestations with diverse effects to actors with different positionalities (Castree 2008).

The second way that a place-based approach can enrich the analysis of transformative politics is by expanding the *action repertoire* by taking into account other forms of place-based activism along with grassroots innovations. Although some attention has been paid to alternative technology movements (e.g. the pro-renewable energy movement) (Smith 2016, Smith et al. 2014), grassroots innovation scholars thus far have engaged little with other forms of collective action beyond the studied socio-technical system, such as struggles against air pollution and the indigenous rights movement, even though the connection has been suggested (Smith and Ely 2015). By contrast, critical scholars on 'alternatives' to modernist, industrial capitalism and developmentalism have combined grassroots innovations with defensive actions in pursuit of social change (Castree et al. 2010, Escobar 2012, Moore, J. 2015, Watts, M. 1993). As Escobar (1998: 74-75) summarizes,

> the construction of alternative production paradigms, political orders, and sustainability are sides of the same process, and this process is advanced in part through the cultural politics of social movements and communities in the defense of their modes of nature/culture.

From a critical perspective, grassroots innovations are one form of the organic assemblages of civil society that could evolve from/to and interconnects with other forms of assemblages at various scales (local, regional, national, global) and with varying characteristics (e.g. defensive, proactive) whenever the grassroots actors see fit to meet their circumstances and agendas. This opens up space for investigating the links between grassroots innovations and other forms of collective action that occur in the same place and that address the same site-specific needs and ends. Chances are that these forms of civic collective action may not exist concurrently or sequentially in every case and that their interrelations are likely to be non-linear and complex. Yet, in cases where grassroots innovations and critical struggles are two sides of the same coin, it becomes problematic to bypass critical struggles that shed light on site-specific concerns, or to study grassroots innovations in isolation where transformative politics is a major research focus.

Here, again, place provides a promising entry point into such broad, yet more critical 'transition studies', which, following Escobar (2012), refers to the research of practices and discourses of innovative initiatives, social movements, and academia that resist devastating socio-ecological consequences of the Western-centric, capitalist development pathways, often in localized ways.[7] As he suggests, "rootedness in particular places" is not only essential for the functioning of these 'alternative' practices (e.g. agroecology) (Escobar 2008: 99); it is also important for recognizing grassroots actors' agency who, even when marginalized in capitalist economic systems, maintain their subjectivity in the processes of place-making and generating change. As such, a place-centered approach can help foster a dialogue between critical studies on various forms of place-based activism for social change to advance a more holistic, grounded understanding of grassroots innovations' contribution to the transformative politics of 'sustainability'.

[7] While inspired by this critical line of 'transition studies', this thesis does not aim to study grassroots innovations in Taiwan from the perspectives of postdevelopment, alternatives to development, or degrowth, which—inspiring as they are—have emerged from very different geo-historical contexts. Instead, my focus is to understand the rationales and practices of grassroots actors in carrying out these initiatives in relation to the country's modernization and industrialization processes, which can sever as the basis for a meaningful dialogue between Taiwanese experiences and the 'transition discourses' elsewhere (Escobar 2015) in the future.

1.3 Research questions and objectives

This research is a grassroots innovation study bringing to the fore site-specific concerns and place-based politics—the key elements identified in the conceptualization of grassroots innovations, yet those remaining largely underexplored in conventional grassroots innovation studies that follow a sector-orientated, decontextualized approach.

Consequently, I first ask a basic question: *How do grassroots innovations take place on the ground?* Analytically, I will look at (1) what motivates grassroots actors to initiate a community-based grassroots innovation in a specific place, (2) what the development history of the community is that gives rise to these motivations and objectives, and (3) how networked politics within and beyond the community of place plays out in making the place and co-evolves with grassroots innovations. These questions seek to unpack the ways in which a grassroots niche as a hybrid space is created and maintained in a concrete place.

Second, I examine *the transformative potential of grassroots innovations* in socio-technical, socio-spatial and structural terms by asking how 'sustainable development' or 'sustainability' are interpreted by grassroots actors who conduct grassroots innovations in relation to geo-historically produced concerns, along with other place-based activisms (if any). This question aims to link transformative politics in both their discursive and material forms by assuming a bottom-up, grounded perspective, asking what grassroots actors talk and do about 'sustainability' in relation to their contexts.

By answering these questions, the original contribution of this research to grassroots innovation studies is threefold. First, it offers a more holistic, bottom-up way of studying grassroots innovations by unpacking the roles of geo-historically produced concerns, place-framing, place identities, and politics in the mobilization and development of community-based initiatives, thereby joining the call for a geographical turn in transitions theory. Second, it brings in the socio-spatial and structural dimensions of 'sustainability' to grassroots innovation studies by drawing on insights from critical social studies on industrial capitalism and social change. Finally, it enriches the discourse and action repertoire of 'sustainability' with what grassroots actors talk about and do by emphasizing their agency and subjectivity in place-making embodied by grassroots innovations and other place-based collective actions.

In summary, this research offers an enabling approach for the study of grassroots innovations that geo-historically contextualizes and politicizes their formation and development. In so doing, it seeks to advance dialogue between systemic approaches adopted in conventional grassroots innovation studies for promoting socio-technical transitions and structural approaches adopted in critical studies on grassroots activism for radical social change.

1.4 Methodology

This research follows an ethnographic approach that allows a researcher to merge with the lifeworld of the grassroots actors in a specific place. Through observation and communication, a researcher can learn more about the opinions, concerns, visions, and social relations in and of a community in natural settings, and can participate in their place-making activities when circumstances permit. It is important to disclose that I was not trained as an anthropologist, but see myself as a political ecologist in the making who applied ethnographic methods while retaining a focus on place-making politics instead of producing ethnographies of the host communities of the studied grassroots innovations. Also, the limited time spent in the field and my being a member of the society I studied led thereto that, all in all, I spent less time with each community than that recommended for standard ethnographic studies.

The relational ontology underlying the place-centered analytical framework guided the ways in which the data were produced and analysed. Following insights from feminist political ecologists (Neely and Nguse 2015), a relational ontology stresses that the properties of actors, both human or non-human, cannot be pre-classified, nor are they static, but instead are relational in the sense that they are "historically contingent and geographically situated outcomes of association, relations between beings" that change from context to context (Sundberg 2011: 322). It rejects the traditional relations between the researcher and the 'researched', in which the former is framed as equipped with the (falsely assumed) omniscient 'objectivity' of scientific knowledge to extract data from the passive, externalized object of study (Haraway 1988). Instead, it celebrates the partial knowledge situated in specific life experiences and viewpoints of different actors. Such situated knowledge is not 'discovered' but is co-produced through a 'conversation' between research participants and the researcher (ibid.: 593). Reflections on my relational positionalities formed through intra-action with people encountered during the fieldwork and how it changed during the research process were carried out in producing, interpreting, and presenting the data (see below).

1.4.1 Fieldwork dynamics

Taiwan provides a valuable chance to study grassroots niches as hybrid spaces. Like other newly industrialized countries, the condensed processes of modernization, industrialization, and urbanization along with several dramatic political changes over the course of the past century have resulted in a very complex society, which can be seen as made up of a constellation of residuals of indigenous and Chinese migrant cultures, local articulations of Western capitalist socio-political systems, and unique challenges related to global politico-economic

dynamics and geopolitics (Chang, K.S. 2010, Huang C. 2010a). By drawing on three cases in Taiwan, this research contributes to grassroots innovation studies through empirical insights formulated from research in the less-explored East Asian context.

As a native Taiwanese, I had easy access to the research sites and first-hand knowledge of the general context, which greatly eased the data generation process. Before I outline important fieldwork dynamics, it is necessary to point out that the thesis has evolved, with two major changes having been made (Figure 1.1). The initial research design followed the sector-oriented approach of conventional grassroots innovation studies, focusing on the opportunities and challenges of civil society in facilitating energy and agri-food transitions. Three cases of grassroots innovations were selected based on the criteria for a case-oriented comparative analysis (Della Porta 2008), namely, their accessibility, representativeness, and relevance to the research focus and hypothesis. Two famous cases of agri-food grassroots innovation associated with the land justice movement in Wanbao Village (灣寶里) and Hsichou Township (溪州鄉), respectively, and one pioneering community-based energy grassroots innovation associated with the anti-nuclear movement in the Taromak tribe (達魯瑪克部落) were thus selected. Emphasis was placed both on the grassroots innovations at the niche level and the oppositional social movements that challenge the incumbent regimes, as well as on their combined transformative potential. Soon after the fieldwork started, however, I realized that this framework would not sufficiently capture the complexity and dynamics of grassroots innovations on the ground. Several considerable changes were then made.

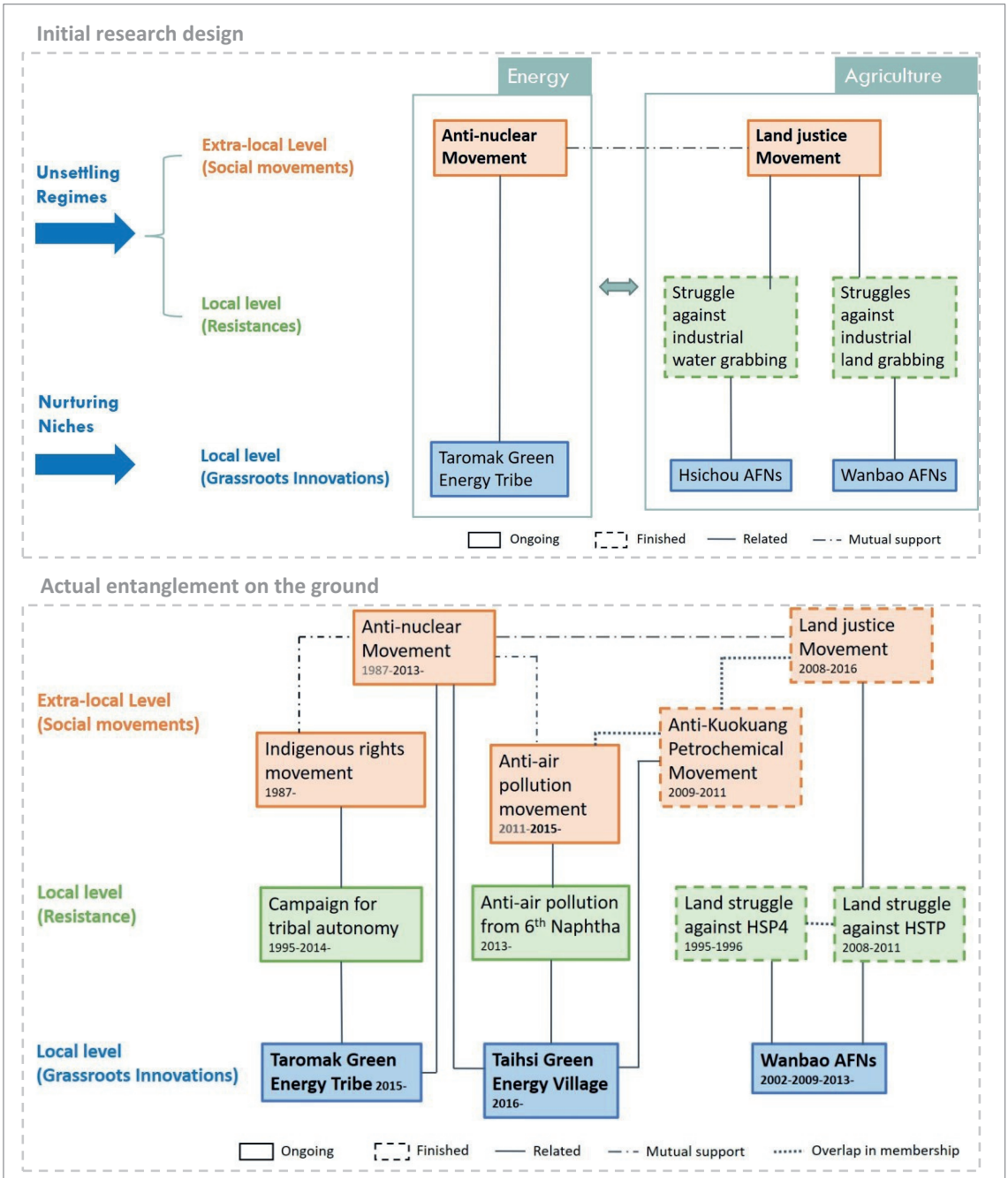


Figure 1.1: The evolution of the research scope. The mapping of the actual entanglement of various activisms across levels is not an exhausted presentation and serves mainly to illustrate the complex and organic networks of collective actions unfolding in reality, which defy sector-oriented simplification.

The first major change concerns the shift in the analytical framework and focus. The need to shift to an approach that is more sensitive to local contexts and grassroots actors' subjectivity in conducting grassroots innovations became clear to me after spending a few months in the field. Apart from the discrepancy between the theory-informed research design and grounded grassroots experiences, which I will describe later on, this decision was in part inspired by the observation of an active member of the Taromak tribe, who told me what he thought of environmental activists who brought the CE project to this indigenous community and were 'outsiders' like I was:

> If you come to the place with good intentions that are more than what local people need, your good deeds become a burden to them, because you didn't see things from their perspective […] Many people have very strong sympathy, but little empathy […] Empathy involves your presence, knowledge, and a true understanding of the place, which is not to be achieved in one or two days.

This feedback taught me that viewing grassroots innovations from a grassroots perspective is vital not only for building a more reciprocal, balanced 'researcher-researched' relationship and for producing data that are more pertinent and accurate to the grounded experiences; it is also essential for avoiding the imposition of colonial and authoritarian ideologies that ignore the grassroots actors' subjectivity in defining their past, present, and future and violates their sense of place. As this research will show, this is at the core of the injustice posed by external politico-economic forces the host communities have suffered from and fought against. Unpacking their stories-so-far and site-specific needs thus became an ethical requirement for conducting anti-oppressive studies as much as an analytical tool for studying grassroots innovations.

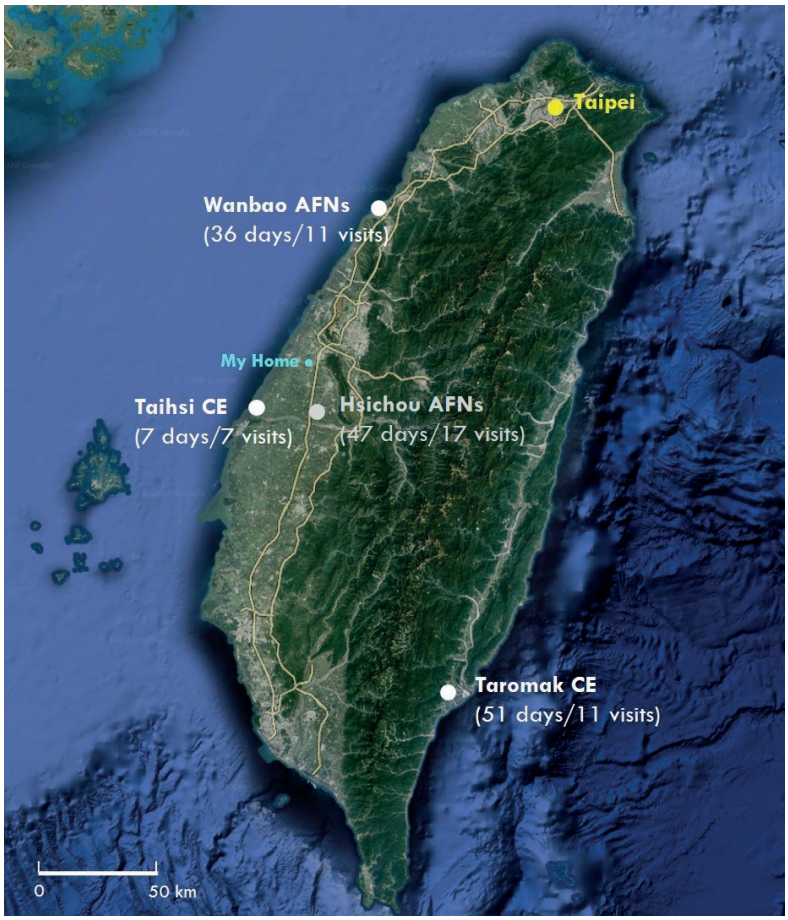
This realization prompted me to draw inspiration from relational, place-related research in the fields of political ecology and human geography and to focus mainly on the three cases of grassroots innovations while expanding this focus to community dynamics beyond the studied socio-technical systems. In this sense, the proposed place-centered enabling approach was a result of my dialogues with the grassroots actors and on-site observations, in addition to my understanding of transition theories and critical social studies.

Another major change involves to the cases included in the thesis. The CE project in Taihsi Village (台西村) that took place four months after the fieldwork had commenced and matched the abovementioned selection criteria was included as one more case of an energy-related grassroots innovation. At a later stage of the research, I left out the agri-food grassroots innovation in Hsichou Township in the thesis due to limited space and time; I will nevertheless write

a paper based on this case for publication in a journal in the near future. I removed this case partly because of its scale difference from other three cases (all at village level) and partly because of its similarity to the Wanbao case (both concerning rural communities resisting industrial resource grabbing). As the latter already comprised three agri-food grassroots initiatives, the impact of this move on the balance between cases should be acceptable. I omitted the fieldwork experiences in the Hischou research site in the following fieldwork overview.

Fieldwork overview

The fieldwork took place over a period of 11 months from July 21st, 2016 to June 18th, 2017 supplemented by three annual post-fieldwork visits to each research site in the following three years. To cover the development of all the cases, I divided the fieldwork period into several event-driven short visits (usually of around one week, varied in accordance with the progress in data generation) staggered over four research sites, Taipei, and my home (Map 1.1). This arrangement was intended to strike a balance between the significant geographical distance between the sites, the limited time available, and the patterns the studied grassroots innovations followed. For instance, the CE initiatives in Taromak and Taihsi might have shown some visible progress every month to a few months, depending on the changing schedules of leading local actors and the external facilitators.



Map 1.1: A map of the main fieldwork sites. The total number of days spent at and visits to each site indicated on the map include both the main fieldwork period and three annual follow-up visits. Compiled by the author based on Google Earth images.

This arrangement proved effective in several ways. First, it allowed me to attend most of the significant events related to these grassroots innovations and other community-wide events in the host communities across the fieldwork period. Second, it helped me build and maintain relationships with the grassroots actors by increasing the frequency of the visits and being present at each site every one or two months, which according to the social norm in rural Taiwan helped decrease social distance. Third, it also helped to justify my presence in the communities (e.g. in the name of attending events, although I would stay

a bit longer before and after the event) and to minimize the potential inconvenience that my stay might have caused to local hosts who shared their living spaces with me. As Taipei is on the way to and from the Taromak tribe in eastern Taiwan, I stayed a few days in the capital city before and after visiting the tribe, when I collected most secondary data, attended relevant activities, such as the annual anti-nuclear demonstration, and conducted interviews with Taipei-based officials, experts, business actors, and activists. My post-fieldwork visits from 2018 to 2020 coincided with the Lunar New Year holiday, which offered me a good opportunity to visit these research sites with some gifts from the Netherlands to maintain the relationship with key grassroots actors and to get the update on the progress of the grassroots innovations.

I started my fieldwork journey in July 2016, first going to the Taromak tribe in eastern Taiwan, where I attended the first green energy camp forming part of its CE project that was organized a few weeks after my dissertation design seminar took place in the Netherlands. Unlike the other sites, which I had visited or gotten to known beforehand, I here had to establish new connections and build a trust relationship between myself and community members. The green energy camp, co-held by key community actors and environmental activists, served as a good opportunity to introduce myself to the community as someone sympathetic to their cause and attending both in my private capacity and in my capacity as journalist reporting the event for an online environmental media platform and as a Netherlands-based PhD student. I identified key internal and external actors engaging in the project at the event, with whom I conducted the first round of interviews. Seizing the opportunity during this visit, I also sought guidance for conducting research in this indigenous community from two scholars who had built long-term relationships with leading local actors, as well as the general advice of an acquainted professor on Taiwan's indigenous studies employed at a nearby university. This equipped me with the basic knowledge of the socio-political dynamics in this community, as well as the know-how to approach key community members that paved the way for the following visits.

During the first visit, I was able to find two places to stay in the community. As the tribe is located around 10 km away from Taitung City, with only four buses per day between them, living in the community granted me more flexibility and time to proceed with the ethnographic investigation. Given the short duration of the stay and uncertainty about the dates of my visits, renting a house or room was not a cost-effective option. Thus, I first stayed in a local B&B that accommodated the participants of the green energy camp and was run by a middle-aged woman who had left the tribe at an early age for work and had returned to the community only recently. As is commonplace in rural and indigenous communities in Taiwan, she acted more like she was a family member

of mine (e.g. aunty), than as a landlady, and shared with me her food, life stories, thoughts about community affairs, and some gossip about local elites and neighbors that helped me understand the community from an insider's perspective. Her personal networks helped me access some interview candidates distanced from the community's political arena, which helped diversify the data feeding into my analysis.

To save money and learn more about the indigenous culture, during the following visits I stayed in the home of a young cultural revivalist while keeping personal ties with the former host. Like other foreign backpackers his family received from time to time, I offered to help in his mother's restaurant serving Taromak indigenous cuisine and with other activities in exchange for free accommodation. Through participating in these activities and observing grassroots actors' participation in other community-wide projects and extra-local indigenous campaigns, I was able to compare their participation and devotion to indigenous cultural restoration to their involvement in the CE project. This accommodation arrangement did not impede my relations with other community members with different political views in any obvious way, given that it was common for outsiders to stay in the community, and given that interpersonal ties in this small community remain strong regardless of political differences.

The first three visits to Taromak corresponded with the three green energy camps. It was during these camps that I realized that my research design did not match the reality on the ground: The CE project had not yet gotten off the ground in a significant way in terms of energy transitions at both the local and national levels, but there were plenty of fascinating community activities and political dynamics beyond the research scope at play on the ground. Moreover, grassroots actors carried out these cultural and political activities with great enthusiasm, confidence, capability, and community energy, while this was less the case for the CE project. It was clear that energy transitions at the local and national levels were not prioritized as much as were the campaigns for indigenous rights and the organization of other community affairs.

Instead of considering their devotion to other community issues as disappointing disturbances or negligible distractions, I took it as a welcome inspiration for improving the research. Along with the search for a more appropriate analytical framework, I expanded the scope of my empirical fieldwork beyond issues related to the energy system. I permitted myself to follow the cues that emerged and stood out in the field, and took seriously the life stories of the grassroots actors, histories (oral or documented) of the community of place, and divergent community-wide events and activities randomly capturing my attention or recommended by community members that may not be directly related to the studied grassroots innovations, yet are important for grasping the

needs, concerns, and socio-political networks of the community, such as the preparation meetings and press conference for self-declaring traditional territory and church activities. Although this significantly increased the workload and was accompanied by a considerable amount of time spent searching for a new approach and trouble finding one, I strove to keep the fieldwork manageable by narrowing down the research focus from both the social movements and grassroots innovations to the latter's formation and development in a specific place.

This methodological change was then applied in my study of the other grassroots innovations. Accessing other sites in western Taiwan was easier to do from a socio-cultural and geographical perspective. For one thing, I had been familiar with these cases through my previous participation in various environmental and agrarian movements between 2009 and 2012, including the land justice movement that was associated with the two agri-food grassroots innovations and the movement against the Kuokuang petrochemical complex sited close to Taihsi Village. By attending workshops, forums, protests, and mass demonstrations in these places and in Taipei as a volunteer and citizen journalist, I was equipped with basic knowledge of the discourses, contexts, networks, and leading actors/organizations in these activisms, which helped me navigate the field, earn the trust of leading grassroots actors, and better understand the stories they shared. For another, my own life experiences of living in a semi-rural township in western Taiwan with a family background similar to many of those of the grassroots actors I encountered at these sites helped me relate to their stories and build positive interpersonal ties. Moreover, many leading actors had prior experience being interviewed by journalists or graduate students, which increased their readiness to accept my request to interview them and conducting my research in their communities.

Before approaching Wanbao Village in northwestern Taiwan, I sought the advice of a friend who wrote an award-winning book on the community's land struggles about the do's and don'ts of approaching leading grassroots actors. With her recommendation, I conducted interviews with two key actors during my first visit and secured accommodation in this rural community for the following visits. My host was a woman in her fifties who is a member of the studied joint farming team, living alone in a house at just five minutes' walking distance from her sister's place, who led this agri-food initiative. I repaid their hospitality in the form of free accommodation, food, and trust through my company and work on the farm as a volunteer, with tasks including harvesting sweet potatoes as early as five a.m., weeding, and helping cultivate sweet potatoes, daikon, and watermelons. This allowed me to obtain first-hand knowledge of the way in which the agri-food initiative operated through close family ties and networks in and beyond the community, as well as the embodied

knowledge of this rural lifeworld by living, working, and eating with them. The joint farming team, their close friends and neighbors were the main source of information, who well represented the voices of the self-help group participating in the second land struggle. With their help, I was able to interview some senior members in the community who had led the first land struggle in the 1990s and managed to interview some key external facilitators who visited them during my stay.

The downside of this arrangement was that I had little opportunity to approach community members who took a different position in the land struggles. As there were no big community-wide events or obvious political dynamics at play during the fieldwork period, to identify and access these people for interviews would likely require considerable additional effort and time. As the thesis focus was on the grassroots innovations, which they did not participate in nor act against, I was happy to rely on secondary data from related research and some local informants to address this gap, while focusing more on the differences between actors carrying out the grassroots innovations. In particular, I managed to interview several internal and external actors who had left the second agri-food initiative after some form of a disagreement between them and key local actors. This was made possible partly through my own relationship with activists in the environmental and agrarian movements, which allowed me to balance and triangulate the stories by engaging different perspectives.

Unlike other cases, my visits to Taihsi Village started in the middle of the fieldwork period and did not involve overnight stays in the community. This was partly because the project was still in its infancy, with few activities to participate in and requiring an overnight stay, and partly because it was only around an hour-and-a-half by bus from my home to the village. As few people in the community at that time were engaged in the project, with participation limited to the initiator, her parents, her brother, the village head, and some close friends and relatives, I focused on building relations with this small group of actors who were also the main actors in the local campaigns against petrochemical pollution and often served as the guides or gatekeepers for external actors, including government agencies, journalists, scholars, and representatives of non-governmental organizations (NGOs), to engage local residents in their projects—I met two of them during the visits and subsequently interviewed them for my research.

From these key local actors, I was able to get an overview of the socio-political conditions, economic activities, and environmental changes of this place; I was also able to identify key external facilitators through four one-day visits during the fieldwork period. Also here, the downside of this singular source of local information (albeit some different opinions among these leading

actors) was the absence of the voices of other community members in the research. As identifying and approaching those who distanced themselves from community-wide activities and the leading local actors' networks would not be an easy task and would likely require time and energy beyond my capacity to offer, I decided to rely on the information provided by key local actors, triangulating it with that from external facilitators and secondary data.

As territorial bonds are a key element of social relations in rural Taiwan, the place identity I shared with these grassroots actors (as residents of Changhua County) created a sense of connection and mutual understanding that was not experienced at the other two research sites, which compensated for the shorter time spent on staying in this community. For instance, I only needed to mention my township when introducing myself and could perceive that they immediately knew how to position me based on their knowledge of my hometown. This geographical affinity and shared life experiences also equipped me with some tacit, 'insider' knowledge of the socio-economic and political contexts at the county level that facilitated our conversations. Similar effects were produced through my acquaintance with several social movements in this region and activists that are also familiar to the key local actors.

The main challenge I encountered at this research site, similar to those in Taromak, was the lack of progress the CE project had made and the uncertainty surrounding it. As most progress and local political dynamics occurred after the main fieldwork visits, I managed to stay updated about any new developments by following leading actors on social media and conducting several follow-up interviews during the post-fieldwork visits and remotely by using communication software.

1.4.2 Methods and sources of knowledge

The main unit of inquiry for the study is the intra-action between a community of place and a grassroots innovation at both discursive and material levels or, put differently, the place-making process and politics whereby a grassroots niche emerges and develops. Such a process can unfold in and beyond a specific place where the community is located through dynamic networks between different community members and with relevant campaigns, lobbying, and social movements at multiple scales and locations (i.e. internal and external place-making politics). I employed a qualitative research approach, using a combination of methods that comprised primarily the collection of secondary data, semi-structured in-depth interviews and participatory observation to capture the development histories, site-specific concerns, place-framing, and political dynamics unfolding in and around the host communities.

First, I collected secondary data regarding three broad categories of information: campaign materials, existing studies of the sites, and key literature on the general politico-economic trajectories emerging alongside the capitalist development of the country. The campaign materials included reports, press releases, pamphlets, and websites of key social movements and grassroots campaigns including both grassroots struggles and innovation that the host communities have engaged in and/or initiated. They form the main part of the texts that were subjected to a discourse analysis to clarify the ways in which community members collectively framed the place for their socio-political ends, the site-specific concerns and objectives that were highlighted in the place-frames, and how these needs and ends were linked with grassroots innovations.

Also, I consulted research on the development history of each host community, including government publications and academic work on regional histories and development to establish a basic knowledge base essential for comprehending the place-frames and challenges facing these communities. To situate these places in the broader politico-economic processes of the country's structural shift toward industrial capitalism, I conducted a multi-disciplinary literature review that included literature from fields ranging from physical and human geographies, anthropology, history, sociology and political economy to development studies, with a special focus on the period after 1895 when Taiwan was incorporated into a modern state for the first time. Besides shedding lights on the geo-historical trajectories that have co-shaped the current conditions of the host communities, this literature has also helped contextualize the evolution of the energy and agricultural sectors in Taiwan so as to understand the structural challenges of socio-technical systems transitions.

Most of the secondary data collection took place during the fieldwork period at two libraries in Taipei: the National Central Library, home to the most comprehensive collection of domestic publications and postgraduate theses, and the National Taiwan University Library, the first and a leading university library established during the Japanese colonial period to which I have easy access as an alumna of the university. Additional attention was given to studies of several themes closely related to the key issues in each case, such as the dramatic transformation of indigenous societies in the processes of colonization and modernization (for Taromak CE), the evolution of agricultural and land policies and controversies over land expropriation (for Wanbao AFNs), and the development of the petrochemical industry in Taiwan (for Taihsi CE). Alongside the thesis-writing process, I also collected supplementary data during the three annual post-fieldwork visits.

Second, to obtain situated knowledges of the community, place, and grassroots innovations, I conducted 127 semi-structured in-depth interviews with 93 interviewees, lasting on average 1 hour and 23 minutes, with questions based

on three broad themes:[8] personal life stories and relations with the place, participation in grassroots innovations and other relevant forms of activism, and perceptions of 'sustainability/sustainable development'. The selection of interviewees was guided by their proximity to the research focus (e.g. their level of participation in the grassroots innovations) and by site-specific circumstances (e.g. other concurrent, important community-wide events) through snowballing and convenience sampling techniques. I initiated all interviews by briefly introducing the study before obtaining written or oral consent to carry out the interviews, which were mostly audio recorded with permission from the interviewees.

To create a comfortable atmosphere that encouraged the free expression of thoughts, most interviews were relatively informal, for example taking place through chats, and were conducted in the language that suited informants best and at a location and time convenient for them, for example in their living rooms. I tried to engage as a non-judgmental, attentive listener who interrupted them only when necessary, for example when needing clarification, for time management, and to nudge the conversation back toward the main themes by asking specific questions.[9] While this would not guarantee that they would disclose their stories and opinions to a near-stranger without reservation, the omissions, hesitation, emotions, and selection of stories they decided to impart were in themselves valuable, helping me to delineate the value systems, socio-political networks, and the interviewees' positionalities in and beyond the community. In addition, informal conversations with them on other occasions, random opinions of other community members who visited the informants during the interviews and joined the conversations, and occasional invitations from various community members for me to join their gatherings also provided me with valuable, often more diversified 'insider' information about the community, in-

[8] I conducted a total of 172 interviews with 131 interviewees, with an average length of 1 hour and 20 minutes each, including those related to the Hsichou case, during and after the fieldwork period.

[9] All the indigenous informants could speak Mandarin, and even more fluently at that than the informants in rural communities in western Taiwan owing to the modernization process. They sometimes switched to the Taromak language in the tribal meetings and in daily conversations, which I did not seek translation for unless this was offered voluntarily, as they were not directly relevant to the research or were deemed by the speakers as issues need to keep private. By contrast, many old farmers in western Taiwan could speak and understand only Taiwanese, which is the most-used language in rural areas. I understand Taiwanese, but do not speak it fluently. Thus, at these research sites, interviews were carried out either in Mandarin (e.g. with younger community members), in more than one language, or, for a small number of interviewees, entirely in Taiwanese—sometimes with the facilitation of other informants who were present. I translated all the quotes cited in this thesis into English by myself.

ternal politics, and views of these grassroots innovations. I transcribed key interviews for a close analysis and triangulated them with other interviews, documents, and observations.

To obtain a comprehensive picture seen from multiple angles, I interviewed a variety of actors as much as circumstances permitted; these included key figures of grassroots initiatives, other community members with differing levels of participation, external experts (in government agencies, the private sector and academia), and activists engaging in relevant social movements and campaigns. For the latter, I was able to identify and interview key actors by drawing on my own knowledge and networks built through my participation in relevant environmental and agrarian movements.

Take Taromak's case for instance: I interviewed 22 community members ranging from 22 to 71 years of age, of both main genders, with different levels of participation, and from all main religious and ethnic groups found in the village. While I paid more attention to key actors in cultural revitalization efforts who led the CE project, the voices of their political rivals in the community were also included, who were surprisingly willing to be interviewed. In this sense, the political competition within the community, although a sensitive issue to navigate, helped me—an outsider with no political or economic interest in the competition between them—access different opinions and belief systems in the community. To complement the grassroots voices, I interviewed 19 actors from anti-nuclear and pro-energy-transition NGOs, indigenous rights activists, and other external facilitators, such as solar energy companies and a legislator.

Third, I employed participant observation to investigate the practices and observe the meetings of grassroots actors and those of movement activists, some of which were audio recorded and for the most part documented in a detailed research diary during or soon after the fieldwork. This allowed me to observe first-hand discourse formation, negotiation, and coalition building in the place-making politics and civic campaigns for socio-technical transitions, as well as how grassroots initiatives were carried out in relation to these internal and external political dynamics on the ground.

By living and working with key grassroots actors, I was able to obtain the embodied knowledges of the studied places, ranging from physical features (climate, topography), socio-cultural landscapes (space allocation and community-wide events), people-environment relations (agricultural activities), lifestyles (local food and social life) to intricate social relations (kinships and interpersonal interaction). This helped me relate to grassroots actors' life experiences and better comprehend their place-framings emotionally and intellectually. The relations with key grassroots actors built through the fieldwork also allowed me

to access conversations and activities that took place in more private spaces, offering an 'insider' perspective.

Besides the research sites, I also conducted participant observation in relevant social movements and at activist gatherings, especially the campaigns for civic participation in energy transitions during the course of the research.[10] I had made acquaintance with several key environmental activists and non-governmental organizations in the advocacy for CE and energy transitions through participating in the annual anti-nuclear demonstrations that have taken place since 2011, conducting graduate research in 2013 on the post-Fukushima anti-nuclear movement in Taiwan, pledging monthly donations to leading NGOs, and reporting on global energy issues as an independent journalist since 2015. This allowed me to access some internal meetings of these organizations, whereby I obtained first-hand knowledge by observing their interactions and strategy-making efforts for collective actions and policy lobbying.

1.4.3 Ethical consideration and reflections

Brown and Strega (2005) stress the ethical and analytical importance of revealing and reflecting on one's positionality and relations with the people and groups engaged with in the process of knowledge creation when conducting a critical, anti-oppressive study for and with disadvantaged communities. For Sundberg (2014, 2015), this entails that researchers do 'homework' (in addition to 'fieldwork') to situate themselves in the field, unlearn the Eurocentric assumptions on which their academic training is based, examine relationships with the informants, and engage in their struggles for a better world. For me, a PhD researcher conducting research with people from a similar background in my home country, the fieldwork itself to a large extent was 'homework' and a

[10] By contrast, there seemed to be few significant, organized campaigns for agricultural transitions in this period of time. The land justice movement had declined after the weakening of the leading civic organization, Taiwan Rural Front (TRF) since 2016 for many reasons, as interviews showed. These include: declining social momentum after party alternation in 2016; several key actors' exit of the organization for various reasons (e.g. illness, value differences); the limited capacity of the TRF overwhelmed by growing cases of land struggles across the country; disagreements among TRF members over priority setting; and the dwindling participation of student members over time, who started to work and raise families and became less available. Consequently, while land struggles across the country continued after 2016, organized social movement against land expropriation has dwindled and was led by other organizations who placed less emphasis on the agricultural and rural sector. The TRF still existed and participated in some agricultural and rural campaigns, albeit with much smaller momentum and visibility than it used to have. Nevertheless, many TRF associated agri-food initiatives continue, and many actors still work to promoting more socio-ecologically just agricultural and rural development through engaging in different positions and activities in the agricultural sector.

continuation of my previous involvement in various environmental and agrarian movements with or related to the host communities. The challenge for me was not how to 'connect' with the people and issues in the field, but how to 'detach' myself from them.

This was especially true for the cases that were cultural and spatially close to my home. While my familiarity with the lifeworlds of the people living in these places was a great help in proceeding with the fieldwork, it also made the fieldwork complex, as personal emotions and feelings deriving from my experiences of living in a similar rural setting interfered somewhat. Like some informants, since my youth I also feared 'getting stuck' in my hometown and yearned to leave for places with more resources and opportunities. This research brought me back to the place where I grew up and to this sentiment, and forced me to face the unpleasant aspects of rural life in Taiwan that had driven me away. This inner struggle was at play during and after the fieldwork, and living in the Netherlands offered a way out: I could still focus on issues in my homeland (which I did not enjoy, but could not ignore), but I could do so at a physical distance (which gave me a sense of freedom and escape). Similarly, I had to keep reminding myself to step outside my lived-knowledge of these places (i.e. my own place-frame formed before conducting the research). Paradoxically, the Eurocentric model used in my academic training helped me maintain a psychological distance to see things that I had taken for granted with fresh eyes and an open mind.

Besides adjusting my relationships with the studied places by switching between the double role of insider/native and outsider/researcher, another challenge I encountered in the field concerns my relations with the people and communities I engaged with in my research. From a relational perspective, researcher positionalities are not fixed, but relational, being situated in and becoming with the entanglement of social relations in and beyond the fieldwork (Neely and Nguse 2015). My double identity as a PhD student based in the Netherlands and as a single, thirty-something woman from a middle-class, semi-rural background who belongs to the majority population group in Taiwan (i.e. Han islanders whose ancestors migrated to the island before the Japanese colonial period) indeed gave me some privilege to access more resources inside and outside the country. This included the opportunity to present the research findings at international conferences based on the stories of the host communities who did not have the chance to do so themselves. But this did not necessarily put me in a superior, exploitative position vis-à-vis the communities whilst carrying out the fieldwork.

For instance, I could feel that several indigenous informants took pride in enlightening me—an ignorant, non-indigenous PhD student—about the com-

munity. In these cases, my presence and curiosity about their stories were welcomed as an acknowledgement of their importance and the fame of the community. Indeed, I seldom had the upper hand in the power relations with the informants in the field. Socio-culturally, as a member of the society, I was expected to abide by Taiwan's social norms, such as showing respect as a young visitor to elders and my hosts, which put me in a lower position than that of my informants who were mostly older than me. Some of them would give me advice about how to live my life, such as urging me to get married, which in turn gave me valuable insight into their value systems.

Economically, while my status as student dependent on scholarships cast me in a positive light, as this made me appear to be a good student, it also put me in an economically inferior position in their eyes, as I was without stable income. Some of them would thus insist on doing me a favor by offering free meals, which put me in debt according to the social reciprocity norm in rural Taiwan (i.e. *renqing)* (for more information about the social norm, see Hwang K. 1987). Indeed, I found myself in a dependence relationship with the host communities: I would not have been able to generate data if they had rejected my presence in the community and requests for interviews. They did not need me, but I could not do without them. In this sense, the information generated from our intra-action was not a resource extracted or exploited from the 'researched', but a gift from the informants that entails my responsibility to repay the favor.

Thus, in contrast to the common assumption about the socio-economic superiority of a researcher in studying marginalized communities, the ethical challenges I encountered were quite the opposite: How could I remain critical of the individuals and groups whom I relied on to carry out the study? What could I do to repay the favor I received from them? My answer to the first question was trying my best to be faithful to the triangulated information and presenting sensitive information in a neutral, abstract manner that could avoid causing trouble to those involved while allowing me to focus on the theoretical contributions of their experiences. Thus, I kept all informants anonymous in the thesis, except for two famous actors in the Wanbao case who were named partly to honor their contributions and partly to facilitate the discussion.

For the second question, I sought advice from an indigenous informant whose critical comments on external help was cited above. His answer became my guidance: I would do whatever was in my power to meet the needs of the communities. To me, this meant trying my best to complete the work assigned by my hosts, sharing gifts from the Netherlands with them, reporting on the activities held by the community to boost the visibility of their campaigns, remaining respectful to their subjectivity over their stories and the knowledge they kindly shared with me, and producing a high-quality thesis and papers in a

way that could convey their voices faithfully and facilitate their site-specific struggles. The last point is what I tried to do with the rest of the chapters.

1.5 Chapter overview

This is an article-based dissertation; the empirical chapters (Chapters 3 to 5) are based on three single-authored papers either published in or under review for publication in three separate journals. To avoid repetition and to improve the coherence of the thesis, I have made some modifications to the content of the papers for each of the empirical chapters. The changes are detailed in the prologues of each of these chapters. I would like to add that this research is not a study of the current systemic changes in the energy and agricultural sectors that seem to have taken place in Taiwan, nor does it presume 'sustainability' will be the expected outcome. Instead, it aims to provide a nuanced understanding of grassroots actors' engagement in what is seemingly the start of energy and agricultural transitions that will affect Taiwan's future development. Similarly, this research does not attempt to make a general claim that all grassroots innovations are linked to social movements or place-based struggles; rather, it hopes to illuminate the often-neglected, yet meaningful connections between these instances of collective action for comprehending 'sustainability'.

To demonstrate the efficacy of the place-centered enabling approach, the rest of the thesis is structured as follows: Chapter 2 traces the development history of Taiwan—the broader community of place—that sets the stage for the grassroots innovations here studied. Instead of providing an introduction of the geo-historical context in a chronological manner, it aims to unpack the socio-spatial differentiation across the country and the socio-technical transitions in the agricultural and energy sectors driven by a state-led structural shift towards industrial capitalism over the past century. It is followed by three empirical chapters on three instances of grassroots innovations that are all highly relevant to the campaigns and social movements in challenging a specific socio-technical system (i.e. energy or agriculture) and in resisting the unequal socio-spatial effects of the processes of modernization and capitalist industrialization, including the violation of indigenous rights, land grabbing, and industrial pollution.

In these empirical chapters, I apply the three analytical constituents of the place-centered enabling approach—the development history of the community, place-framing, and place-making politics—in different ways to capture the site-specific articulation in each case. Chapter 3 discusses the CE project in the Taromak tribe in eastern Taiwan to show that geo-historically produced concerns deserve more scholarly attention regarding their active role in the for-

mation of a grassroots innovation, whose development is entangled with identity politics within the community resulting from the all-round transformation of the indigenous community in the processes of colonization and modernization. Chapter 4 elaborates on the agri-food initiatives in Wanbao Village in northwestern Taiwan and their intra-action with two struggles against industrial land grabbing to demonstrate the shared structural lock-in of the fossil fuel-intensive agri-food regime and the marginalization of rural space. Chapter 5 explores how the CE initiative in Taihsi Village in central Taiwan emerged with the community's campaign against unjust environmental harms related to the petrochemical industry, and how the CE advocates' priority of promoting civic participation in energy transitions could impede grassroots actors' pursuit of environmental justice through the grassroots innovation. It emphasizes the ethical importance of place sensitivity in knowledge production processes and policymaking, especially in the case of disadvantaged communities. Finally, Chapter 6 provides a synergetic discussion regarding the research questions and the intersection of the socio-systemic and the socio-spatial domains. It concludes with some reflections and implications for future research to rethink 'sustainability/sustainable development' and potential transformative pathways.

2 Socio-Spatial Transformations, Socio-Technical Transitions, and the Structural Shift Toward Industrial Capitalism

2.1 Introduction

As a place is a unique, ever-shifting "coming together" of numerous socio-politico-economic processes stretching beyond a single locale (Massey 2005: 141), Taiwan as a modern capitalist country can be viewed as an on-going product and producer of geo-historical processes within internal and broader politico-economic trajectories.[11] This chapter provides an overview of Taiwan's development history with a focus on the consolidation of industrial capitalism in the country in the past century. It aims to show that the structural shift toward industrial capitalism has not only resulted in the continuous evolution of socio-technical systems in the agricultural and energy sectors, but also in socio-spatial transformations taking place across the country that have led to divergent development-related challenges in different places. The primary objective is to highlight the structural linkage between these two dimensions—one system-centric and the other place-based—and to demonstrate that studying them in a synergetic way is, first, feasible, and second, crucial for a more holistic understanding of pathways toward 'sustainability'.

In outlining the socio-spatial transformations taking place in Taiwan over the past few centuries, I will focus on the marginalization of rural areas in relation to the rapid industrialization. As Barca and Bridge (2015: 367) suggest, industrial capitalism "is arguably the primary driver of social and spatial differentiation across a range of scales", especially that between country and city. Special attention is thus paid to socio-spatial differentiation in Taiwan after its integration into a modern state in 1895 and the emerging industrial capitalist system that followed. In unpacking the historical socio-technical transitions

[11] The country governs the main island of Taiwan and several isles around it which have different development histories from the former. I refer only to the former in the following discussion.

taking place in agriculture and energy in the industrialization process, I will provide an overview of the evolution of these two sectors in relation to the development of industrial capitalism, briefly introducing the emergence of country-wide niches for alternative practices in recent decades.

Given the limited space, it is not possible—nor is it the aim—to comprehensively discuss Taiwan's development history here. Instead, the core task is to examine and describe the rural transformation that has taken place in just under a century through rapid industrialization in a critical and concise and, hence, inevitably selective and simplistic manner. This is done to reveal the uneven socio-spatial and sectoral development as a result, which in turn gave rise to specific hybrid spaces that co-evolve with grassroots innovations. Likewise, instead of singling out and making the historical transition of an individual socio-technical system the central focus (for instance, see Geels 2002, 2006, Geels et al. 2016, Smith 2006), I wish to demonstrate that they are embedded this structural shift to industrial capitalism along with socio-spatial transformations.

This historical contextualization is important not only for analytical purposes, but also for the need to remain geographically sensitive when engaging with theories that were developed in places with development politics and trajectories different from those in Taiwan. Considered an 'anomaly' in terms of its colonization pathway and an exceptionally successful newly industrialized country (Wade 2018), Taiwan's encounter with industrial capitalism, albeit sharing several features and contexts, likely differs in many ways from countries in the so-called Global South and Global North, where the majority of case studies on sustainability transitions studies and critical transition discourses are found. For instance, instead of the proletarianization and concentration of farmland in the hands of a few colonial elites, as was common in Latin American and African countries, Taiwan's peasants experienced the consolidation of the family smallholding agriculture under Japanese colonial rule (Ka 1989, 1991, 1995a, 2006). Similarly, owing to its unique geopolitical position and limited material resources, Taiwan in the initial stage of its post-war industrialization process was immune to the intervention of powerful transnational corporations that have been criticized for producing devastating socio-economic consequences in other developing countries (Gold 1986). A relational approach is thus important for understanding the specific experiences of and consequences for a country in engaging with global geo-historical processes such as colonialization and industrialization.

I begin by briefly summarizing the shift in pre-capitalist geo-historical contexts since the early seventeenth century, followed by an overview of the "agrarian origins of industrialization" (Watts, M. and Goodman 1997: 16) under colonial rule and the rapid process of capitalist industrialization led by the

developmental state, with a focus on agrarian changes and post-war agriculture-industry structural asymmetry (Byres 1995). I then explore the socio-spatial transformation and differentiation alongside the transition to industrial capitalism, showing that rapid urbanization over the past century has been accompanied by the marginalization of the agricultural and rural sector that poses multiple development challenges for rural areas. Last, I discuss the socio-technical transitions occurring in the agri-food and electricity systems that were enabled and sustained by capitalist industrialization. In accordance with the nature of the grassroots innovations considered in this thesis, I will focus, on the one hand, on the chemical-intensive, industrialized, smallholder farming regime that emerged in the 1970s and the nationwide environmentally friendly farming niche emerging a decade later; and on the other hand, on the evolution of the electricity system in the early twentieth century and the nationwide renewable energy niche expanding together with the post-Fukushima anti-nuclear movement in the 2010s. I argue that the *systemic* lock-in resulting in the reliance on fossil-fuel intensive agricultural and energy practices is intrinsically intertwined with the *structural* lock-in resulting from industrial capitalism, giving rise to multiple rural development challenges.

2.2 The emergence of sedentary agriculture and early encounters with the global capitalist system (1624-1895)

The current status of Taiwan as a modern capitalist country can be viewed as the result of its encounter with various regional and global politico-economic powers and activities over the past few centuries (Huang, C. 2010b, Hwang, J. and Wang 2010, Tsai, M. 2010). Various Austronesian tribal groups scattered across the island may have formed part of Southeast Asian trade networks (Jacobs 2016) as early as 5000 BC.[12] Taiwan (at that time known as Formosa by Westerners) in the seventeenth century became a stopover point along the busy East Asian and Southeast Asian trading route. Indigenous tribes bartered deer meat and deer hides with pirates and merchants/dealers from Fujian, Japan, Ryukyu, and other places in Southeast Asia for piece goods, salts, iron, and other products (Chiu, H.H. 2012, Jacobs 2016, Shepherd 2016).

Taiwan first became swept up in the great wave of global capital accumulation when the Dutch East India Company (*Vereenigde Oostindische Compagnie*, VOC) in seeking direct trade with China established the first colonial settlement

[12] 'Austronesian' refers to a family of languages spoken by indigenous peoples in Southeast Asia, Oceania, and Madagascar. According to some archeological evidence, it is likely that people migrated from Taiwan to these areas starting at around 1500 BC (ibid.).

between 1624 and 1662 in southwestern Taiwan.[13] Serving as the VOC's trading station for East Asia, Taiwan became the hub for imports and exports of silk and gold from China, silver from Japan, and spices and fabric from Southeast Asia (Blussé 1996, Lin, W. 2005). By incorporating indigenous tribes into the trading systems through tribute and franchise systems and issuing licenses to hunters from China to hunt on indigenous land, the VOC managed to monopolize Taiwanese deerskin exports, with deerskin exported to Japan for use in Samurai armors and other products (Cheng, W.C. 2017, Lin, W. 2005, Kang 2005, Koo 2011, Wu, T. 2008).

At the same time, sedentary agriculture emerged at the Dutch settlements on the island. The VOC introduced commercial farming practices centered on cash crops such as sugar and indigo and systematically recruited Han settlers from southeastern China to work on these monoculture plantations (Tseng, P. 2006, 2007). The sugarcane and rice farms situated on approximately 10,000 *akkers* (9,700 hectares) of land were clustered around Zeelandia, the first city in Taiwan (Liu, Y.H. 2004). Sugar as a lucrative commodity was exported to Persia, Japan, and Batavia, while rice was produced as cheap food source for Chinese migrant workers and Dutch settlers (Tseng, P. 2007).

As a result, Taiwan's encounter with early global capitalism in the form of Dutch commercial capital transformed the landscape in the southwest of the island. With the northward expansion of farmland and creation of a commodity frontier for deer products driven by deerskin exports that could have exceeded 100,000 hides per year, the wild deer population in these areas dropped dramatically, along with the disappearance of several endemic species such as leopards (Lin, W. 2014, Tseng, P. 2007). Replacing the indigenous landscape was a new agroecological configuration of Han farmers, domestic animals, primarily water buffalos, crops that had been imported from Southeast Asia and China, and a few remaining endemic plant and animal species such as bamboo, which co-evolved with the changing socio-ecological system. This self-sustaining farming system, based on agricultural practices from China and mixed with the commercial production of cash crops, was further consolidated when small-scale farms came to dominate the landscape after the expulsion of the VOC by the Kingdom of Tungning in 1662. This landscape remained relatively unchanged for the next two centuries (Tseng, P. 2006, 2007).[14]

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[13] Spain colonized a few places in northern Taiwan two years after the VOC first set foot on the island, but was expelled by the Dutch in 1642. Given the small spatial and temporal scale of the Spanish occupation, I omit it in this discussion.

[14] The Kingdom of Tungning, also called Zhen Family Kingdom, was part of the royalist movement of Han people seeking to restore the Ming Dynasty formerly ruling mainland China that was overthrown by the Qing Dynasty established by the Manchu people in the mid-seventeenth century. The kingdom only ruled western Taiwan, especially those southwestern areas that had

Taiwan moved beyond the reach of Western capital accumulation when the Kingdom of Tungning was defeated by the Qing Empire in 1684. Seen as a potential site for rebel bases, it was passively integrated into the political and economic orbit of the Qing Empire through careful trade and migration controls (Shepherd 2016). With the loosening of migration controls in the late-eighteenth century in response to increased population pressure along the southeast coast of China that led to an increasing demand for Taiwan's agricultural products (Chen, H.T. 2009, Tseng, P. 2006, Wen 1983), the population of Han settlers jumped from less than 100,000 in 1683—numbering slightly less than the total indigenous population—to approximately 2.3 million settlers in a matter of two centuries (Liu, Y.H. 2004, Shepherd 2016). Likewise, the total cultivated land increased 33-fold to nearly 600,000 hectares between the late-seventeenth century and the late-nineteenth century (Liu, T. 1995). Several settler communities were established on the basis of kinship and geographical affinity of their hometowns in mainland China, while a few port towns emerged through trade with port towns in southeastern China (Liu, Y.H. 2004, Liu, P. and Tung 2003).

Advances in agriculture, enabled by larger and more effective irrigation systems constructed by the settlers in central and northwestern Taiwan, significantly increased the production of rice and accelerated the assimilation of indigenous communities on the plains (the Pingpu peoples) into Han-based socio-economy (Wang, S. 1994). For instance, thanks to the largest irrigation system on the island at that time, Changhua Plain in the early eighteenth century was transformed from an area dotted with sugarcane farms and indigenous deer hunting grounds into the main hub of rice farming (Ku 2000, Su, J. 2001, Wen 1983). Despite some fierce conflicts, the outnumbered Pingpu tribes were gradually integrated into the Han-based society through intermarriage, the agriculturalization of their lifestyle, land tenure arrangements, and military cooperation with the Qing authorities in pacifying the internal conflicts among Han settlers and in countering the mountainous indigenous tribes who remained outside state control (Liou 2015, Shepherd 2016). The agricultural advancement also resulted in the commercialization of rice, which after 1726 became the main export commodity shipped to mainland China, along with sugar, in exchange for clothing, porcelain, and other daily necessities (Lin, M. 1997).

The regional division of labor between Taiwan and mainland China changed in the 1860s, when four ports in southern and northern Taiwan were opened to Western capital following the Second Opium War (1858-1860). Taiwan once again was integrated into the global capitalist system, this time as a peripheral

been developed by the VOC. Under its rule, sugar and deerskin exports continued through trade with the British East India Company and Japan.

force exporting primary agricultural products, especially sugar, tea, and camphor, mostly to European countries and the United States (Huang, C. 2010b, Lin, M. 1997).[15] The Western merchants, mostly from the United Kingdom, the United States, and Germany, secured these agricultural products through credit offerings to farmers, who repaid loans and interests with their harvests. Greater surpluses were accumulated from the locals by reselling imported higher-value products such as metals, cotton textiles, and kerosene.

Consequently, the natural vegetation of the low-lying hills of central and northern Taiwan was replaced by tea trees, other crops, as well as Taiwan acacia trees serving as fuel source to meet the increasing energy demand from tea processing activities and household use by a growing population (Tseng, P. 2006). With the rapid development of tea exports and camphor trade, northern Taiwan became the new economic and political center of the island, whereby Taipei, now Taiwan's capital city, emerged in this area, becoming one of the biggest cities (Lin, M. 1997, Liu, Y.H. 2004, Liu, P. and Tung 2003). The competition between Western merchants, local gentries, and local authorities for camphor's windfall profits also led to more aggressive measures by the latter to 'pacify raw barbarians' residing in the mountains.[16]

When Japan conquered Taiwan after the First Sino-Japanese War (1894-1895), it encountered an island with a vast market-oriented, price-sensitive agricultural population occupying most of the arable land in western Taiwan, along with quite a few indigenous tribes in the east that fiercely resisted the expansion of the state space and the camphor commodity frontier into their territories.

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[15] These three commodities made up nearly 94% of Taiwan's total exports between 1868 and 1895 (Lin, M. 1997). Soon after its introduction to Taiwan by an American merchant from Fujian in the mid-1860s, tea became the primary export, with its volume increasing 100-fold in the 26 years following 1866 (Lin, M. 1997, Tseng, P. 2006). Over 90% of tea products were exported to the United States, with the rest exported to the United Kingdom and countries in Southeast Asia. Sugar was now also exported to Australia, Western Europe, North America and South America, as well as to China and Japan. Camphor was a particularly attractive and lucrative commodity for Western merchants, not only because it was an ingredient for many products, such as medicine, celluloid, ballistite, and new types of films, but also because Taiwan along with Japan was the only natural habitat of camphor trees (Lin, M. 1997, Tu, C. 2011). Taiwan's camphor products dominated the world market before 1877 and after 1892 and were exported mainly to Germany, the United Kingdom, France, the United States, and India.

[16] 'Raw barbarians' refers to indigenous peoples who remained outside the rule of the Qing Empire (Scott 2009). By contrast, indigenous tribes who were integrated into the 'state space', such as the Pingpu peoples, were called 'cooked barbarians'.

2.3 Capitalist industrialization and the asymmetrical agriculture-industry power structure (1895-)

According to Byres (1995), capitalist industrialization requires the state's efforts in enabling the processes of capital accumulation in rural areas for industrial development, whose consequent transformation in turn conditions the ways, forms, and results of industrialization in a specific geo-historical context. This section explores agriculture-industry dialectics that have been occurring alongside the state-led structural transition toward industrial capitalism since 1895. It first discusses the ways in which a modern colonial state transformed Taiwan's agricultural and rural sector with the introduction of Japanese sugar capital to support industrial development in Japan. It then discusses the process of capitalist industrialization in post-war Taiwan and the accompanied agrarian transformation. It will show that capitalist industrialization in Taiwan not only has an agrarian origin, but has also expanded through the ongoing exploitation and appropriation of the agricultural and rural sector.

2.3.1 Colonization, modernization, and agrarian change under Japanese colonial rule (1895-1945)

Since scientific statecraft and colonial power often pave the way for capitalist accumulation (Moore, J. 2015), the capitalist economic system in Taiwan was established through the island's incorporation into the politico-economic entanglement of imperial powers in the late nineteenth century (Huang, C. 2010b). While the encounter with Western imperial powers had prompted the Qing Dynasty authorities to tentatively introduce a few small-scale modernization projects in and near Taipei, such as railways and electric lighting, it was not until Taiwan became the first colony of Japan in 1895 that it started being systematically transformed into a capitalist society characterized by modern infrastructure and institutions.

Japan was considered an example of 'premature imperialism'—a former victim of Western imperialism eager to build an industrial capitalist system and a modern state of its own (Yanaihara 2014 [1929]). Taiwan's modernization and capitalization under Japanese rule was to a large extent carried out in pursuit of this objective under the leadership of a strong colonial government (Gold 1986, Huang, C. 2010a, 2010b, Tu, Z. 1993 [1975], Yanaihara 2014 [1929]). The colonial government in the first decade of its rule first conducted a series of island-wide scientific investigations into the socio-material and demographic conditions on the island, which were translated into charts, figures, maps, and statistics informing colonial governance. This paved the way for the establishment of a favorable investment climate for Japanese capital in the following decade, made possible by unifying and standardizing a system of weights, measures, and

currency in accordance with the Japanese system, erecting modern infrastructure such as railways, ports, irrigation systems, and telephone lines, developing human capital through public education, and introducing banking and rural credit systems to replace pre-capitalist usury operated by local landlords. This conjoined social, economic, and technological transformation was enabled by strong political control in the form of a modern police system and its appropriation of Taiwan's traditional community organizations. With these 'infrastructures of capitalism' in place at the beginning of the twentieth century (Yanaihara 2014 [1929], Tu, Z. 1993 [1975]), the colonial government was able to assume unprecedented control of Taiwan and establish the first island-wide market in its history.

The colonial state-led capitalization and modernization project was also conditioned by the socio-economic context formed prior to Japanese rule of the island, however. On an island where the lion's share of arable land had been turned into labor-intensive small-scale family farms on which two-thirds of its population resided and worked, a transition to large-scale plantations managed by wage labor was not only politically risky, but also inefficient from an economic perspective (Huang, S.H. 2010, Ishikawa et al. 2012, Ka 1991, 1995a, 2006, Nakamura 2010, Tu, Z. 1993 [1975]). Consequently, the colonial government utilized, and in so doing preserved and restructured, the pre-capitalist land tenure system to further its aims (Ka 1989, 1991, 1995a, 2006).[17] Land reforms in plain areas launched in 1905 led to the successful establishment of a modern legal base for land as private property, whereby small-scale family farms were protected as the major unit of agricultural production (ibid.).[18]

Along with the decline of the local landlord class, the colonial government consolidated its politico-economic power over peasants and peasant farming, whereby the "land, resources, *and soil* [were] robbed to support the industrialization of the colonizing countr[y]" (Foster 1999: 384, emphasis in original).

[17] The traditional double-tier landownership system comprised three social groups (Ka 1995a, 2006): the *ta-tsu-hu* (registered landholders), the *hsiao-tsu-hu* (*de facto* landholders), and tenants. '*Ta-tsu-hu*' refers to wealthy families or mainland merchants who obtained land reclamation permits from and paid land taxes to the Qing authorities. With limited initial investments in land reclamation, they then leased the land to settler peasants who paid rent in exchange for heritable and permanent land use rights. Many of them became *hsiao-tsu-hu* after several generations, sub-leasing the land to latecomers and less-advantaged peasant migrants. The colonial land reform confirmed the *hsiao-tsu-hu* as *the* legal landowners and taxpayers by cancelling the right to land of the *ta-tsu-hu*, who received government bonds as compensation.

[18] In 1921, 51.7% of farmland in Taiwan with a farm size less of than three *akkers* (around 2.91 hectares) belonged to rural households, comprising 88% of total rural households on the island. By contrast, less than 11% of the total farmland was owned by or leased to large sugar companies between 1925 and 1935, of which around 50% or 60% was converted to capital-intensive plantations (ibid.).

Embedded in the Japan-centered regional division of labor, Taiwan became a source of cheap food, particularly rice, and raw materials, particularly sugar, used to sustain the cheap labor force for industrial development in Japan, as well as the market for Japan's industrial products, especially metals and machinery (Ishikawa et al. 2012, Ka 1995a, 2006, Huang, C. 2010b).[19]

Given the relative scarcity of uncultivated land for capitalist expansion, the colonial government focused on improving land productivity by promoting a modern, science-based agricultural system with the help of government-monitored farmers' associations (Matsuda 2012, Park 2010). This included upgrading and expanding irrigation systems, establishing research institutions specializing in agricultural sciences and agronomics, investing in the improvement and standardization of agricultural product variety, and introducing intensive farming technologies, such as chemical fertilizers, mostly imported from Japan. Consequently, the amount of irrigated land almost tripled between 1904 and 1943, enabling two crop seasons per year (Tu, Z. 1993 [1975]) and a two-fold increase in the total rice output between 1905 and 1939 (Ka 1995a, 2006, Teng 2003).

Japanese sugar capital also spearheaded the socio-technical transition in the agricultural sector. Encouraged by the economic prosperity in Japan following the Russo-Japanese War (1904-1905) and the lavish profits guaranteed by several policy measures, several Japanese *zaibatsu* (financial conglomerates), especially Mitsubishi, Mitsui, and Fujiyama, set up sugar companies and large-scale modern sugar refineries in Taiwan in the late 1900s. The Japanese sugar cartel came to dominate Taiwan's prosperous sugar production and export industry within a matter of years. They accumulated windfall profits by creating a state-facilitated monopoly of Taiwan's sugarcane market, whereby the sugarcane price was kept low and decoupled from the soaring sugar price in the Japanese market (Ka 1989, 1991, 1995a, 2006). To maximize the profits, they offered sugarcane farmers loans and subsidies for cultivating varieties of improved quality while investing in irrigation systems to boost production. Consequently, the land productivity of sugarcane family farms increased 2.37 times between 1917 and 1940.

In the process, as Ka (ibid.) has suggested, small-scale farming in Taiwan was reshaped by and incorporated into the capitalist system not through the commodification of the labor of smallholder farmers, but rather through their

[19] Other motivations for this regional division of labor included the pressure to decrease the colony's financial dependence on the colonizing country, and to help Japan reach self-sufficiency in rice and sugar production so as to reduce its massive foreign exchange deficits (Hori 2010).

increased specialization in production practices and the further commodification of the farmers' products. As food processing was the key arena for capital accumulation, farmers' participation in this capitalist agricultural system was confined to crop production, leaving crop processing to specialized small-scale rice mills run by Taiwanese capital or big modern sugar refineries held by Japanese capital that replaced most local sugar mills after the 1910s (Ka 2006, Nakamura 2010, Tu, Z. 1993 [1975], Yanaihara 2014 [1929]). In response to exploitation by the colonial state and Japanese capital, smallholder farmers actively utilized all possible means available to them, along with careful cost-benefit calculations, to improve land productivity and their livelihoods, such as the strategic selection of profitable varieties of crops and the mixed usage of chemical fertilizers and manure (Ka 1995a, 2006, Nakajima 2012, Oomameuda 2012). Seizing the market opportunity created by the surging food demand linked to Japan's rapid industrialization and urbanization, they rushed to produce *Ponlai* rice (a more profitable, yet more capital-intensive variety of *Japonica* rice) introduced to the farmers in 1925, leading to the gradual replacement of endemic *Indica* rice by *Ponlai* rice.

Consequently, the income and living standard of rice farmers significantly improved in the 1920s and 1930s at the expense of the profits of Japanese rice farmers and sugar capital (for details, see Ka 1995a, 2006). This prompted them to sell most of the rice products on the market and purchase cheap food and modern agricultural inputs from the market to increase rice production. The growing dependence on the monetary system and market competition deepened their integration into the capitalist economic system. Meanwhile, the introduction of a state rice monopoly in 1939 to repress local rice capital formed by the landlord class further consolidated a modern, family-run smallholder farming system that was tightly integrated into the capitalist market system and under state control (Ka 1989, 1995a, 2006).

In parallel with the ongoing processes of agricultural modernization and agronomic transformation in western Taiwan, the colonial government launched a policy on forestry and camphor management in 1895, whereby almost all of the indigenous land was nationalized to prevent unauthorized activities related to camphor production (Fujii 2001, Yen, A. and Cheng, T. 2012). The 'frontier guard line' was drawn based on a so-called 'savage border' set by the Qing authorities, allowing the population, resources, and commodity flows to become closely controlled under a modern police system. It symbolized the modernist Nature/Society divide (Moore, J. 2015): the indigenous peoples confined in the 'savage area' were treated as part of an externalized 'Nature' to be 'civilized' by forcing the agriculturalization of indigenous communities and by introducing primary education in the Japanese language and lifestyle.

For improved management, scientific surveys of land and resources in the mountainous regions were carried out after 1910, followed by the introduction of the Forest Planning Enterprise in 1925 and follow-up surveys in the 1930s. In so doing, an abstract socio-nature in the form of maps, figures, and statistics produced by scientific measuring techniques, became legible for state control (Scott 1998) of various governance and conservation purposes (Horng 2004, Lee, W. 2001).[20] While the total indigenous reservation area dramatically shrunk by 87.8%, leaving only a fraction of the 'savage land' designated at the early stage of colonial rule (Wu, S.T. 2000), the colonial government preserved indigenous land rights, whereby it tried to transform the indigenous population into disciplined citizens of a modern state by replacing millet-centered slash-and-burn practices with a rice-based sedentary farming system.

As such, Taiwan's experience of capitalist development under colonial rule differed significantly from its counterparts in Latin America and Africa (Gold 1986): instead of being driven off their land onto plantations, the majority of the population—both rural and indigenous—retained a certain means of production and improved their agricultural productivity through state-introduced inputs, knowledge, and the infrastructure of a modern, scientific agricultural system. This colonial modernity was accompanied by the undeniably heavy burden of taxes, debts, socio-political oppression, discrimination, injustice, ongoing resistance, and intense struggles. Yet Taiwanese farmers survived despite the exploitation of Japanese capital not only through self-exploitation of family farms, but also by making use of the capitalist market and modern agricultural technologies (Ka 1989, 1995a, 2006). They were transformed into an agricultural population who had access to the benefits of scientific advancement and market exchange and adapted to state control and supervision. Similarly, the society was reconstructed through modern socio-technical infrastructure, such as legal institutions and a more educated population, which facilitated state-promoted capitalist industrialization in the following decades (Gold 1986).

2.3.2 Post-war capitalist industrialization and its agrarian origins

The origin of industrialization in Taiwan can be traced back to the modernization and capitalization of agriculture. Taiwan's processed food industry was burgeoning by the start of the twentieth century with the introduction of modernized machinery and cheap materials supplied by the local agricultural sector

[20] The facilitation of the accumulation of Japanese capital was a relevant, but not primary objective of the colonial government. Forestry and tropical commercial agriculture headed by big Japanese capital were limited to a few select years in the early twentieth century (encouraged by the colonial state for the purpose of pacifying indigenes) and the last decade of colonial rule (to supply materials for military purposes) (Lee, W. 2001).

(Kim 2010, Yamada 2012). Taiwanese-owned small enterprises pioneered this trend, which included the production of commodities such as sugar, tea, alcohol, and vegetable oil since the Qing period (Ka 2006, Kao, S. 2003). As at the beginning of its rule big Japanese capital was scarce and the need for the colony to become financially independent urgent, the colonial government encouraged the investment of local capital in the renovation of sugar mills with machinery powered by steam motors and petrol engines to boost sugar production. From 1911, the Japanese-dominated sugar industry headed the renovation of the sugar industry, which became the major industry on the island (Hsueh, H. 2006, Tu, Z. 1993 [1975]), making up over 75% of total industrial output value in 1932 (Ka 1995a, 2006).

Japanese sugar capital also played a key role in the industrial turn of Taiwan through the new regional division of labor that was kickstarted in the mid-1930s. Following the shift in Japan to a controlled economy in preparation for war, the colonial government starting in 1935 systematically introduced heavy industries, especially those producing aluminium, machine tools, and industrial chemicals, to support the munitions industry in Japan (Gold 1986, Kao, S. 2003, Yamada 2012). In 1940, around 65% of total industrial capital formation in Taiwan came from the investment of top-eight sugar companies (Hayashi Masuo 1943, cited in Ka 1995a, 2006). Thanks to the processed food industry and a booming munitions industry, industry output value outstripped that of agriculture in 1939 (Hsueh, H. 2006, Yamada 2012).

This early industrialization boom enabled by Japan's military ambition however soon suffered a significant setback when Japan was defeated at the end of the Second World War (WWII). When Taiwan was taken over by the Republic of China (ROC) after the war, nearly 75% of its industries ground to a halt because of the heavy bombardment by the Allied powers of factories and electricity facilities. Soon after its politico-economic ties with Japan were abruptly severed, Taiwan was dragged into the civil war in mainland China. Once again it became a peripheral actor whose resources and food were shipped out to the mainland to fuel the nationalists' (KMT's) war against the communists. This brief chaotic period in the late 1940s, when inflation reached 3000% and a bloody, island-wide suppression of disgruntled crowd (2.28 Incident) rocked the island, led to the disillusionment of many islanders with the nationalist regime, which had replaced the Japanese colonists, occupying most of the important political positions and controlling most key economic resources (Gold 1986).

When ties with mainland China were severed after the nationalist government withdrew to the island in 1949, replaced by an umbilical cord connecting Taiwan to the United States after the outbreak of the Korean War in 1950, a new phase of capitalist industrialization in Taiwan began (Gold 1986, Huang,

C. 2010b, Lu, A. 1995, Tung, A. 1995). In the process, without the engagement of transnational corporations (TNCs), the state became the major capitalist force—a development enabled by the absolute political power bestowed upon it by martial law, numerous assets left by the Japanese, as well as politico-economic support from the United States in the form of military protection, economic advice, trade preference, and aid totalling 1.5 billion USD provided between 1951 and 1965 (Gold 1986, Huang, C. 2010b). The priority of state capitalism was not to maximize capital accumulation, but to reach socio-political stability necessary for the regime's survival and its preparation for the recovery of the territories it had lost.

To this end, the authoritarian government employed an agriculture-industry synergetic development strategy to develop the nascent industrial sector with agricultural surpluses (Kay 2009). It first launched a series of land reforms in the period from 1949 to 1953 to consolidate its rule in rural areas, whereby the ratio of smallholder family farms increased by 19% to 55% for all types of farmers, while land capital was channelled into the development of industry (Gold 1986, Ho, H. 2015, Hsu, S. 2016, Lee, C. 2012). Agricultural productivity rapidly increased owing to policies promoting various cash crops, chemical fertilizers, and other technologies; the aim was both to augment foreign exchange through the exportation of agricultural goods (especially sugar) and to meet the surging food demand resulting from the sudden population increase after 1949.[21] Several systematic measures to nurture industry with agriculture accompanied the rapid advances in agricultural productivity, whereby the agricultural surplus in the form of foreign exchanges, food, materials, and labor was squeezed out and funnelled to industrial development (Lee, T. 1972, see Section 2.4.2). As a result, the state-owned chemical fertilizer industry expanded rapidly, along with the cement industry and cotton textile industry leading import substitution industrialization in the 1950s.

This story of capitalist industrialization in Taiwan is a textbook case of industrialization in developmental states that resulted from the interaction of historical contingencies, Cold War geo-politics, and the global division of labor (Wade 2018, Wang, J. 2003). Specifically, this involved the need for self-sustained development before US aid would cease and a bureaucratic-authoritarian government with a strong capacity to control the socio-political sphere, the financial system, key upstream industries, and private capital. Taking advantage of the integration strategy for Asia of the United States after the outbreak of the Vietnam War (of 1955-1975), the Cultural Revolution in mainland China

[21] In 1945, migrants from mainland China (mainlanders), then governed by the nationalist regime, numbered around two million, whereas islanders and indigenous peoples totalled around six million inhabitants (Liu, P. and Tung 2003).

(of 1966-1976), and industrial upgrading in advanced economies, the nationalist government strategically engaged in international trade to advance industrial development. It attracted foreign capital in the form of direct investments from Japan, the United States, and the Chinese diaspora in labor-intensive industries with low added value, especially those manufacturing textiles and electronic components using a cheap, disciplined, and educated local labor force, as well as through the establishment of the world's first Export Processing Zones in 1966. By shifting to export-oriented industrialization in the mid-1960s, Taiwan entering at the bottom rung of global commodity chains and the international division of labor (Chou, T. 1997).

The industrial structure changed from light industry to heavy industry in the 1970s (Chuang 2016, Kao, S. 2016), when Taiwan's relative advantage of cheap labor was diminished as competition with other emerging developing countries ensued. The politico-economic landscape also underwent a significant reconstruction, including a change in political leadership, two oil crises, and an avalanche of diplomatic setbacks, such as its withdrawal from the United Nations in 1971 and the forging of diplomatic relations with the People's Republic of China (PRC) and Japan in 1972 and the United States in 1979. To secure the regime's survival, newly inaugurated president Chiang Ching-kuo strove to reduce the country's political economic vulnerability by means of industrial restructuring and the strengthening of economic ties with other countries in the place of political ones. Following the advice of US consultants, the government focused on developing capital-intensive heavy industries such as the petrochemical industry to integrate the synthetic textile and plastics industries (see Chapter 5).

To boost the development of the high-tech industry, the first science park was erected in 1980 with policy support and using cheap energy and water, whereby technology-intensive industries, such as those manufacturing computers, telecommunications, precision machine tools, and advanced electronics replaced the textile industry as the leading industry for export goods and the leading manufacturing industry in 1984 (Hsueh, L. 1995). With growing global competition and the rise of neo-protectionist policies in advanced economies in the 1980s, the industrial shift toward export-oriented technology and knowledge-intensive industries continued in the 1990s and thereafter (see Chapter 4), moving from the assembly of electronics to the semiconductor industry and the information and communications technology industry (Chou, K. and Walther 2016). In so doing, Taiwan climbed to a new position in the international division of labor ranks and has been considered a 'high-income

economy' by the World Bank since the 1980s and named an 'advanced economy' by the IMF in 1997.[22]

The politico-economic structure for industrial development changed in the mid-1980s alongside the democratization process, the neoliberal turn in policymaking, and Taiwan's application for participation in the General Agreement on Tariffs and Trade (that would later become the World Trade Organization) in 1994. Alongside the decline of the developmental state, the rising influence of industrial capitalists in policymaking, and the flourishing of socio-political interaction with China, Taiwan's small and medium-sized enterprises (SMEs), which then comprised over 98% of the manufacturing industry and contributed nearly half of its output value, started to invest in and move offshore to Southeast Asia and China in the late 1980s and the 1990s (Chang, H. 2004). This industry relocation to secure a cheaper labor supply and to access the emerging markets in these areas restructured Taiwan's international economic ties. Japan and the United States had been the biggest trade partners of Taiwan after WWII, followed by Europe after 1986 (Cheng, S. 2016). In 2001, China (including Hong Kong) replaced the United States as the largest export destination and became Taiwan's major trade partner in 2016 (30.8% of total trade), followed by the Association of Southeast Asian Nations (ASEAN—15.4%) and Taiwan's three former biggest trade partners (BFT 2017, 2020).

All in all, rapid capitalist industrialization since the 1950s transformed the socio-economic structure of the island from one dominated by an agricultural society to one dominated by industry by the mid-1960s. What ensued were exceptionally high economic growth rates for the next three decades (with a growth rate of over 6% sustained between 1962 and 1994), relatively equitable income distribution, and high social mobility (Gold 1986, Wade 2018).[23] Yet this so-called 'economic miracle' and structural transition toward industrial capitalism in a matter of a few decades gave rise to rapid socio-spatial differentiation, instantiated especially by the divide between cities and the countryside.

[22] Taiwan's per capita income jumped from 154 USD in 1951 to 7,672 USD in 1990 and 21,566 USD in 2017 (DGBAS. 2020). It was one of 13 middle-income countries (out of 101) in the 1960 that eventually reached a 'high-income' level (Wade 2018).

[23] Taiwan had the lowest Gini coefficient (a measure of wealth inequality) in Asia, along with South Korea, between 1965 and 1972, with one of the most rapid income increases among the poorest 40% of the population for less developed countries prior to 1971 (Myers 1984). Its Gini coefficient (by per capita income) was 0.282 in 2014—lower than that of South Korea (0.36)—whereas the ratio of per capita income (top 20% to lowest 20%) was 3.98, around half of that of South Korea (7.37) (DGBAS 2019a).

2.4 Socio-spatial transformations and differentiation

Industrialization triggered a dramatic socio-spatial transformation and socio-spatial differentiation on the island. This section discusses the interrelated processes of rapid urbanization and the marginalization of the agricultural sector that have given rise to multiple concerns for and challenges to rural development.

2.4.1 Urbanization since 1895

The lack of an extensive inland transportation system due to geographical obstacles like rivers and mountains impeded urban development in Taiwan before the twentieth century, with only 8% of the population dwelling in cities in 1875 (Shih, T.F. 1999). Thanks to the establishment of a modern transportation system and the booming sugar industry under colonial rule, the number of towns and cities with a population size of more than 10,000 increased from 11 in 1912 to 27 in 1935, mostly emerging along the railways and main roadways in the west (Liu, P. and Tung 2003). Urbanization visibly increased with the industrial turn in the 1930s, and six cities with a population size of more than 50,000 emerged within the next nine years. Nevertheless, as the colonial economy relied heavily on agriculture and the processed food industry, the colonial government also promoted migration to marginalized land in rural areas across the island for land reclamation, leading to a relatively balanced urban-rural development divide (Liu, P. and Tung 2003, Shih, T.F. 1999).

Urbanization sped up after WWII, transforming Taiwan from a rural society into a highly urbanized country in less than half a century. With most migrants from mainland China settled in cities, the fraction of the population residing in urban areas increased from 10% at the beginning of the twentieth century to around 26% in 1951 (Chen, D. and Jou 2004, Liu, Y.H. 2004, Liu, P. and Tung 2003). The labor-intensive, exported-oriented industries, especially the textile industry, located in industrial complexes in suburban areas, absorbed much of the rural surplus labor in the 1960s. Rapid urbanization continued in the following decades, along with the development of heavy industry in the 1970s and the high-tech industry starting in the 1980s (Figure 2.1). Owing to rapid economic growth and the booming service sector that overtook the industrial sector in terms of employee numbers in 1988 (Figure 2.2), in 1991 nearly 75% of

the total population lived in a total of 88 cities and towns, each with a population size of 50,000 and above.

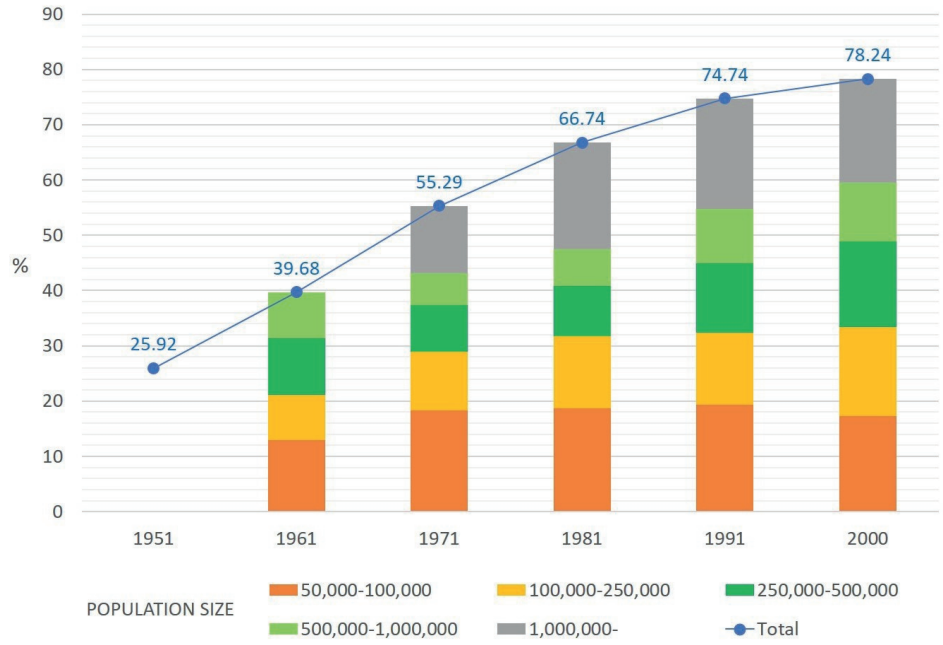

Figure 2.1: The share of the population residing in urban areas in Taiwan between 1951 and 2000, per urban population size. Graph compiled by the author based on the data from Sun, Ching-Shan, cited in Chen, D. and Jou (2004: 38).

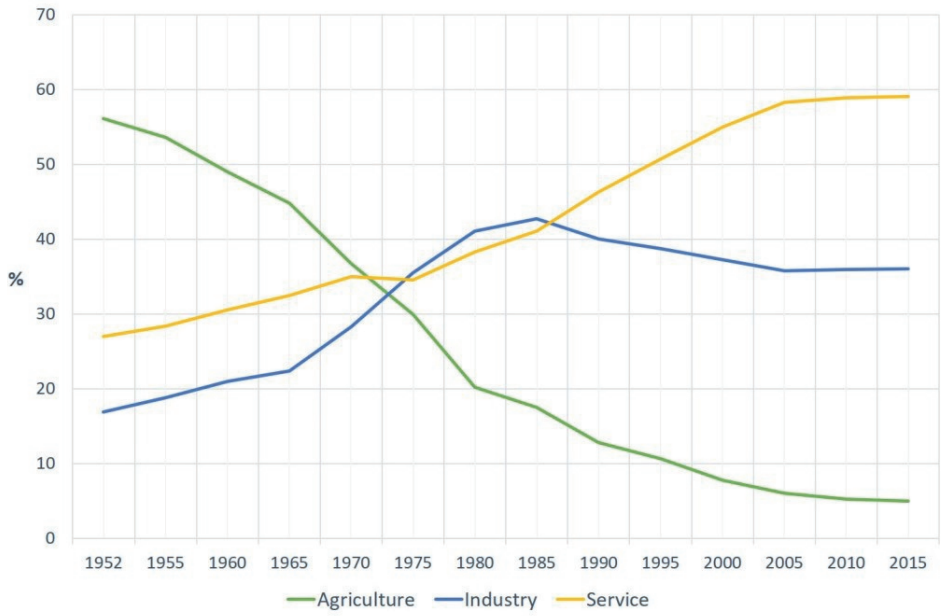

Figure 2.2: The distribution of employed persons across economic sectors, shown in increments of five years. The share of the population employed in the industrial sector in 1973 exceeded that of the population share active in the agricultural sector and was in turn surpassed by the share of persons employed in the service sector in 1988. Graph compiled by the author based on data from Chen, D. and Jou (2004: 55) and NDC (2020).

Unlike 'urban primacy' occurring in many developing countries, whereby the population and resources are concentrated in a few megacities, urban areas in Taiwan, although dominantly located in the west, became relatively evenly distributed (Chen, D. and Jou 2004, Chou, T. 1997, Liu, P. and Tung 2003, Shih, T.F. 1999). Cities that expanded due to a policy promoting industrial complexes in rural areas and in each county for balanced regional development in the 1970s often overlapped with the locations of industrial complexes. The distribution of these complexes, at first concentrated around Taipei and Kaohsiung in northern and southern Taiwan, shifted in the 1960s, with several clusters arising in between these two cities (Chen, D. and Jou 2004, Wu, L. 1990). Consequently, cities of varying sizes cropped up as the economy developed, although several large metropolitan areas, especially Taipei, still attracted more migrants in comparison to other cities as it has been the center for Taiwan's thriving service sector (Shih, T.F. 1999).

2.4.2 The marginalization of agriculture and rural areas

Although decentralized and rural industrialization helped reduce rural poverty (Ho, S. 1979), the socio-spatial differentiation between rural and urban areas started increasing in the 1960s. Despite a dramatic increase in agricultural productivity in the 1950s, by 1962 the gross value of industrial output outstripped that of agricultural output, whereas the share of agriculture as part of the total gross domestic product (GDP) fell from 32.4% in 1951 to less than 2% in 2000, resulting in and from agriculture's marginalized position in the state's economic policies (Figure 2.3).

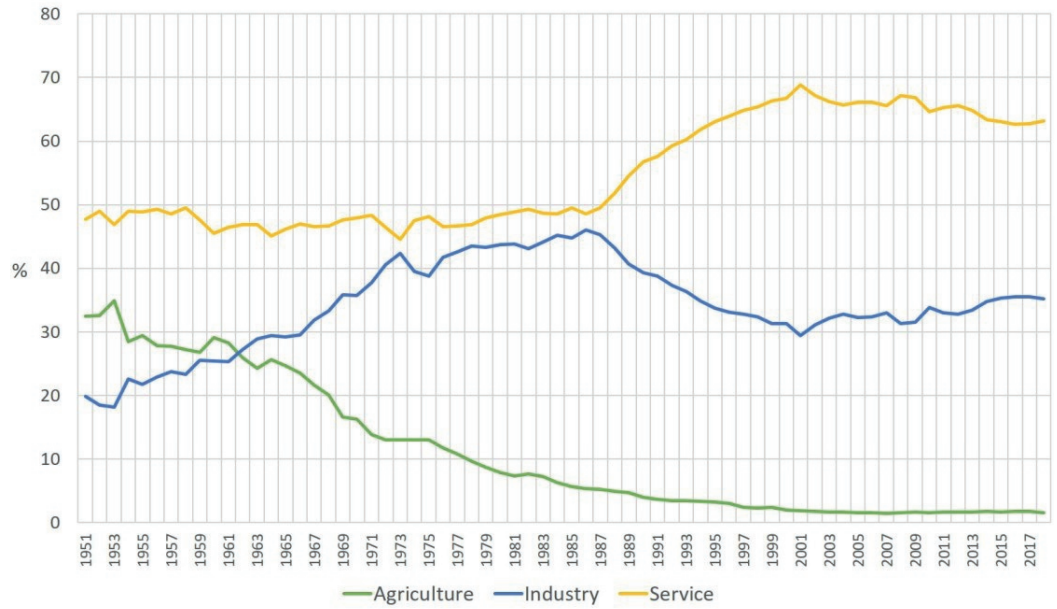

Figure 2.3: The distribution of GDP (at current rates) for Taiwan for the three major economic sectors, 1951-2018. Graph compiled by the author based on data from DGBAS (2020).

This marginalization originated in a structural shift toward industrial capitalism starting in the 1950s, enabled by the state-led extraction of agricultural surpluses to nurture the nascent industrial sector (Chou, K. and Walther 2016, Hsu, S. et al. 2016, Huang, C. 2010b, Lee, T. 1972, Sheu 1992). This included exchange rate controls to appropriate the massive foreign exchange reserve created by sugar and other agricultural exports, heavy taxes, compulsory sales of rice at prices 20% to 40% lower than market prices, and the institution of a

rice-fertilizer barter system under which farmers had to pay for fertilizers sold at abnormally high prices with rice.[24] Consequently, the agricultural sector suffered a net capital outflow to the industrial sector—of as much as 3.34 billion NTD—in the 1950s and 1960s (Chang, H. 2004).

Despite a significant increase in farm household income thanks to economic growth and the productivity boom, the average income of individual farmers in 1966 was a mere 70% of that of non-farmers, dropping to 60% by 1973 (Tung, C. 2012). As agricultural income stagnated and the rural population grew, nearly one million rural surplus laborers left to work in labor-intensive industries in cities and towns in the 1960s to sustain their families in the rural areas (Liao, C.H. and Liao, M. 1979). This signalled the start of a seemingly irreversible trend of a youth population outflow from rural areas in the following decades. Consequently, the share of agricultural employment as part of total employment dropped from 49% to 20.2% from 1960 to 1980, while the proportion of full-time farmers as part of the agricultural population decreased from 47.6% to 8.9% for the same period (Tung, C. 2012). Similarly, the share of agricultural income as part of total farm household income shrank from 65.9% to 45.6% between 1966 and 1973 (Hsieh, M. 2004), revealing the diversification of rural livelihoods that now involved multiple income sources from farming and non-farming activities across sites. Economically, such a survival strategy of farm households "straddle[ed] the rural-urban divide" (Kay 2009: 122) by integrating urban-based capitalist economic activities into a vital part of rural livelihoods (Ka 1995b). However, it also strengthened an epistemic rural-urban divide, namely, the general experience of and belief that agriculture was unprofitable and rural areas backward, and that young people, to build a prosperous, 'successful' life, should leave the countryside to pursue non-farming jobs in cities.

The asymmetrical agriculture-industry relations and the marginalization of rural areas deepened even after agricultural policies in the 1970s prioritized the need to improve rural livelihoods. To boost agricultural income and address labor shortages, the government resorted to further agricultural modernization and capitalization, including cancelling the rice-fertilizer barter system in 1972, replacing the compulsory sale of rice with guaranteed prices for rice and export-oriented crops in 1974, introducing diverse cash crops, and keeping on promoting farmland readjustment to upgrade agricultural infrastructure on fragmented and disadvantaged farmlands. Nevertheless, the per capita disposable

[24] In 1963, the price of urea was 85.2 USD/ton in Taiwan—much higher than that in Japan (58.4 USD/ton), South Korea (65.9 USD/ton), and the United States (60.1 USD/ton) (Lu, A. 1995). Meanwhile, in 1966 the tax paid by farm households was 4.15 times higher than that of non-farm households (Chou, K. and Walther 2016).

income of farmers lagged behind, representing only 80.3% of that of all households in 2014 (COA 2014), whereas the share of agricultural income as part of total farm household income kept on declining, reaching less than 20% in 1993 (Hsieh, M. 2004). Likewise, the agricultural population contracted by 65% between 1978 and 2012, while the average age of those employed in the agricultural sector jumped from 39 in 1977 to 63.5 years old in 2015 (DGBAS 2017, Liao, C.H. and Liao, M. 1979, National University of Kaohsiung 2013).

The unequal rural-urban and agriculture-industry relations gave rise to the unremitting appropriation of farmland in rural areas for the expansion of industrial and urban space (see Chapter 4). As part of its strategy to improve rural income levels, the government encouraged the establishment of the so-called 'living room factories' and backyard factories in the countryside in the early 1970s, whereby rural households were integrated into export-oriented industrial commodity chains, entering at the bottom of the subcontracting ladder (Shieh 1992). Unregistered factories on farmland continued to mushroom after the introduction of spatial planning measures and controls in the 1970s, which in effect reduced the cost of farmland acquisition for industrial purposes while pushing commercial agricultural activities to sensitive ecological areas like mountain slopes (Lee, C. 2012, Tung, C. 2012). Meanwhile, the county governments' reliance on land taxes and land-associated profits (Chen, D. and Jou 1993, Hsu, S. et al. 2016) and the loosened restrictions on farmland ownership and transactions since the late 1990s accelerated the trend of farmland use change. Consequently, 35,237 hectares of agricultural land, mostly prime farmland, was lost to non-agricultural land use between 1977 and 1991 (Mao 1998), and the size doubled (to 77,000 hectares, i.e. 8.7% of agricultural land) in the following two decades (DGBAS 2014) on top of the increase of fallow land.[25]

The incessant infiltration of non-agricultural enclaves in rural areas not only changed the rural landscape, but also degraded agricultural production conditions in many rural areas (Chang, T.K. 2015, EPA 2015). In an island-wide survey of 580,000 hectares of irrigated land (Chang, T.K. 2015), around 15,000 hectares (2.6%) was found to be polluted and 49,000 hectares (8.5% of the land) at threat of heavy metal pollution, mostly by the contaminated wastewater discharged by nearby factories into irrigation channels (Chang, T.K. 2015, Huang,

[25] In 1984, the state launched a series of land-use change policies for paddy fields partly to reduce the financial pressure of 'purchasing rice at a set price' and partly in response to dietary changes that emerged along with economic growth (Lu, A. 1995). An increase in fallow land has been the primary outcome of land-use change, increasing from 5,700 hectares in 1984 to 200,000 hectares in 2002, the year in which Taiwan joined in the WTO (Chen, H.H. et al. 2014). Despite several measures having been introduced to encourage recultivation in recent decades, fallow land acreage remains high, with the rural population growing older and the water supply prioritized for household and industrial use over irrigation during droughts.

C.H. 1994, Hsu, S. 1994). The abuse of rural areas as a sink for industrial waste and as a site of resource grabbing gave rise to the predominantly farmer-/fisher-led environmental protests in the 1970s and early 1980s (Liu, H. 2011).

Nevertheless, industrial exploitation has persisted in the recent decades, not only in the form of unregistered factories that proliferated over the past decade, but also in the form of illegal quarrying activities on farmlands, often accompanied by the onsite dumping of industrial solid waste (Hsu, S. et al. 2016). Moreover, the thriving illegal sale of farmhouses to an urban middle class in less-polluted rural areas near metropolitan areas triggered the inflation of land prices and intensified commodification of farmland in these places (Lin, H.J. 2015, Liu, K. et al. 2015). This reduced farmers' access to farmlands in these agricultural production bases, while increasing their concerns about the loss of prime farmland and contamination of the remaining farmland (Lu, Z. 2015).

The marginalization of rural areas also occurred in eastern Taiwan, despite the fact that it has generally been neglected in Taiwan's post-war industrialization and urbanization (Hsia, L. et al. 2016). Although some level of migration from the west and Japan for land reclamation occurred during the colonial period and in the 1950s and 1960s (Huang, X. and Huang, H.W. 2010, Lin, Y.J. 2007, Zheng 1995), eastern Taiwan remained the least populated and least industrialized region on the island, with only a few industries present in the area, including the food processing industry and the cement industry. Nevertheless, indigenous communities mostly situated in this region experienced a dramatic socio-economic reconstruction after being integrated into the market economy as a result of state policies introduced in the 1960s to improve their livelihood through education, modern lifestyles, and cash crops (Huang, Y.K. 1975a, see Chapter 3). As ethnic minorities that were less familiar with the capitalist market and modern agricultural production practices and with less access to educational and financial resources compared to citizens in the west, the socio-economic status of the indigenous population lagged far behind the national average during the rapid industrialization process (Chiu, H.Y. 1983).[26] Consequently, the indigenous population outflow to cities and towns in western Taiwan, accelerated since the 1970s, with indigenes often taking on dangerous, low-paid, unskilled work such as manual laborers (ibid.).

[26] More than 75% of the indigenous population still worked in the agricultural sector in the 1970s, with much lower productivity rates in comparison to farm households comprising non-indigenous peoples. The average income of an indigenous household was only 29% of that of a non-indigenous farm household and 21% of that of a non-farm household in 1967, which increased to 40% for the former and 29% for the latter in 1978. In 2018, the registered indigenous population totalled around 570,000 (2.4% of the total population) (DOS. 2019).

In parallel, the tourism industry emerged in eastern Taiwan thanks to the rich indigenous culture and the relatively pristine natural environment. In the recent decades, the region attracted numerous tourists, middle-class migrants, and estate investors from the west, as well as several private tourism development projects, raising concerns over and campaigns against the violation of indigenous rights and environmental degradation (Our Island 2013).

Overall, rapid urbanization and industrialization in Taiwan not only consolidated the socio-economic marginalization of the agricultural and rural sector both in western and eastern Taiwan; it also resulted in the creation of a hybridized rural space comprising various economic activities and interests that not only thrived at the cost of agricultural production, but also became one of the greatest structural challenges for rural development (Academic Sinica 2013).

2.5 Socio-technical transitions in the agricultural and energy sectors

As indicated above, the structural shift toward capitalist industrialism also triggered—and was enabled by—radical changes in agricultural and energy production and consumption. This section investigates the evolution of these two with the industrialization process to demonstrate how the socio-technical regimes in the farming and electricity sectors have come into being and what alternative niche innovations at the national level have emerged to drive the transition towards more socio-ecologically benign practices.

2.5.1 The agricultural regime and the emergence of an environmentally friendly farming niche

Previous discussions have shown that state-led agricultural modernization programs in place since the Japanese colonial period to boost agricultural productivity have fundamentally transformed farming practices in Taiwan. Because the expansion of cultivation areas was geo-physically and socio-demographically constrained on this densely populated island, the colonial and nationalist state both relied on technological advances, especially in the form of irrigation systems, chemical inputs, machinery, and crop variety 'improvement', to boost agricultural production in facilitation of industrial development. The subtropical climate, humid weather, and the increasing rural labor cost further popularized the incorporation of chemical inputs and machinery into farming practices. Consequently, the current agricultural system in Taiwan is characterized by heavy reliance on synthetic fertilizers and pesticides, machinery, and a crop monoculture led by smallholder farmers for market exchange purposes (Table 2.1).

Table 2.1: The agricultural management entities in Taiwan in 2015, including those in the crop, fishery, livestock, and forestry sub-sectors.

		Smallholder farming		Farm plantations	
Entire sector	Number of farms	778,930	99.8 %	1,326	0.2 %
	Cultivated land (ha)	539,874	95.6 %	24,983	4.4 %
	Annual revenue (NTD)	333,382,040,000 (~€ 9.75 billion)	90.3 %	35,805,240,000 (~€ 1.05 billion)	9.7 %
Average	Farm size (ha)	0.69		18.84	
	Annual revenue (NTD)	428,000 (~€ 12,520)		24,740,000 (~€ 723,676)	

Note: 25.3% of the total farm households were engaged full-time in farming activities in 2015, while 6.3% with some non-farming incomes and 68.4% with another primary occupation and farming on the side.

Source: DGBAS (2017)

The post-war socio-technical transition in the farming system

Emerging in the early twentieth century and developing as the century passed, modern, capital-intensive, industrialized, science-based agriculture has come to characterize Taiwan's primary farming system since the 1970s. A rural exodus, low crop prices, and a decrease in the cost of chemical fertilizers after the removal of rice-fertilizer barter system in 1972 triggered a drastic increase in the use of chemical inputs in the following decades. It became a convenient, if not necessary, means for smallholder farmers to drive down the costs of agricultural production and retain productivity and profits (Hsieh, M. 2004, Lu, A. 1995). The consumption of chemical fertilizers increased 8.7-fold within a decade from 61.88 kg/ha in 1944, and remained at above 1,000 kg/ha since 1973—a use rate that exceeds that in most Asian countries (Lu, A. 1995). Similarly, the portion of total rice farms using herbicides jumped from 54% in 1974 to 99.8% in 1983 (Teng 2003). With easy access to and the aggressive marketing of these products by local agricultural material suppliers, who acted as the main providers of agronomic knowledge for farmers, the overall consumption of pesticides increased from 9.7 kg/ha in 2001 to 12.4 kg/ha in 2013, outstripping consumption rates of most countries in the world (Wong 2016).[27]

[27] The pesticide consumption in Taiwan in 2013 was lower than that in China (17 kg/ha), but higher than that in Japan (11.9 kg/ha), South Korea (8.9 kg/ha), the Netherlands (11 kg/ha), Brazil (4.3 kg/ha) and the United States (1.8 kg/ha) (ibid.). After 2002, the rate of pesticide consumption peaked again in 2017 partly because of the increasingly accurate declaration of production outputs and transactions (Liu, I. 2018), suggesting that the previous rates could

Additionally, the farming system was industrialized in the 1970s through the state's promotion of agricultural mechanization, albeit to a varying extent for different crops (Editorial Committee of HDFMT 2013, Hsieh, M. 2004). Rice farming, in particular, was turned into a highly mechanized process involving machinery used in different production processes—from raising seedlings to husking and packaging. Occurring parallel to this were land readjustments and the specialization of raising seedlings that facilitated mechanization, as well as the disappearance of water buffalos that were introduced to the island by Dutch colonists and became a symbol of Taiwan under Japanese colonial rule. In their stead, mechanized contract farmers emerged, who purchase heavy machinery and providing mechanized services to farmers with less capital, such as ploughing and harvesting services, through oral contracts based on rural social networks (Ka and Own 1991, Tseng, H. 2007). Agricultural mechanization became vital for sustaining agricultural production in the face of the marginalization of the agricultural and rural sector. By outsourcing key steps to mechanized specialists like seedling centers, rice mills, and harvesters, elderly farmers could continue farming despite rural labor shortages and increasing labor costs.

The incumbent farming regime in Taiwan is entwined with global agri-food systems and international politico-economic dynamics more so than its predecessors were. For instance, rice production was halved between the 1970s and the 2000s partly due to the protectionist shift in the United States's trade policy in the 1980s and Taiwan's entry into the WTO in 2002; at the same time the policy response (the encouraged conversion of paddy fields to wheat, maize, and soybean production) was compromised by the importation of cheap grains from the United States (Teng 2003, Tsai, P. 2009). While rice remained Taiwan's leading crop for the sake of food security, sugarcane had lost its leading position as primary agricultural and export product following a significant decrease in sugarcane cultivation areas since the 1980s. This came in response to growing global competition and low prices in the global sugar market (Chang, S. 2014). Farmers then switched to other, more profitable crops, especially fruits and vegetables, which next to rice (31.4%) occupied 30.6% and 17.4% of the total cultivated land area in 2015, respectively (DGBAS 2017). This gave rise to a new generation of professional farmers engaging more actively in the capitalist market and investing more for profit maximization as compared to traditional rice farmers (Tsai, P. 2009, Tung, C. 2012).

Although the agricultural products are consumed mainly domestically, with food self-sufficiency ratios exceeding 80% in terms of rice, fruits, vegetables,

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have been underestimated. Most pesticides sold and used in Taiwan were produced by domestic-pesticide-processing SMEs using imported materials coming mostly from China (Hsu, C.Y. 2010).

pork, and fish (COA. 2020), the interrelation of Taiwan's agriculture sector and the global agri-food system increased with its entry to the WTO (COA 2015b, Li, C. and Liao, C.M. 2012). Almost all types of agriculture-related goods, especially aquaculture products, vegetables, fruits, and flowers, are traded on foreign markets, particularly in China, Japan and the United States. Meanwhile, imported agricultural products, especially meat as well as grains and soybeans from the United States and Brazil as fodder, increased dramatically since 2000, reflecting modern dietary changes. As such, the food self-sufficiency ratio calculated based on energy consumption dropped from 56% in 1985 to less than 35% in 2003 (COA. 2020).

The national-level organic and environmentally friendly farming niche

In response to growing socio-ecological concerns emerging from the farming regime, a national-level agri-food niche has emerged in Taiwan over the past three decades thanks to several distinct, yet often interrelated lines of effort by the state, private sector, consumer groups, and farmers.[28]

The proposal of organic farming as an alternative to fossil fuel-intensive farming practices appeared to emerge first within the socio-technical regime in 1986 when regime actors tried to address surging environmental issues that included soil acidification, the eutrophication of water bodies, a decrease in biodiversity on farmlands, and the emergence of superweeds (Cheng, E. 1994, Hsu, S. 1994, Jiang, M. 2006, Lu, A. 1995). Inspired by the growing global interest in organic and sustainable agriculture, a group of experts, technocrats, and scholars in agronomics and soil science at leading agricultural institutions initiated several programs in the 1980s to introduce organic farming practices from the United States and Japan (Chen, J.W. 1999, Hsieh, S.C. 2010). This included conducting experiments and research, holding conferences and training programs, and establishing organizations and internal working groups specialized in these tasks and international networking. This reform attempt occurring within the socio-technical regime focused on promoting ecologically sustainable agricultural production through the establishment of top-down technical and regulatory guidelines, including the state-led promotion of organic farming for commercial production in the 1990s and the establishment of a regulatory environment and organic certification schemes in the 2000s.

[28] The following overview is based on: a small number of studies of organic farming and community-supported agriculture; government reports; websites of the main organizations, institutions and groups; interviews; and personal observations. The purpose here is to provide a tentative outline of the general trend in order to situate the studied grassroots innovations, rather than producing a comprehensive analysis of its development. This also applies to the overview of the nationwide renewable energy niche discussed in the next section.

In parallel, several consumer-based civic organizations advocating 'environmentally friendly' agri-food products—roughly referring to those produced without chemical inputs— emerged in the 1990s in response to the concerns over food safety relating to farmland contamination and environmental degradation. Often adopting the form of co-operatives, a few pioneers of such organizations, including the Homemakers Union Consumers Co-op (see Chapter 4),[29] successfully established alternative agri-food commodity chains by training and contracting smallholder farmers, setting up their own certification schemes in parallel or with the authorization of the government, and establishing organic agri-food sale channels, including running stores and restaurants across the country. In so doing, they become key intermediary actors in promoting organic agricultural practices to farmers (often in cooperation with the government), as well as key providers of organic agri-food products to consumers.

The rising public awareness of food safety and the growing market for organic agri-food products from the late 1990s onwards started attracting business actors (Chen, P.J. 2014, Yang, Y.H. 2013). The business-led organic agri-food model often involves vegetable box schemes and capital-intensive production modes, such as those linked to self-run, large-scale organic farms, and serves as a diversification strategy for conglomerates originating from the industrial sector, such as Formosa Plastic Groups mentioned in Chapter 5. These actors tend to be leading players in the official organic certification schemes, as the annual administrative cost and restrictions have discouraged many smallholder farmers from joining (Huang, J. 2016). While involving contracting smallholder famers to some extent, these organic agri-food companies often pay more attention to the marketing of their products to consumers as upmarket health foods.

By contrast, various farmer-based experiments on environmentally friendly farming and consumption practices have mushroomed since the 2000s. These include farmers' markets, subscription- or membership-based purchasing schemes, and 'adapting farm' schemes whereby consumers could participate in farm management and experience farming activities (Chen, P.J. 2014, Lai E. and Tai 2009, Tai 2010, Taiwan Rural Front and Partnerships for Community Development 2015). These initiatives are often established by starting farmers

[29] HUCC emerged in 1993 out of the Homemakers Union Foundation (HUF), one of the earliest environmental organizations in Taiwan established by a group of female activists in 1987 to advocate healthy diets, a low-carbon lifestyle, and a nuclear-free homeland. Unlike the HUF, the HUCC focuses on promoting ecologically friendly agri-food production and consumption practices. With its own organic standards and monitoring schemes, it has become one of the most famous agri-food co-operatives in Taiwan. In 2017, it comprised around 150 farmers, 200 food-processing plants, 72,700 members, and 54 shops across the country (HUCC. 2020).

who are younger and more educated than 'conventional' farmers, prioritizing reciprocal relations between producers, consumers, and the environment while placing less emphasis on organic certification and profit maximization (Yang, Y.H. 2013, Lai E. and Tai 2009). Inspired by 'natural farming' practices in Australia, Japan, South Korea, and Thailand, these grassroots initiatives tend to be small in terms of farm size and membership, yet innovative in their modalities and farming practices. They outnumber other types of agri-food experiments and contribute to the development of a nationwide agri-food niche by enriching existing action and discourse repertoires and by increasing the visibility of such niches by means of media presence.

Being relatively resource-poor and more vulnerable to environmental and economic constraints, these grassroots initiatives were often more sensitive to structural challenges underlying Taiwan's agricultural and rural development. The most critical voice came from the Taiwan Rural Front (台灣農村陣線, TRF), the civic group that led the nationwide land justice movement between 2009 and 2016 (see Chapter 4). Besides facilitating land struggles, TRF-associated activists and scholars also launched several agri-food initiatives as a form of resistance to industrial capitalism's exploitation of rural areas, farmers, and nature (Lii 2011, Tsai, Y. 2014). This included eco-friendly farming practices, either on an individual basis or with indigenous and rural communities, holding a monthly farmers' market during which forums on issues like land grabs and food sovereignty would be organized, and networking with international agrarian movements, especially La Via Campesina (Lin, L.X. and Tsai P. 2012, 2015, Tsai, P. and Liu, C. 2012).

The interaction between reformist endeavors within the regime and grassroots innovations in civil society is generally reciprocal and conducive to the expansion of the organic and eco-friendly farming niche. For instance, training and consultation on organic farming provided by agricultural agencies served as important technical support for inexperienced farmers, whereas the latter's difficulties in accessing suitable land and markets in the 2010s prompted the Council of Agriculture (COA) to establish ten 'organic farming special districts', on the one hand, and to create outlets for organic products in supermarkets and on online platforms, on the other. In late 2016, the booming practices and discussions on environmentally friendly farming in civil society urged the COA in cooperation with several grassroots organizations to expand its regulatory attention and resources beyond organic farming to other farming practices not applying chemical inputs. With efforts from civil society, the government, and other actors, the organic and eco-friendly farming niche has been expanding steadily across the country over the past two decades, with participating farms comprising over 11% of all cultivated land in 2015 (Table 2.2).

Table 2.2: Total acreage and share of land per total cultivated land adopting organic farming and eco-friendly farming practices, 2005-2015.

		2005	2010	2015
Cultivated land with organic certification schemes	hectares	1,335	4,044	6,490
	%	0.28	0.89	1.32
Cultivated land without chemical inputs	hectares	43,997	45,371	54,294
	%	9.14	9.93	11.05
Total cultivated land	hectares	481,610	456,856	491,341
	%	100	100	100

Note: (1) Land on which eco-friendly farming practices have been adopted refers to land cultivated without the application of chemical inputs in production processes, which includes land with organic certification schemes. (2) Cultivated land here refers to land registered under the Censuses of Agriculture, Forestry, Fishery and Animal Husbandry that is currently used for the growing of crops and animal husbandry. Source: Chou, I. (2017) and NIU (2020)

2.5.2 The electric power regime and the emergence of a renewable energy niche

Energy plays a pivotal role in the capitalist industrialization process. As Barca and Bridge (2015: 367) note, "the core of the industrialization process is […] the energy source which moves [the machine]". Like the agricultural sector, the energy sector in Taiwan has undergone a great transformation in the modern era. This is best demonstrated by the emergence and evolution of the electricity system, which is at the heart of energy policies and debates in Taiwan (Chang, K.H. et al. 2019). Over the past century, it has evolved from a self-reliant, hydro-based system preceding WWII to a fossil fuel-dominated, highly import-dependent system emerging with the post-war industrialization process.

Historical socio-technical transitions in the electricity system

Taiwan's nascent industrialization in the early twentieth century was enabled by the energy transition from animal- and steam-generated power to electric power (for the introduction of mechanization in Taiwan, see Kao, S. 2016). Like industrialization, the emergence of the electricity system has been closely linked to the processed food industry. As company-owned, small-scale, coal-fire-generating lighting equipment became an important lighting source in sugar refineries, the industrial demand for electricity burgeoned in the late 1910s (Kitaba 2012). The rice export boom in 1925 further prompted the rapid growth and mechanization of Taiwanese-owned rice mills and other small industries (Kao, S. 2003). These industries' wide application of small-scale electric motors, along

with factories that utilized electric heating, propelled the increase in electricity consumption in the 1920s and 1930s (Horiuchi 2012, Kitaba 2010, 2012). The total horsepower generated by electric motors grew 5.9-fold from 1920 to 1934 and 22.2-fold between 1920 and 1941 (Kitaba 2012), with electricity supplied by self-owned facilities or secured through contracts with electricity companies.

The budding electricity production market for powering factory machinery and urban street lighting was opened to both state-run and private, small-scale electricity providers. Given the view of securing electricity supply as serving public interest, the colonial government appointed agencies to monitor the development of the electricity industry while establishing small-scale hydroelectricity power stations along rivers and irrigation systems near cities and surrounding areas. Private, small-scale electricity providers equipped with less capital-intensive fossil fuel generators mushroomed in places that were not covered by the utilities (Figure 2.4) (Lin, L.F. 2011, Tung, A. 1995, Wu, J. 1996).

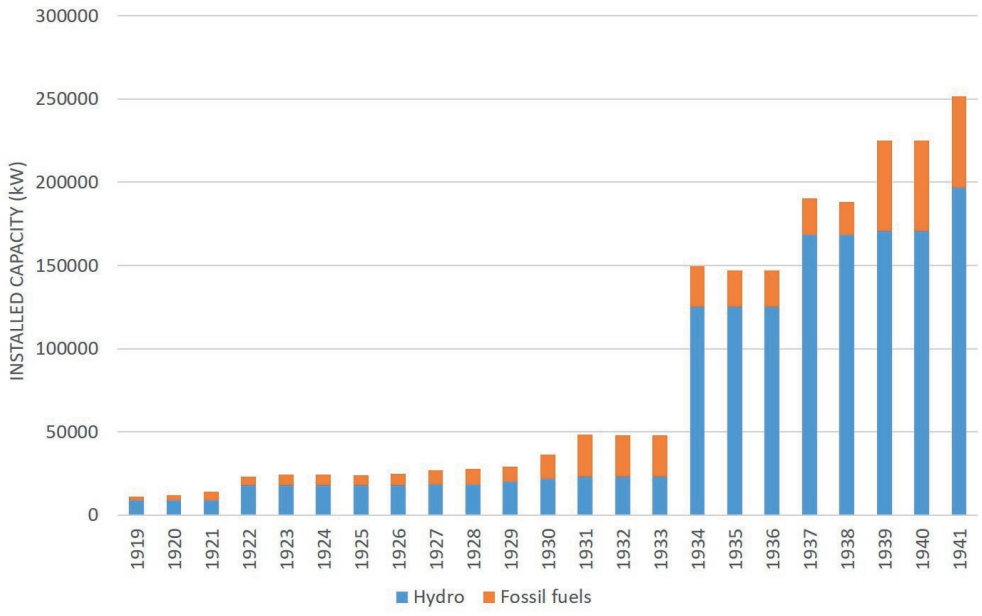


Figure 2.4: The combined electricity-generating capacity of all power plant installations in Taiwan, 1919-1941. The dramatic jumps in hydroelectricity generation (in blue) in 1934 and 1937 were related to the completion of the First and Second Sun Moon Lake hydroelectricity power plants. Fossil fuels (in orange) include natural gas (the majority), coal, and diesel. Graph compiled by the author with data from the 'Overview of Electricity' of the Office of the Governor-General, cited in Kitaba (2010: 237).

Large-scale power stations were added to the energy matrix in the 1930s as a key part of the colonial government's plan to boost industrial development in Taiwan. On an island with zero oil reserves, few gas fields, some coal mines, and with mean annual precipitation double the global average, in addition to many steep river slopes, hydroelectricity was the most obvious source of power (Lin, L.F. 2011). In 1919 the Taiwan Electricity Company (TEC), of which the Office of the Governor-General was the major stakeholder and in charge of its management, was established to carry out the biggest hydroelectricity project in the empire, the First Sun Moon Lake hydroelectric power station (SML 1; maximum power yield 100 MW) on the biggest river in central Taiwan.[30]

The industrial and militant turn of the colonial polices in the 1930s contributed to the completion of the SML 1 project and several large-scale hydroelectricity projects that followed. Given the capital-intensive and physical-technical characteristics of mega hydroelectricity projects, the installed capacity had to be maximized to reach optimal cost effectiveness (Kitaba 2010), leading to a great leap in energy supply which in turn had to be met by an equal leap in demand. To this end, the Japan Aluminium Corporation (JAC) was established with the help of the Japanese government and investments by the TEC and several *zaibatsu* that dominated Taiwan's sugar industry. After being completed in 1934, the SML 1 immediately became a primary driver of the rapid growth of heavy industries, with the first island-wide of electricity grid transmitting the electricity it generated across western Taiwan.

In turn, the newly developed electrochemical, energy-guzzling industries, such as the aluminium, special steel, and chemical fertilizer industries, consumed the lion's share of electricity after the late 1930s. With cheap energy, the JAC's refinery processed bauxite shipped from Indonesia into aluminium ingots as material for Japan's aircraft industry invested in by the same group of *zaibatsu* (Kao, S. 2003, Kitaba 2010, 2012, Lin, L.F. 2011, Tung, A. 1995).[31] In this way, Taiwan was transformed from an agricultural production base into the

[30] The project was initiated to meet the increasing demand for lighting, railway electrification, and the establishment of domestic industries producing chemical fertilizers, iron, and textiles for import substitution (Tung, A. 1995). Postponed in the 1920s due to difficulties in securing funds, it was resumed in the late 1920s partly as a result of the soaring demand from the booming small industries using electric motors and electric heating equipment (Kitaba 2012).

[31] The JAC also played a significant role in industrial and electricity development in eastern Taiwan (Lin, Y.J. 2004). After the completion of the Port of Hualien in 1938 as part of the colonial government's preparation for war, the JAC established the Eastern Taiwan Power Company in 1939 along with four other companies run by Japanese industrial capital to power its new refinery in Hualien. The Eastern Taiwan Power Company monopolized the electricity industry in this region between 1943 and 1944 before it was merged into the TEC in 1944.

empire's stepping stone to the South Sea and a relay station linking South China and Southeast Asia.

After WWII, the electric power system kept on evolving alongside the development of post-war industries. To reconstruct the heavily damaged electric power system, which was prioritized in US aid-financed economic programs, the nationalist government established a power utility, Taiwan Power Company (Taipower), in 1946 to take control of and repair the power facilities left by Japan (Taipower 1989, Tung, A. 1995). One of the utility's priorities was to supply cheap energy for the development of the fertilizer and the cotton textile industry in the 1950s. The centralization of the electric power system, a process starting in 1944, was consolidated, whereby Taipower monopolized the generation, transmission, distribution, and sale of electricity across the country.

The leaping energy demand driven by rapid industrialization contributed to a series of energy transitions in the following decades (Figure 2.5) (Taipower 1989). To access a more stable energy source, the state increased its reliance on coal-fired power stations in 1953, which came to dominate electricity generation by the mid-1960s. In so doing, it reversed the 'hydro-led and fire-supplemented' power structure, marking a transition from renewable energies to fossil fuels. Yet, when production peaked in 1967 after coal mines on northwestern Taiwan's hills reached their limits (Tsai, L. and Sun 2014) and global oil price remained low, the government in the late 1960s again shifted to oil to sustain the rapid economic growth and the burgeoning heavy industries in the 1970s.

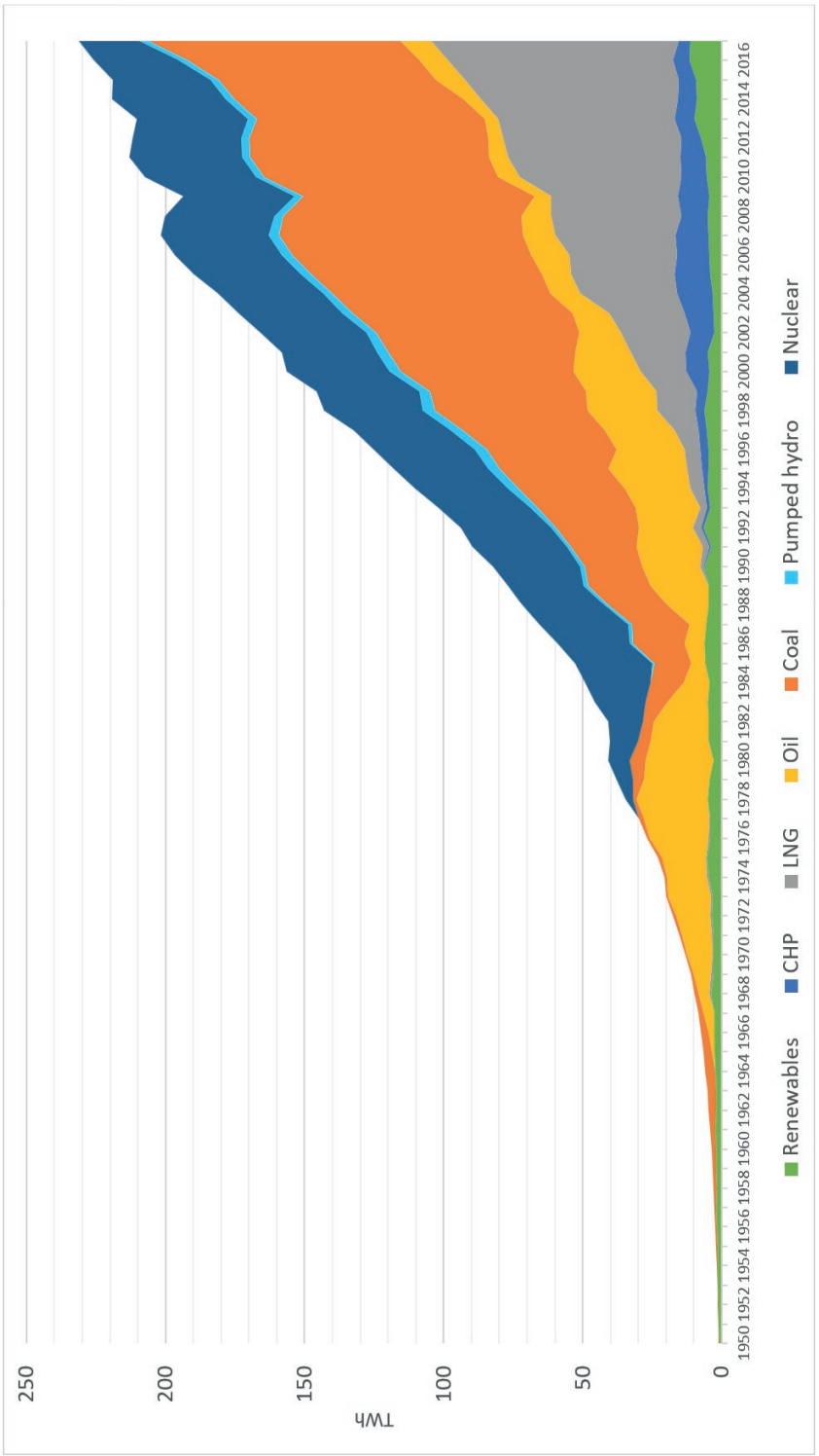


Figure 2.5: The total net electricity produced and purchased by Taipower by fuel type, 1950-2017. Graph compiled by the author based on statistics of Taipower (2020a).

In response to the two oil crises of the 1970s and 1980s, the government followed the example of many other countries by (once again) switching to coal-fired power stations and introducing nuclear energy. This time, the coal-fired power plants relied wholly on coal imported from Australia, the United States, South Africa, and other countries. For energy diversification and environmental protection, power plants running on liquefied natural gas (LNG) imported from Southeast Asia, Qatar, Australia, and Russia joined the energy matrix in 1990. Together, they drove the rapid growth of electricity generation capacity in the following three decades, consolidating the transition toward a fossil fuel-intensive energy system and an economy classified by an extremely high level of energy dependence.[32]

To address frequent power shortages and growing social opposition to the construction of coal- and gas-fired power stations, the state since the late 1980s encouraged the industrial sector to build cogeneration plants—plants that produce combined heat and power (CHP)—whereby many companies, especially the energy-guzzling petrochemical and steel industries, set up their own CHP systems, mostly fuelled by coal and oil, whose surplus power was purchased by Taipower (Lin, T. et al. 2012). This public-private partnership to relieve Taipower's burden of energy generation and to increase energy efficiency thrived with the opening up of the electricity industry to private electricity suppliers in 1995. This neoliberal turn signalized a historical, albeit limited, move toward decentralized energy production. Several private coal-fired and LNG power plants joined the national energy matrix since 1999, run primarily by the Taipower-invested cogeneration corporation and leading petrochemical and cement companies (see Chapter 5).

Nuclear power emerging in the 1970s was a response to geopolitical dynamics as much as it was a response to the need for a diversified energy supply. The nationalist regime considered it essential for the country's survival in the face of an emerging PRC equipped with nuclear weapons and in reaction to changing US-Taiwan relations in the 1970s (Huang, T. 2002, Taipower 1989). Nuclear power plants were erected partly to circumvent the United States's sanctioning of nuclear weapons and partly to strengthen US-ROC ties by engaging with key US energy companies and investments. The first nuclear power plant (NPP-1), one of the 'Ten Major Development Projects', started operating in 1979, and the construction and initiation of three additional nuclear power plants followed in 1980. Consequently, nuclear power generated from uranium imported

[32] Since 1991, more than 97% of primary energy sources in Taiwan (including petroleum for the transportation sector and petrochemical production) have been imported (BOE. 2020). Taiwan has been ranked the seventh-largest coal importer in the world over the past decade (IEA. 2020).

from the United States, South Africa, and other countries replaced coal-fired power stations as the major source of electricity between 1983 and 1993.

Despite its declining presence in the energy matrix, nuclear power has been at the center of Taiwan's energy politics and electric power regime. While the nuclear weapon program had failed, unconditional political and financial support from the authorities led to a political and institutional culture at Taipower and energy agencies that privileged nuclear power over other forms of energy, including giving it a greater investment in research and more power in the decision-making process (Huang, T. 2002). As most nuclear technocrats and scholars at Taipower and relevant government agencies were trained at the few nuclear research institutes, knowledge and discourse production revolving around nuclear energy was concentrated in the hands of a small, closed group of experts. For decades, these nuclear-associated interests had a greater say in energy policymaking arenas and remained the biggest challenge to the transition to renewable energies in Taiwan (Tseng, Y. 2015). [33]

Consequently, nuclear energy has been the most politicized and contested form of energy in Taiwan, compounded by its strong association with party politics, numerous corruption scandals, poor quality control records, controversies regarding water management, and constant increases in construction time and costs. In response, the anti-nuclear movement initiated by scholars, environmental NGOs, rural and indigenous communities affected by the construction of nuclear facilities and nuclear waste disposal, artists, and ordinary citizens emerged in 1987 in alliance with the political movement against the KMT's one-party authoritarian rule. (later evolving into the Democratic Progressive Party, DPP) (Ho, M. 2006, 2014a). Plagued by growing socio-economic controversy, nuclear energy has remained the focal point of the public energy debates and national energy conferences over the past few decades (Chang, K.H. and Hsu, C.M. 2019, Ling 2013). With strong support from the KMT in the name of sustaining economic development and opposed by the DPP as a representation of authoritarianism, nuclear power became a political issue as much as—if not more than—an energy issue that has dominated the politics of energy transitions in the past decade.

[33] The nuclear-associated interests included the pro-nuclear managers at Taipower, relevant government agencies, a few nuclear institutes, engineering consulting firms jointly invested in by the state, KMT, and the private sector, and (to a lesser extent) US engineering companies (especially Bechtel Corporation and Ebasco Services) and electricity companies (such as General Electric Company and Westinghouse Electric) (Huang, T. 2002).

The emerging national-level renewable energy niche

Since 1974, the electric power system has provided electricity to nearly all Taiwanese households (Chen, P. 2003), in 2018 at the third-lowest cost globally (Taipower. 2020b). Yet it is the industrial sector that for long has consumed the greatest share of electricity, especially the industries manufacturing petrochemicals, basic metals, and computer and electronic products (BOE 2020, Tseng, Y. 2015).[34] Over the past few decades, energy-intensive industries along with the demand for oil as a raw material for petrochemical production have steered the growth of the country's energy consumption, which increased by 2.32 times between 1990 and 2015, accompanied by a rapid increase by 2.29 times in greenhouse gas emissions at the same period (BOE. 2020, Chou, K. 2017). Consequently, industrial and business elites, especially those associated with the energy-intensive industry, came to play a key role in lobbying the state to sustain the fossil fuel-intensive, pro-nuclear energy regime.

The development of renewable energies in Taiwan, such as wind and solar energies, had been slow under the KMT government (2008-2016) (Chang, K.H. and Hsu, C.M. 2019) despite growing awareness of climate change among the general public, its increasing mention in policies, a few pilot programs to promote renewable energies, favourable natural conditions, and a leading solar cell industry globally (Su, Y. 2013). A bureaucratic-authoritarian political culture, conservative renewable energy goals, a lack of political will, resistance of vested interests to energy transitions, and low electricity prices were identified by environmental activists and scholars as main reasons for the path dependence in the high-carbon energy system (Chou, K. 2017).

The strongest call for an energy transition toward renewable energies came from civil society, especially those activists and scholars associated with the anti-nuclear movement, which resurfaced in public debates and on political agenda after the Fukushima accident in 2011 (Ho, M. 2014a). After successfully nudging the KMT government to seal up the controversial fourth nuclear power plant (NPP-4) in 2014, anti-nuclear activists redirected their attention to the promotion of energy transitions and renewable energies. Drawing on experiences from other countries, especially the 'Reduce A Nuclear Power Plant' plan in South Korea and community energy projects in Germany, some of them focused on lobbying county governments to improve their performance vis-à-vis the conservation of energy and development of renewable energies, while others since 2015 tried to build pilot community energy projects. Additionally,

[34] The share of total electricity consumption in 2018 of the industrial sector was 56%, followed by the services sector (17.7%), the residential sector (17.6%), and the energy sector itself (7.2%), whereas the transportation sector and the agricultural sector used a negligible share (0.6% and 1.1%, respectively) (BOE 2020).

a few citizen-based co-operatives and social enterprises that invested in the installation of solar panels on citizen-donated rooftops emerged in 2014, often celebrated by activists as successful examples of civic participation in energy transitions.

The changed political opportunity structure after the general election in 2016 opened up a window of opportunity for pro-renewable-energy transitions. As the DPP government, which had the majority of seats in Parliament, considered energy transitions a political priority, the strong pro-nuclear political culture in energy agencies and Taipower was challenged, and a new agency for cross-department coordination to further this end, the Office of Energy and Carbon Reduction (OECR), was set up with some prominent anti-nuclear activists and business actors in the booming renewable energy industry as committee members. To phase out nuclear power by 2025 in accordance with the legalized 'nuclear-free homeland' vision, the DPP government announced a more ambitious renewable energy target in 2017, aiming for a total installed capacity of 27 GW by 2025 to increase the share of renewable energy as part of total electricity generation from 4.8% in 2016 to 20% by 2025 (Figure 2.6).

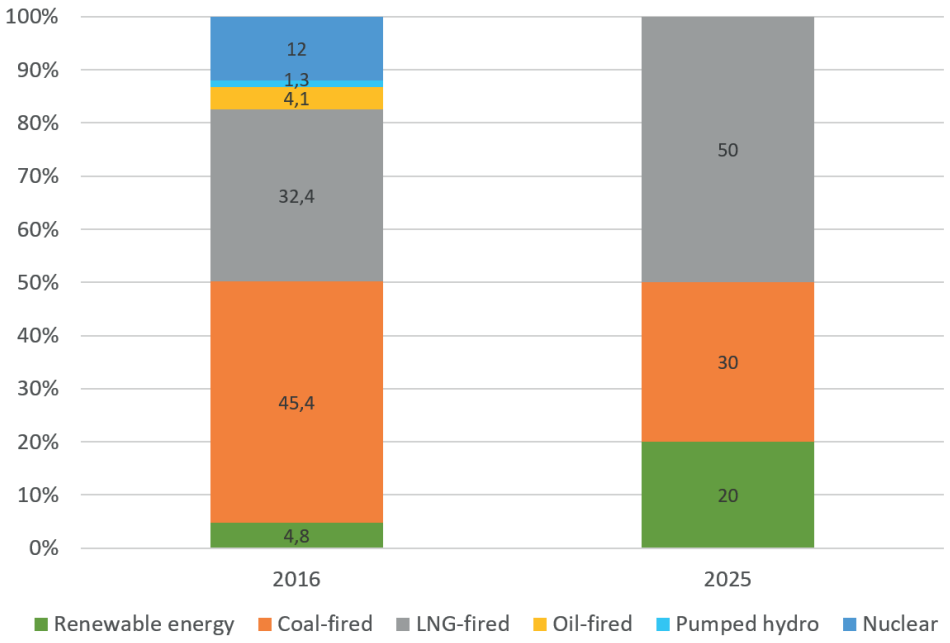


Figure 2.6: The composition of all electricity sources as share of total electricity production (by fuel type) in 2016 and the targeted composition for 2025. Graph compiled by the author based on data from BOE (2016).

To this end, the Electricity Act was amended in 2017, allowing private actors and citizens to participate in the generation and sale of renewable energies (Chou, K. et al. 2017). This was followed by the amendment of the Renewable Energy Development Act in 2019 to simplify the procedure of facility installation and grant renewable electricity providers a free choice between the feed-in-tariff (FIT) and the free market (Chen, W. 2019). While the ambitious 5.5 GW offshore wind energy program launched in 2017 has attracted investments by several world-leading companies, including Denmark's Ørsted, the promotion of solar energy to meet the target of 20 GW by 2025 has encouraged the development of PV-ESCOs (i.e. solar-energy service companies) and various attempts to develop community energy projects.

Since the energy transition as a concept and a socio-political process are novel both to politicians and society, environmental activists and anti-nuclear NGOs have played pivotal and multiple roles in nurturing the renewable energy niche. Despite differences in priorities and approaches, they have contributed to national-level niche building and civic participation in energy transitions in several ways. This includes lobbying for progressive policies and regulations to facilitate the development of more socio-ecologically sound renewable energy, collaborating with county and central governments by sharing international experiences and know-how, participating in official energy conferences and providing constructive evaluations of government performance, enhancing dialogue between government agencies, business actors, and civic groups through public hearings co-held with supportive legislators, raising public awareness of community energy and energy transitions through articles, forums, and grassroots experiments, and countering the resurging pro-nuclear campaign allying with the KMT and industrial and business elites. In so doing, they have been the key niche actors not only in terms of knowledge production and transmission, but also in terms of communication and coordination between multiple stakeholders of different interests and concerns.

2.6 Conclusion

This chapter outlined the island-wide socio-spatial transformation and the historical socio-technical transitions in the agricultural and energy sectors in Taiwan in relation to the state-led structural shift toward industrial capitalism over the course of the past century. It showed that the agriculture-industry power asymmetry has not only led to the marginalization of the agricultural and rural sector since the 1960s, but also the differentiation and entanglement of city and countryside. Rural space in Taiwan as a sink and source of resources for industrial and urban development is thus hybrid, with non-agricultural activities and interests posing various socio-ecological challenges for rural development on

top of the environment consequences of the fossil fuel-intensive agricultural production. The local articulation of these challenges and processes set the stage for the grassroots innovations taking place in rural and indigenous communities, as discussed in the following chapters.

This chapter moreover demonstrated that agricultural and energy socio-technical systems are also embedded in Taiwan's development history and have come into being with the structural shift toward industrial capitalism. The rice-centered sedentary farming system starting in the seventeenth century has been transformed into a fossil fuel-intensive, mechanized, smallholder farming system by the modern state's pursuit of industrialization as much as by farmers' responses to this. Similarly, the electric power system that emerged with the rise of mechanized rice and sugar mills under Japanese colonial rule has been transformed from a self-reliant, hydro-based, relatively decentralized system to a fossil fuel-dominated, highly centralized, and import-dependent one used to sustain post-war industrial development. Both sectors have witnessed the emergence of a national-level niche for more socio-ecologically sound practices over the past few decades in which civil society has played active and diverse roles along with the state and business actors.

In the next three chapters, I will explore how community-based grassroots innovations as part of civil society's endeavor to promote agriculture and energy transitions and as a local response to ongoing socio-spatial transformation take place through their entanglement with site-specific concerns, aspirations, and politics deriving from host communities' development histories.

Prologue to Chapter 3

Chapter 3 is the first of three empirical chapters that together explore how grassroots innovation takes place on the ground and how they are entangled with the geo-historically produced concerns, aspirations, and politics of a community of place. It aims to demonstrate that place specificity matters for the formation and the development of grassroots innovations and deserves more scholarly attention.

I start with a renewable energy grassroots innovation in Taromak, an indigenous community located in eastern Taiwan, in part because indigenous peoples have a development history on the island that stretches beyond that of other populations, and in part because its CE project is one of the first and most widely known in Taiwan for forming part of a wider campaign for increased civic participation in energy transitions on the island. More importantly, the rich geo-historical entanglements at play in Taromak triggered my desire to better understand and seek to address the limits of conventional sector-oriented grassroots innovation studies, leading to a great shift in focus and research approach, as detailed in Chapter 1.

This chapter is based on a paper published in *Geoforum* in January 2019, with several modifications having been made to match the purpose of the thesis.[35] First, the introduction has been rewritten; the introduction and theoretical review of the paper that focus on the gaps in CE studies are here omitted to avoid repetition. Second, more details on the Taromak community's geo-history, its CE initiative, and the project's intra-action with existing identity politics are here provided to create a more comprehensive overview, including what has transpired since the paper has been submitted. In particular, to examine how a grassroots niche space was created and sustained in this indigenous community, more emphasis is placed on the ways in which external actors have strategically engaged with the community to advance both the agenda for a national energy

[35] Lai, H. (2019) 'Situating Community Energy in Development History: Place-Making and Identity Politics in the Taromak 100% Green Energy Tribe Initiative, Taiwan', *Geoforum* 100: 176-187.

transition and the place-based vision of the community centered on tribal autonomy. This expanded section has been placed after the section describing the community's geo-historical dynamics to show how the specific context precedes and influences cooperation between grassroots actors and external activists in initiating the CE project. Last, I have written a chapter conclusion in line with the overall research objective of this thesis—namely, the formation and development of the grassroots niche space in a community shaped by geo-historically produced complexity and hybridity.

3 Powering Tribal Autonomy: Identity Politics and the Taromak 100% Green Energy Tribe Initiative

3.1 Introduction

> Green energy is a concept. We don't know if the tribe will rely 100% on green energy in the future, but it will affect our autonomy in relation to the land, culture, and resources [on our territory]. And this is what matters.

This quote from an active member of the Taromak tribe (達魯瑪克部落) in eastern Taiwan captures the perception of most grassroots actors participated in the Taromak 100% Green Energy Tribe Initiative (達魯瑪克綠能百分百部落計畫). Founded in 2015, this project is the first community-based initiative in Taiwan that is carried out in cooperation with the national anti-nuclear movement. Activists and the media have lauded it as a pioneering initiative that provides evidence of the possibility for successful public participation in energy transitions, embodying the ideals and concepts promoted in the former's campaign discourse, such as 'decentralized electricity system', 'local production and local consumption of energy', 'the transformation of citizens from pure energy consumers to energy producers', and 'energy democracy' (for instance, see Liu, R. 2016).

Yet it is not just an initiative concerning energy. The project is situated in a community where struggles for tribal autonomy have been of primary concern; local actors have stressed the need to connect their indigenous identity to the project (Figure 3.1). As the quote suggests, this project is seen as a step toward restoring tribal autonomy linked both to restoring autonomy on their traditional territory and the land-based culture of Taromak, which have been eroded since the incorporation of the tribe into a nation-state in 1895. To make sense of this example of grassroots innovation thus requires relating the initiative to the community's history rooted in processes of colonization and modernization, as well as its struggle to reclaim its right to define the past, present, and future of the place that was denied by the modern state.

Figure 3.1: Grassroots actors dressed up in traditional dress during the installation ceremony of the PV system at the community center, which demonstrates the pivotal role of their indigenous identity in promoting the CE project. Source: Photo taken by the author.

Place and place identity have played a pivotal role in indigenous rights movements across geographical locations and scales; indigenism, stretching beyond single communities as a global pan-indigenous movement, is fundamentally "about the control of place" (Castree 2004: 151) and is inherently political at least in two senses. First, it concerns the extra-local power relations between nation-states and indigenous communities. As Castree (2004) notes, the indigenous identity claim is a place-making project that resists dominant geo-historical discourses and excluding or oppressive legal, institutional practices imposed by nation-states. The aim of asserting indigeneity is to reclaim the right to lost territories and access resources required for the survival and flourishing of indigenous communities. Second, it refers to identity politics internal to a community that involves discursive competition in the construction of geo-histories and claims to territory, as Watts (1999) shows through his research on the Ogoni people's struggle against a petro-capitalist invasion in Nigeria. In his view, the strategic construction of the Ogoni as an indigenous minority group, although justifiable, poses the risk of resulting in "a territorial essentialism and a fetishism of geography" (Watts, M. 1999: 101)—namely, a romanticized and reductionist framing of community and tradition that highlights some voices in the community and obscures others.

Yet indigenous identity stemming from a particular geo-history does not necessarily entail an exclusionary localism. As Castree (2004) suggests, for one

thing, indigenism as a global movement and a collective 'resistant identity' for indigenous people across different geo-historical contexts is simultaneously multi-scalar and transboundary, as well as place-specific. For another, the essentialization of indigenous identities and place-frames, although provisional and mythical, can be used as an inclusive and empowering political tool for the marginalized to reclaim their subjectivity in place-making processes.

This chapter concerns the ways in which the Taromak 100% Green Energy Tribe Initiative intra-acts with the place-making processes with which the community co-evolves. The intra- and extra-local identity politics that originated from the geo-historical context and have existed prior to the CE project enjoy particular attention to show how they have enabled yet also constrained the development of the CE project.

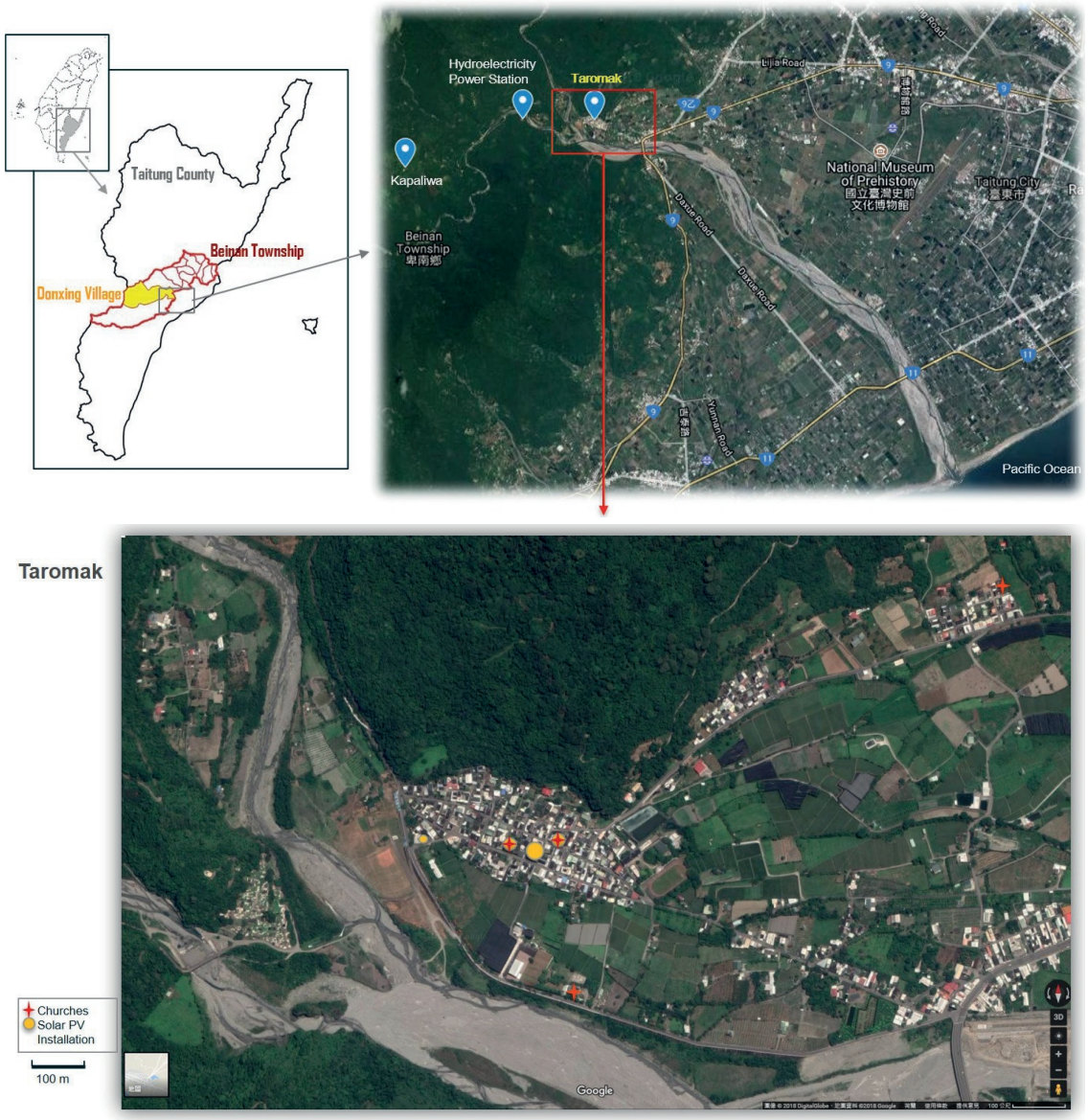
The first section provides a concise overview of two dialectical place-making processes that have taken place since the tribe was incorporated into a modern state under Japanese colonial rule so as to contextualize the CE project as part of the community's ongoing endeavor to reclaim its lost identity and territory. The second section explores the emergence of the project and how a grassroots niche space was created by including the CE initiative in the broader, extra-local campaign for tribal autonomy. Correspondingly, the rest of the chapter investigates the entanglement of the CE initiative with the community's internal identity politics. It first examines two main political stances which variously situate the CE project in relation to two competing place-frames that interpret the geo-historical experiences in very different light. It then elaborates on the way in which identity politics based on these place-frames shape and are reshaped by the CE project. In so doing, this chapter aims to demonstrate how grassroots innovations come into being with a community's geo-historical contexts and place-based political dynamics that is often overlooked by conventional grassroots innovation studies adopting the socio-technical systemic approach. I argue that grassroots innovation studies could benefit from an interrogation of the ways in which a community project co-evolves with site-specific needs and ends resulting from a community's development history through the networked politics of place (Pierce et al. 2011).

3.2 The development history of Taromak

Taromak, administratively located in Dongxing Village (東興村) in Beinan Township (卑南鄉), Taitung County (台東縣), Taiwan, is seen as belonging to the eastern Rukai (魯凱)—one of the Austronesian indigenous groupings in Taiwan. The tribe, comprising 499 households and 923 people in 2013 (CIP. 2017), form the ethnic majority in the village currently comprising around 1,400 people, along with a few Han and other indigenous migrants (THRO. 2018),

including some western Rukai and Paiwan peoples who have largely integrated themselves into the community by means of decades or even centuries of intermarriage and participation in community-wide events. The division of ethnic groups into clear-cut categories is thus problematic and does not reflect the sense of belonging of different ethnic groups to Taromak as a community.

After several group migrations from elsewhere in the early twentieth century, the tribe settled at the confluence of two branches of Rijia River (利嘉溪) on the western edge of the Taitung Alluvial Plain, around 11 km from Taitung City center (Map 3.1). While considered the official location of the Taromak tribe, the administrative borders of Dongxing Village do not completely correspond to the actual residential area of the tribe, as some of its households fall within the administrative borders of another village. Thus, the Taromak community (hereafter Taromak) cannot be viewed as comprising a single ethnic group living in a village with a clear administrative boundary; rather, it can best be described as a group of people (mostly of Rukai descent) living on or originating from the land where the majority of the Taromak tribe is currently clustered. In practice, Taromak, Dongxing Village, and Tanan (大南)—the old name both for the tribe and the village (see Footnote 39)—are used interchangeably. Community members tend to refer to themselves as residents of Dongxing Village when communicating with Han outsiders, whereas they call themselves Taromak when talking to other indigenes.



Map 3.1: The approximate location of Taromak. The self-declared traditional territory covers around 20,000 hectares of mountainous area to the west of the community. The four sites of solar PVs forming part of the community energy initiative that had been installed by 2019 are, on the map from left to right, the office of the neighborhood watch group (1 kW installation), the Catholic church (3 kW installation), the community center (4 kW installation), and the Tanan Presbyterian church (3 kW installation). Source: Compiled by the author based on Google Earth images.

This thesis argues that a place-based historical contextualization of a grassroots innovation is essential for understanding the complex interplay of its emergence and development, site-specific concerns, and local politics. This section outlines Taromak's development history, with a focus on two broad, concurrent, and co-constitutive place-making processes that have been ongoing since 1895, the one state-led, the other community-based. In this way, the 'stories-so-far' of Taromak can be understood as the dialectics between different place-making processes and a continuous (re)formation of collective identities, with which the CE project is becoming (Massey 2004: 130).

3.2.1 A top-down place-making process: incorporating Taromak into the state space

As mentioned in Chapter 2, eastern Taiwan for centuries was home to many indigenous tribes that until the late nineteenth century remained beyond the reach of state power and the budding capitalist economy owing primarily to the rugged terrain, the lack of easy access to the area due to a lack of transportation networks, the islands' peripheral position in relation to the Dutch colonial government and the Qing Empire, as well as fierce local struggles against the state's frontier-making efforts. For centuries, the Taromak tribe had been a stratified society united around a shifting cultivation and hunting and gathering practices, where people's life and seasonal rituals cycled together with the growth of millet and the cycles of nature (Fu, J. 1997, Huang, Y.K. 1975b: 37). At the core of the social order were the '*talriyalralray*' (the nobility comprising the first six families who occupied the space), forming the heads and foundation of the tribe by functioning as the leaders, the landlords, the priests, and the distributors of economic gains (Chiang, B. and Mitsuda 2015, Fu, J. 2001). In exchange for land access, other members paid tribute to the *talriyalralray* by offering a portion of the harvest, part of which was redistributed to those in need to meet the obligations of the nobility towards the tribe. Food production and distribution practices, religion, socio-ecological relations, and socio-political orders were united in an integrated, self-sustained system.

After the tribe migrated from southern to eastern Taiwan around four hounds years ago (Li, P.J. 2010), for centuries it was capable of defend its constructions of place. The legend of two heroes killing staff of the Dutch East India Company (VOC), leading to its being classified as an enemy by the VOC in the 1640s, is still proudly recounted by many Taromak people (Chiang, S. 2003, Kang 2005, Liu, J. et al. 1997).[36] However, an epidemic that followed

[36] Although the Taromak tribe attended the meeting of tribes in the eastern region under the VOC's feudalist government in 1655, it maintained military independence and defeated a big tribe supported by the VOC in 1656 (Chiang, S. 2003, Kang 2005, Meng 2001).

forced the tribe to migrate, till they settled on a hillside called Kapaliwa (two kilometers away from the current location, see Map 3.1), with subsidiary tribes formed by western Rukai and Paiwan migrants upon invitation of the *talri-yalralray*.

Yet the tribe's control over its territory came to an end with the establishment of a modern state space at the turn of the twentieth century. The lengthy, complicated process of '*chihouka*' that incorporates tribal societies into a modern state governed by a central administration was initiated by the Japanese colonial government after it took over the island in 1895 and was later continued by the Chinese nationalist regime after WWII (Matsuoka 2018).[37] This resulted in the dramatic and systematic reconstruction of Taromak in every aspect.

The first major change was a state-imposed geographical demarcation between 'civilized society' and 'undeveloped nature' (where the indigenes resided), the land of the indigenes becoming subjected to state-led appropriation and the peoples themselves subjected to an agenda of 'civilization'. The Japanese colonial government's focus on the indigenous communities in northern Taiwan where camphor trees grew led to relative autonomy in Taromak at the early stages of the Japanese colonial period, which soon ended when the government tightened control of eastern Taiwan in the 1900s. A dynamic 'frontier guard line' was gradually imposed across the island, with the modern police system equipped with Western armory and communication technologies to protect the state's monopoly of camphor interests (Fujii 2001, Lin, Y.H. 2010).[38] It consolidated the socio-political and economic boundaries between the 'normally' and 'specially' administered territories, whereby 'savage police substations' controlled flows of population and capital into and from indigenous communities.

[37] '*Chihouka*' (地方化) is a Japanese concept proposed by Matsuoka (ibid.) that can be literally translated as 'localization', whereby a place is transformed into a 'local' administrative unit of a modern nation-state (thus different from the usage of 'localization' in the localization-globalization academic debate). In particular, it refers to a state-initiated, long-term incorporation process whereby tribal societies are transformed from self-regulated tribal nations into 'local' administrative units in a state-centered governance system, which results in the loss of cultural, socio-political, and economic autonomy of indigenes. Based on the notion of 'state simplifications' of high-modernist states (Scott 1998), it highlights the social engineering process of making tribal societies legible for state control with an aim to create disciplined subjects and modern citizens.

[38] The 'frontier guard line' went through several changes and was finally replaced by special police stations on indigenous territory in the mid-1920s; the police were also in charge of various governance tasks ranging from administration, economic development and education to public hygiene matters.

After several fierce pushbacks from the indigenous peoples, the colonial government started a five-year long 'savage management policy' in 1910, eventually disarming the Taromak people in 1914 (Meng 2001).

Thereafter, Taromak was enrolled in the state-building process centered on two state-driven simplification measures in the name of 'civilization' (Fujii 2001, Matsuoka 2018, Meng 2001). Firstly, the 'migration-by-groups' policy resettled mountain-dwelling indigenous communities to the flatlands for more effective resource extraction and population governance (Lee, W. 2001). Taromak was thus forced to move first from Kapaliwa to Doo and Irila in the mid-1920s, and then again between 1941 and 1942 to the current location. Accompanied was the nationalization of the majority of their traditional territory under the 'Forest Management Project' in 1925 and other following measures.

Secondly, the 'agriculturalization' of indigenous communities was initiated to convert traditional shifting cultivation practices and traditional culture into the monocropping of wet rice, one of the 'state-space crops' ideal for concentrating manpower and grains for state-making purposes (Scott 2009). Around 17.5 hectares of paddy fields were cultivated in Taromak in 1931, with irrigation systems established by Taromak people on instruction of the local police forces (Police Bureau, Office of the Taiwan Governor-General 1931). The transformation of the agricultural production process signified the beginning of a shift from traditional socio-spatial orders to a productivity-oriented, monetary-based economic system and a rice-centered socio-culture relying on state power for capital and scientific knowledges (Huang, Y.K. 1975b, Matsuoka 2018).

The nationalist regime further advanced the path of modernization and the incorporation of the tribe into the capitalist economy. Following its Japanese predecessor, the 'mountain administration' of the nationalist authorities emphasized 'civilization' and capitalist economic development in indigenous communities from 1951 to the 1970s (Fu, J. 2001, Fujii 2001, Matsuoka 2018). The 'savage territory' demarcated by the colonial government was incorporated into the civil administrative system in the form of 30 'mountain townships', which served to classify indigenes as either 'mountain' (山地) indigenes or 'plain-land' (平地) indigenes. Located in a 'plain-land' township after several forced migrations, the Taromak tribe was institutionally identified as 'plain-land indigenes', conflicting with their traditional spatial identity as '*kacalisiya*' (highlanders) (Cheng, W.N. 2009).

With the rise of police-enforced borders, the traditional collective identity was further challenged by demographic changes in the 1950s and 1960s driven by multi-scalar political economic dynamics. A few Hakka and Hoklo Taiwanese families moved from flood-struck central-western Taiwan to the outskirts of the village seeking economic opportunities, whereas several veterans from

mainland China who were stationed in nearby areas by the government to reclaim barren land moved to the village after being encouraged by the government to marry Taromak women (Hsieh, J. 1967, Jen 1956, Huang, X. and Huang, S.W. 2010, Zheng 1995). Although the restrictions of indigenous reserved land limited the influx of non-indigenous people to the village, they by then had outnumbered the indigenous population in eastern Taiwan (Lin, M.R. et al. 2001) and came to dominate elections at all levels.

The late 1960s was the turning point for the indigenous economy in Taiwan (Chiu, H.Y. 1983). Besides the sharpening of the rural-urban divide during the period of rapid industrialization and economic growth, a number of historically contingent factors accelerated the process of the community's socio-economic marginalization. First, the cadastral survey and the loosening of the reserved land regulation in 1966 consolidated individual private ownership of land in Taromak (Kuan 2014, Li, Y.Y. et al. 1983, Yen, A. and Cheng, T. 2012), which terminated the nobility-centered, traditional land and social welfare systems and exacerbated illicit land acquisition and occupation of the Han people through deceitful means or usury. Second, several market-oriented crops were introduced since the 1960s, including exported-oriented citronella, which changed the hillside landscape and socio-economic life of Taromak (Fu, J. 2001, Cheng, W.N. 2014). Although citronella cultivation was halted in the 1970s when synthetic citronella was invented, farmers in Taromak by then had become embedded in the agroeconomic system in Taiwan and global commodity chains, whereby their lives increasingly relied on the market economy and monetary system (Fu, J. 2001). Third, a fire accident struck the tribe in 1969, claiming 49 lives and razing 180 houses.

The destruction of local livelihoods, along with the decline of the citronella industry and the completion of the road and railway network connecting western and eastern Taiwan, led to the outflow of young people to cities and other places, where they sought employment as domestic workers, factory workers, casual laborers, and pelagic fishing workers to support their families. Consequently, the Taromak people's living standards, although improved, lagged behind the national average (Fu, J. 2001). The lack of job opportunities and subsequent loss of the younger population still has severe implications for Taromak, as is the case for many indigenous communities (Shia 1992).

The loss of economic autonomy and the subordination of indigenous societies to modern states contributed to the dramatic decline of a traditional culture centered on the nobility. In less than four decades, the traditional elites lost their absolute political and economic advantage. They, too, became small-scale farmers, indebted to non-indigenous illicit loaners during the process of agriculturalization, and conducted dangerous manual labor in other places, such as on the coalmines in northwestern Taiwan. The reproduction of their traditional

culture was further hindered by the rural exodus, the influence of a modern urban lifestyle, and the introduction of new religions. The frustration in the rapid socio-economic transition provided a fertile ground for organized missionaries who brought in spiritual and material comforts the *talriyalralray* could no longer afford. After Christianity was introduced in 1958, only a few families remained traditional animists, whereas over 80% of the villagers converted to Christianity according to local estimates. Christian activities, doctrines, and institutions have replaced many traditional rituals, norms, and organizations in unifying and driving collective action in Taromak (Fu, J. 1997, 2001).

3.2.2 A bottom-up place-making process: indigenism and cultural revitalization

The externally introduced, state-driven place-making process lasting a century transformed Taromak from an autonomous tribal nation into a hybrid community roughly corresponding to the administrative boundaries drawn up by the Taiwanese centralized modern state. Yet as Meng (2014) notes, state-tribe relationships in general involve a dialectical process in which tribal communities maintain a certain capacity for resistance and adaptation to such transitions to 'modernity'. By dwelling in the place and enacting and responding to state schemes contributing to a modernity agenda and the capitalist mechanism driving modernity, they are essentially engaged in a process of constantly remaking Taromak from the bottom up.

As "nationality, internationalism, and indigenism were mutually constituted formations" (Barclay 2018: 2), indigenism in Taiwan was born in the early 20th century when the modern nation-state came into being. To create a national identity, a series of measures for cultural reformation were imposed by the imperial state, including the introduction of a common language (Japanese) via the primary education system and the promotion of a neutral collective identity '*Takasagozoku*' (高砂族, the Formosan Indigenes) in the 1930s (Fujii 2001). This paved the way for the formation of a pan-ethnic identity used by the indigenous movement fifty years later in response to the economic and cultural crises of indigenous societies resulting from '*chihouka*' (Barclay 2018, Hsieh, S. 1987, Matsuoka 2018). Like the anti-nuclear movement, the indigenous movement for land reclamation and name recertification emerged in the mid-1980s as martial laws were lifted. Along with global indigenism and Taiwan's democratization, a series of successful campaigns led to several institutional changes, including the establishment of the Cabinet-level Council of Indigenous Peoples in 1996 and the Basic Law of Indigenous Peoples in 2005 (Simon 2016). The result is one of the most advanced indigenous policies in the world and the gradual recognition of the term '*yuanzhumin*' (原住民, the indigenous peoples)

that would become the official pan-ethnic identity for Austronesian indigenes in Taiwan in 1994 (Hsieh, S. 1987, 2017).

Parallel to the permeation of indigenism, Taromak elites actively seized political opportunities for their own place-making. Soon after the shift to the nationalist regime, one traditional elite working in the government initiated the first, though failed, campaign to establish a 'mountain township' for the Taromak and nearby tribes. Many families from western Rukai tribes were invited to settle down in the village to meet the qualification for township building, generating a lasting effect on local demographic and political structures. Echoing the turn for 'tribalism' and 'regaining tribal environment' of the indigenous movement along with the policy of 'comprehensive community development' in the mid-1990s (Chi 2005, Hsieh, S. 2017, Juan 2015), the Dongxing Community Development Association (DCDA) and the Eastern Rukai Culture and Education Association (ERCEA) were established in 1992 and 1998 by local elites (not necessarily the *talriyalralray*) returning from cities.

With the leadership of the village heads and the facilitation of scholars at local universities, they obtained several government grants to boost local economy and cultural revitalization, including projects related to the reconstruction of Kapaliwa, to community-based ecotourism, and to the local cultural industry drawing inspiration from indigenous cuisine (Figure 3.2). Ecological surveys, traditional territory mapping, and the recording of oral history were also conducted in the late 1990s, making Taromak one of the pioneers. Although most projects could not sustain themselves after the grants ended, the symbolic authority of the chief has been reconstructed along with facilities for cultural education.[39] Furthermore, the sense of community has been strengthened during the past three decades, leading to the tribe's reputation as a relatively unified indigenous community (Fu, J. 1997, 2001). In the process, the self-identification with and official recognition of the name 'Taromak', meaning 'our home', significantly increased, replacing the term 'Tanan'. [40]

[39] The chief refers to the male head of the oldest family in the *talriyalralray* that was recognized by Japanese authorities. This family is the only *talriyalralray* that sticks to the traditional land faith and still actively engages in tribal affairs.

[40] The Taromak people have referred to themselves as such for centuries (documented by the VOC as Taroema, Terroma, etc., see Chiang, S. 2003), despite the tribe having been known by Mandarin- and Japanese-speaking outsiders as 'Tanan tribe'. Tanan was also the name of the village, administratively established after WWII and renamed 'Dongxing' by the KMT government after the fire accident in 1969 due to the proximity of the word 'Tanan' to the Mandarin word for 'huge disaster'. According to a cultural revivalist, the community has mostly been referred to as 'Taromak' since attempts in the 1990s to be called 'Taromak' rather than 'Dongxing' in the local vernacular and 'Taromak' instead of the 'Tanan tribe' in official documents in the 2000s.

Figure 3.2: The statue of the guardian god at the entrance of village. In traditional spatial practices, the statue representing the ancestral spirits signals the border of the tribal space, and whoever wants to enter the space safely needs to ask the ancestral spirits' permission to enter. This statue forms part of a series of community development projects carried out since the mid-1990s, along with the restoration of other cultural symbols to reconstruct the tribal space, including the ancestral house of the chief, tourist maps that show the sites where some important traditional activities take place, and the reconstruction of Kapaliwa for the education of the younger generation and ecotourism. Source: Photo taken by the author.

As Castree (2004) suggests, these local place-making initiatives are pursued through trans-local networks with their own initiatives, such as the 'Roots and Shoots' initiative of primatologist and anthropologist Jane Goodall, who visited Taromak several times, and the international campaign of the Indigenous and Community Conserved Areas (ICCAs). In 2014, leading community actors cofounded the Taiwan Indigenous Conserved Territories Union along with other indigenous activists in eastern Taiwan, which became one of the ICCAs. As part of the movement, they initiated a campaign to promote Taromak as a 'mountain township' in response to the exploitation of the river by the state and semi-state agencies on what their traditional territory. These actors represent a local coalition for tribalism and indigenous sovereignty in Taromak that links to a pan-Taiwan aboriginalism within and beyond Taiwan (Hsieh, S. 1987).

Overall, the Taromak's embeddedness in the geo-history of the island and the global political economy has led to a dramatic socio-ecological transformation in every respect. The traditional religion, politics, economy, and culture

have dissolved and have been replaced, roughly speaking, by Christianity, modern political institutions, a monetary market system, and a multicultural society. Yet, history does not proceed in a linear way (Williams 1977): the result of this transformation is a complex mix of residual elements of traditions, dominant modern lifestyles, and the emergent competition between different approaches to reconcile with the past, the present, and the future. It is within this specific temporal-spatial configuration that the Taromak CE project emerged.

3.3 The Taromak 100% Green Energy Initiative

3.3.1 The emergence of CE

The Taromak were involved in the expansion of the electricity sector at the industrial and militant turn of the Japanese colonial period in the 1930s. The Eastern Taiwan Power Company, the largest electricity company in eastern Taiwan of which the Japan Aluminium Corporation controlled half of the shares, formulated a plan to generate hydroelectricity on the Rijia River running through the tribe's traditional territory (Lin, L.F. 2011). Consequently, in 1941, a small, state-supported, run-of-the-river hydroelectric power station called the Dongxing Hydroelectric Power Station was erected on one of the branches of the river to supply electricity to air-raid shelters housing fighter aircrafts nearby (Figure 3.3).[41] Six months after the power station's completion in 1945, however, the war came to an end. The power station, like all the electricity facilities on the island, was then taken over by state-owned power utility Taipower, forming just a small part of the county's centralized electricity grid that supplied energy to nearby areas.

[41] There is some ambiguity regarding the electricity generation capacity of the power station. According to the data provided by the Business Office of Taipower's Taitung Branch during my visit to the hydroelectric power station for the research, the original power generation capacity was 200 kW, which was expanded to 800 kW after the end of WWII. Curiously, another Taipower publication states that the capacity was 650 kW at the time that Taiwan was taken over by the nationalist government (Taipower 1989). Some historical studies suggest that the original installed capacity was 250 kW (Lin, B. 1997, Wu, J. 1996), whereas others claim it was 800 kW (Lin, L.F. 2011). Signs on the two generators in the power station dating back to 1941 indicate, however, that the total maximum capacity is 900 kW.

Figure 3.3: The Dongxing Hydroelectric Power Station (originally called the Tanan Power Station) is situated on a branch of the Rijia River, with its water inlet pictured below. The dam, enlarged when Taipower raised the dam wall based on Japanese design, was regarded by local actors as a cause of the degradation of the river's aquatic ecosystem along with several weirs constructed by the semi-official irrigation association and the state-run water corporation for the Taitung area. The relentless generation of cheap energy and cheap water through appropriation of the river's potential for the Taromak symbolized the encroachment of state power on the tribe along with the processes of colonization and modernization, thus becoming central to their campaign for tribal autonomy. Source: Photos taken by the author.

Due to advances in technologies for energy production and the country's skyrocketing energy demand in the following decades, this small hydroelectric power station was no longer cost effective to Taipower, nor was it sufficient to meet the energy demand of Dongxing Village, in part due poor water quality and environmental changes. When Taipower decided to decommission the plant in 2015, several grassroots activists focused on cultural revitalization and a professor of life science at the National Taitung University who had been involved in facilitating the preservation and reconstruction of the ecocultural environment since 1995 proposed the demolition of the station and the restoration the aquatic ecosystem of the river. The professor, who was also an environmental activist associated with the Taitung branch of the Taiwan Environment Protection Union (台灣環境保護聯盟, TEPU), introduced the river restoration proposal at the annual Environmental NGO Conference held in 2015 in Taipei and invited the secretary-general of TEPU to visit Taromak.

In parallel, TEPU, a leading NGO that had formed part of the anti-nuclear movement since 1987, and its allies initiated a campaign for a national energy transition after the controversial Forth Nuclear Power Plant was sealed up in 2014. As the secretary-general of TEPU imparted in an interview,

> Like the war against the Eye of Sauron in *The Lord of the Rings*, you have to fight against nuclear power with various kinds of military forces. Along with street protests, we need concrete examples of renewable energies to show that there is another way to generate electricity.

To him and many anti-nuclear activists, "energy transitions and anti-nuclear campaigns are two sides of one coin". He believed that CE could contribute to a fairer energy transition and that it needed to be combined with community development in deprived areas to help the socially vulnerable. Inspired the Schönau CE project in Germany, during his visit he proposed to leading grassroots actors the idea of appropriating the hydroelectric power station to build a '100% green energy tribe'. With trust he had built by previously facilitating their press conferences for tribal autonomy in Taipei, he successfully persuaded them to adopt this idea by situating CE in their ongoing campaign. By taking over the hydroelectric power station and gaining independence from the national electricity grid, the tribe could move one step closer to autonomy and regaining control over the resources on their traditional territory.

This framing of the CE project as embodying energy autonomy was also a strategic necessity for creating the niche space with support from inside and outside of the community. As a non-indigenous outsider, the secretary-general of TEPU was acutely aware of the risk of being accused by community members and indigenous rights advocates of imposing environmental activists' energy agenda on the indigenous community, which could detrimentally affect

how CE would be viewed by the public and the community. With the assistance of the scholar-activist, he managed to build a reciprocal relationship with local actors in two ways. The first concerns showing respect for the tribal subjectivity, such as inviting local leaders to speak first at press conferences as conference hosts and seeking their approval of the press releases he drafted and the arrangements of green energy camps that were to be held in the community. The other involves carefully adopting an apolitical stance to maintain friendly relations with different political groups in the community and treating them as potential partners of the CE project. This political strategy used to navigate the political dynamics in the community however does not suggest that the niche space was protected from the impacts of local political conflicts. On the contrary, as I will show in Section 3.4, the CE project actively engaged with local politics through the networks of grassroots actors.

As such, the promotions of CE and tribal autonomy at both the local and national levels had work hand in hand through the alignment between grassroots actors and external activists based in Taipei (Table 3.1). The communication between them took place mainly through social media platforms and telephonically, except for occasional visits and face-to-face meetings when important issues had to be discussed. In principle, the leading actors in the cultural revitalization and autonomy campaign were in charge of the CE program at the local level, whereas the secretary-general of TEPU and other environmental NGOs, especially the Taiwan Renewable Energy Alliance (台灣再生能源推動聯盟, TRENA), functioned as facilitators. In practice, as the notion of CE was foreign to the locals, the secretary-general carried out most of the administrative and networking activities together with the government agencies and business actors at the beginning stage. Utilizing their networks in the political system and the energy sector at the national level, these external activists provided the knowledge, technology, and material resources for grassroots actors, including introducing relevant government agencies to Taromak, arranging visits to other renewable energy projects, securing the donation of solar PV panels, and organizing free training sessions led by renewable energy companies and practitioners. In turn, their support and networks increased the leading grassroots actors' confidence in the project and helped them persuade other community members to participate.

Table 3.1: Timeline for key events pertaining to the Taromak 100% Green Energy Initiative and the tribal autonomy initiative, 2014 to 2018.

Period	Activity
2014	Committee for tribal autonomy initiative, aimed at building a mountain township of its own, is established

2014/11	A joint press conference is held in Taipei with other indigenous activists in which tribal autonomy is highlighted as a primary concern
2015/03	A joint press conference on autonomy is held in Taipei with the president of the ICCAs from Iran and a Democratic Progressive Party (DPP) legislator in attendance[a]
2015/04	A joint press conference is held in Taipei conjointly by local activists, anti-nuclear NGOs and the DPP legislator, where the notion of 'energy autonomy' is promoted
2015/05	Environmental activists visit Taromak and introduce the idea of a 'green energy tribe' at the tribal meeting; at this meeting, the initiative is discussed and accepted
2015/09	A CE workshop is held in Taromak; relevant government agencies are invited by the DPP legislator to exchange ideas with local actors
2016/07	The first 'green energy camp' is held in which a provisional, ground-based 3 kW PV system is installed at the venue of the millet harvest festival
2016/08	The second 'green energy camp' is held in which a roof PV system of 4 kW is installed at the community center
2016/09-10	The third 'green energy camp' is held in which a roof PV system of 3 kW is installed at the Tanan Presbyterian Church
2016/12	A community-led press conference for self-declaring traditional territory takes place, which leads to Taromak a leading example in the indigenous campaign for reclaiming indigenous lands
2017/01	Taromak wins the first prize in the 'low-carbon sustainable community' competition in Taitung County and builds a small wind turbine at the office of the neighborhood watch group with the prize money
2017/03	A poster of Taromak's self-demarcating traditional territory appears in a recent, more radical sit-in campaign for reclaiming indigenous lands in Taipei
2017/06	Young community members visit the sit-in campaign with other indigenous activists from southeastern Taiwan to show solidarity
2017/07	The fourth 'green energy camp' takes place in which a provisional ground-based 3 kW PV system is installed at the venue of the millet harvest festival, which later on is reinstalled at the Catholic church

2017/09	The preparatory office of Taromak Green Energy Company is established and announced at a press conference, kicking off the second phase of the initiative
2018/02	Seven young community members conduct a 'tracing roots' site survey by hiking to sacred places in the traditional territory
2018/03	The annual anti-nuclear demonstration takes place with a special focus on CE in which the Taromak initiative is showcased as a successful case
2018	Key grassroots actors apply for a pilot CE subsidy scheme offered by the Bureau of Energy with the facilitation of the environmental activists; 200 million NTD is granted in 2019

[a] This was the beginning of the cooperation between leading grassroots actors and the secretary-general of TEPU, who also worked in the DPP legislator's office at that time.

Source: News reports, my own participation in the events and observation, and interviews.

In so doing, the external actors forged seemingly reciprocal relationships with key local actors that fed into their own agenda for public participation in energy transitions. The environmental activists functioned as gardener-like intermediary actors, nurturing and sustaining the grassroots innovation by mobilizing material and political support beyond the community before the project germinated and grew in this place. They also helped address local needs and concerns (Hargreaves et al. 2013)—in this case, the pursuit of tribal autonomy and the lack of resources and knowledges to carry out a CE project on their own. In turn, this CE project was used to support their lobbying efforts and efforts to raise public and government awareness of community energy. For instance, in the annual anti-nuclear demonstration in 2017, they invoked the Taromak CE project to illustrate the feasibility of participatory energy transitions, presenting it as a bottom-up social experiment that challenged the conventional imaginary of energy in policymaking and public debates as a purely scientific, technical matter. To this end, the grassroots actors showed their solidarity with these activists in the press conferences in Taipei, expressing their own stories and the idea of 'energy autonomy' to strengthen lobbying for more political and institutional support for CE.

3.3.2 The development of CE

To improve local understandings of CE as well as to boost the initiative's visibility as part of the nationwide campaign for civic participation in energy transitions, four 'green energy camps' were held by key grassroots actors and anti-nuclear activists after the project was accepted in the tribal meeting in May

2015. Three self-sustained PV systems together generating 10 kW were installed at the community center and two churches, respectively, during these green energy camps (Table 3.2), which also served as opportunities for intermediary actors and grassroots actors to meet and as a means to retain local momentum and draw public attention to the development of the initiative. The camps comprised two main parts: (1) workshops, including those on energy issues presented by renewable energy companies and practitioners who were invited by the environmental activists and were often the donors of equipment, as well as workshops on local culture and the biophysical environment presented by grassroots actors in relation to their efforts towards cultural revitalization; and (2) participation in the installation of solar PV panels in a common space of the village, facilitated by external practitioners and companies. This mostly took place on the last day of the camp following a press conference about the progress of the initiative, often with the attendance of government officials and supportive politicians at the local and national levels to attract media attention.

Table 3.2: Green energy camps co-hosted by intermediary actors and grassroots actors in Taromak

	Date	Outcome of the Camps	Installed Capacity (kW)
1	2016/07/18-22	Installing a provisional ground-based PV system for *alakowa* (i.e. the training site of the young men's corps) during the millet harvest festival	3[a]
2	2016/08/19-21	Installing a roof PV system at the community center	4
3	2016/09/30-10/01	Installing a roof PV system at the Tanan Presbyterian Church	3
4	2017/07/19-20	Installing a provisional ground-based PV system for *alakowa* during the millet harvest festival, which was later reinstalled on the roof of the Catholic Church	3

[a] This set of solar PV panels was reused in the third camp. Besides these four green energy camps, panels that can generate an additional 1 kW were installed at the office of the neighborhood watch group along with a small wind turbine. All the solar PV and inverters were sponsored by renewable energy companies and installed by external volunteers and participants of the camps with the help of practitioners invited by the NGOs.

The camps aimed to promote social learning about the technologies and policies regarding renewable energies, while also boosting the visibility of the

CE project inside and outside the village and serving as networking opportunities for different actors in the energy sector. It also created a space for community members to understand and participate in this initiative. Nevertheless, most participants in the first three green energy camps I attended were citizens from outside of the community, such as college students interested in renewable energies and indigenous culture, and families seeking extracurricular activities for their children. Local participation remained very limited, partly due to insufficient promotion of the project within the community, unfamiliarity with and a lack of incentives to learn about new technologies, and competition of other local activities that community members deemed more important, such as preparations for the millet harvest festival and regular church activities. Additionally, the intermediary actors focused more on the external publicity of this pilot CE project at its initial stages in an attempt to kickstart the nationwide campaign for participatory energy transitions—the main objective for them and a task that they were better at. In the process, education and mobilization at the local level, which they considered requiring more active engagement from leading grassroots actors at a later stage, received less attention.

Achieving total, community-wide energy self-sufficiency would be made possible by means of the acquisition of the hydroelectric power station, the installation of PV systems on rooftops, and the operationalization of small water mills in the irrigation system. Nevertheless, the plan has been subject to constant change due to limited resources, trial-and-error processes, internal and external political dynamics, and the spontaneous networking of people with diverse interests characterizing grassroots innovations (Seyfang and Smith 2007, Seyfang and Haxeltine 2012). For instance, the hydroelectric power station remained in the hands of Taipower, as the tribe had not been able to obtain the legal status and capacity to manage it, which can take several years of campaigning for re-regulation.[42] Thus, it has not played a practical role in the CE project so far, but functioned more as a symbol that demonstrated the potential of this grassroots innovation.

The second phase of the project commenced in July 2017 when, at a public conference, the formation of the Taromak Green Energy Power Company was announced. The company was set to be run by community members who were

[42] According to the grassroots actors, this plan to take over the power station is dependent on the regulation of Tribal Public Juristic Person, an entity that is still under construction and seems unlikely to make much progress in a short time. Once the Tribal Public Juristic Person position is established, the chair of the tribal meeting could have the legal position to negotiate with government agencies for the governance of the resources in the tribe, including taking over the hydroelectric station from the state-run power company. This shows that the success of the CE project depends not only on energy-oriented conditions, but could also involve support and efforts in other dimensions like indigenous rights in this case.

expected to hold over 50% of the shares. Nevertheless, only around 20 community members became shareholders in early 2019, largely due to a lack of clarity about the future operation of the company, uncertainty regarding the cost effectiveness of the investment, and unfamiliarity with renewable energies and CE in general. Moreover, the leading grassroots actors' prioritization of tribal autonomy and devotion to other community affairs diverted their attention and energy away from the CE project, which led to a slowdown in the project's progress while the nationwide CE movement was strengthened, suggesting the existence of what Seyfang et al. (2014) have described as a 'twin-tract phenomenon' in which grassroots and intermediary actors work at different speeds.

To access more resources, the external actors supported Taromak in obtaining a government subsidy of 2 million NTD (57,440 euros) through a pilot CE subsidy scheme in 2019.[43] This allowed them to employ a local resident new to the initiative to take charge of the implementation of the proposal over the period of one year, as most leading grassroots actors were already overburdened by other community-based projects. Nevertheless, by the end of 2019, problems related to a lack of sufficient local manpower and low levels of participation in the execution of the project remained a challenge for the operation of the company and the CE project as a whole.

3.4 Decolonization vs. modernization: competing place-frames in Taromak

While embedding CE in the local campaign for tribal autonomy helped maintain the grassroots niche space for CE to develop in this community, local needs as voiced by active members and interpretations of the community's development history were themselves subject to contestation. This section explores the ways in which the CE project is situated in relation to two competing place-frames associated with two main local coalitions existing prior to the emergence of the project—the coalition for cultural revitalization and one for Protestantism (Table 3.3). Because external actors have carefully kept their distance from local politics to show respect for tribal autonomy, these networked place-framings are even more crucial for the development of the project.

[43] This is also the one applied for by the Taihsi CE project—see Chapter 5.

Table 3.3: Two coalitions and their place-frames in Taromak

	Coalition for cultural revitalization	Coalition for Protestantism
Key actors	Active actors in the cultural revitalization and indigenous rights movement	Active members of three Protestant churches
Religious preference	Traditional land faith and Catholicism	Protestantism
Party preference	DPP or no preference	KMT
Place-frame	Decolonization: an autonomous tribal nation	Modernization: a deprived community in need of churches' help
Place identity	'People of mountains and forests': reconnection to ancestral lands as guardians	Focus on current living space; mingled with other collective identities, esp. a Protestant identity
Place/bundles	Unjust appropriation of their resources by state power; cultural elements, e.g. Kapaliwa, legend of the Sun God's son, Doo	Hardships of slash-and-burn; current socio-economic problems in indigenous communities; church activities and charity work
CE	Compatible with culture and part of a move toward autonomy	As an investment; generally welcomed, but with relatively low participation
Place visions	To rebuild a local metabolism that can sustain cultural regeneration, social reproduction, reciprocal relations with the rest of nature, and political autonomy	To fit into the modern, capitalist society better through the guidance of churches and with the support of external institutions

Note: This table aims to provide a heuristic outline of the general preferences of the active actors belonging to either of the two coalitions and should not be read in an essentialist manner. For instance, several members of the coalition for cultural revitalization also share concerns about the cost effectiveness of installing solar panels, but do not articulate it as much as they do their aspiration for tribal autonomy.

3.4.1 The leading place-frame in the CE project: decolonization and cultural revitalization

Because the Taromak CE project had been embedded in the campaign for tribal autonomy from the start, the key local actors in the CE project are those who lead this campaign. Through ecotourism and cultural education projects, they obtained administrative skills and formed partnership with the chief and some similar-minded community members. The coalition's members are a heterogeneous group in terms of age, descent, caste, education level, occupation, and

level of participation in the CE project. For instance, the convener is a retired policeman and a traditional hunter from a commoner family with one parent from a nearby Pinuyumayan tribe. His right-hand man is a mixed-blood descendant of a Han mainlander and a Taromak woman and was once the leader of the young men's corps, an important traditional organization whose training is essential for transforming Taromak boys into recognized tribal members, on the chief's recommendation (Jen 1956, Kokubu 2013 [1936], Sugisaki 2013 [1936]). All these members are bonded by strong identification with the tribe and traditional culture and are more connected to the Democratic Progressive Party (DPP) and the Catholic Church, both of which are relatively receptive of the notion of indigenous cultural revitalization.

Several cultural elements strategically form part of the place/bundles—a changing set of raw materials drawing from the space-time trajectories that are collectively recognized and constantly negotiated to form a place-frame—and are promoted in public discussions with external actors to justify the CE project. The legend of an ancestor who was the Sun God's son, a piece of upland called Doo (meaning 'burned by the Sun') and the sun-shaped male headwear linked to this legend are most frequently invoked to verify the compatibility of solar energy and the traditional culture. The eco-friendliness of renewable energies compared to that of fossil fuels and nuclear energy are preferred and considered to be in line with the symbiotic people-envrionment relationship in their tradition. These place elements were strategically called on in the green energy camps. The solar system for instance was installed at the venue where the millet harvest festivals are held in order to demonstrate that renewable energy technologies were conducive to cultural practices (Figure 3.4). The camp programs included lectures on the tribe's history and visits to Kapaliwa, whereby the CE project supported cultural revitalization initiatives. Furthermore, the chief was invited to perform a private ritual before the installation of the PV system at the community center, whereby the project obtained the consent of the ancestral spirits and cultural legitimacy.

Figure 3.4: A ground-based PV system was provisionally installed at the venue where the millet harvest festival takes place on the last day of the first Green Energy Camp in 2016. This arrangement was intentionally made by the leading environmental activist in order to introduce renewable energy technologies to the tribe and to show those who might view green energy technologies as another form of colonial intrusion that these modern technologies can go hand in hand with the indigenous culture. Source: Photo taken by the author.

A key biophysical element in the place/bundles is the river, which was at the heart of the recent campaign for tribal autonomy. The rapid deterioration of the aquatic ecosystem was attributed in this frame to the unjust appropriation of water as a source of 'cheap energy' for generating hydroelectricity and 'cheap raw materials' for irrigation and supplying water to Taitung City (Moore, J. 2015). Interactions of people with rivers, the vivid memory of the rich aquatic system passed down from generation to generation, and resentment toward the uneven redistribution of the benefits generated from the water resource make this element a particularly powerful tool for public mobilization. By emphasizing this grievance, cultural revivalists were able to successfully mobilize villagers to vote for the DPP candidate in 2014, breaking the decades-long dominance of the KMT governing at the township level. Interestingly, once the hydroelectric power station was reframed as a positive element for energy autonomy, it was discursively deemed compatible with the aquatic system when the intake infrastructure would be replaced with an ecologically sound one, which was argued to be possible only when the station is managed by the locals. Thus, this

product of colonization was transformed into a powerful tool for decolonization, demonstrating the dynamic, relational nature of place/bundles (Pierce et al. 2011).

The story of appropriation justifies the urge for the state's recognition of the Taromak tribe's rights over the traditional territory. Community-based natural resources management is touted as the solution to the problem of endless resource appropriation by the external state and semi-state agencies; in contrast, the Taromak people co-evolving with local ecosystems for centuries are depicted as guardians of their traditional territory. Their collective identity as the Taromak people finds glory and pride in its premodern past, including in its traditional rituals and taboos that embody their rich environmental knowledge of the place in retaining a reciprocal relationship with the rest of nature. As this civilization has been unjustly treated by the colonial and nationalist states, it is their birthright to reclaim the culture and place identity as "people of mountains and forests" (Liu, J. et al. 1997). Accordingly, the identification with Taromak indispensably involves identification with the traditional land faith and the reconnection to ancestral lands and the traditional spatial order.

The cultural framing of the CE project nevertheless is not equally convincing to all coalition members. A most critical reflection came from a former general director of the DCDA, who questioned the environmental costs of renewable energies and industrial capitalist logics underlying the renewable energy industry. In his framing, the replacement of nuclear energy and fossil fuels with another capitalist-driven, seemingly more benign form of energy reflects a blind reliance on technological fixes, distracting attention from the need for energy conservation and the continuous expansion of energy consumption of modern lifestyles. "Why can you not live in accordance with the rhythm of the Sun? Why is electricity necessary?" he questioned. To him, "what our lives rely on is the whole ecosystem, of which solar energy is only a part." Although renewable energies to him do not match traditional culture, he agreed that this project offered a chance to reflect on modern lifestyles and was a useful means to spread knowledge about the indigenous worldview.

Despite the discrepancy between perceptions of and participation in the CE project, members of this coalition shared a very similar vision for local sustainable development: to rebuild a local metabolism in which the economy, society, culture, and biophysical environment are integrated as a whole and can sustain itself. As an informant explained,

> Sustainable development means utilizing the resources in this place without exhausting them and passing them down to the future generations without destroying the local environment. Many forms of environmental development are in fact exploiting, grabbing, and bringing these resources to other places. Sustainability

means you understand this place, such as the resources it possesses, and keep them in place, so that they could be retained in a circular manner.

For him and other cultural revivalists, the key step is returning to the roots of their culture, namely a land-based faith that stems from the recognition of their reliance on and identification with the land and the rest of nature from which they have been estranged by the state-led, market-driven place-making process.

To rebuild the connections with the land and land-based culture, several initiatives were carried out by these actors during the time of my fieldwork, including eco-tourism initiatives, the promotion of environmentally friendly agricultural practices, efforts to start an under-forest economy, and the exertion of claims to traditional territory. This combination of cultural revival, ecological stewardship, territorial reaffirmation, and economic empowerment as an alternative development pathway echoes successful examples of other indigenous communities in Taiwan, where a place is both a site of resistance against colonial legacy and one of 'ecocultural renaissance' (Hipwell 2007, 2009). The CE project is envisaged in this place vision as a tourist attraction, a tool for environmental education, and a source of job opportunities for the younger generation.

3.4.2 A competing place-frame: modernization and Protestantism

Christianity became the dominant religion in Taromak after the erosion of traditional socio-ecological relations in the 1950s. The Presbyterian Church, the Roman Catholic Church, and the Free Methodist Church in particular have fundamentally reshaped social relations and value systems in Taromak in a way that could eventually compromise cultural revitalization efforts. In contrast to the Catholic Church, which shows more appreciation for traditional land faith and remains relatively removed from politics,[44] the Protestant churches in

[44] After the Communist Party started ruling mainland China, several Swiss priests travelled to Taiwan in the 1950s and started missionary work in Taromak (Chao, M. 2013, Chiu, H.Y. 1981, Guo 1985). Their previous experiences of Han Chinese people's worship of ancestors led to a relative tolerance toward the indigenous worship of animist and ancestral spirits. Reframed as cultural practices of showing respect to the world created by God and to fulfil filial duty, the traditional land faith from this perspective becomes compatible with Catholic doctrines. For instance, in contrast to the Tanan Presbyterian Church, elements of traditional culture are celebrated in the Catholic Church in Taromak, such as drawings of lilies and a statue of the Virgin Mary dressed up in traditional costume. This interpretation of traditional land faith as the domain of culture, rather than religion, was upheld by the cultural revivalists, whereby they could mobilize the public regardless of their religion. Nevertheless, the apolitical attitude of the Catholic Church also led to a relatively weak capacity for internal mobilization as compared to the Protestant churches during local elections.

Taromak regard traditional rituals performed by the chief as a superstition to be 'improved upon' by Christian prayer. Unlike the Catholic priest, who is appointed in a top-down manner, the Presbyterian churches rely heavily on senior community members for the church's operation and are more likely to engage with local politics through their close-knit networks. In recent years, a political coalition to 'Protestanize' Taromak involving networks between three Protestant churches has been identified by the cultural revivalists. Despite the differences and implicit competition among them, as well as their heterogeneous membership, members of this coalition are unified through their identification as Protestants in local elections.

The contrast between the two coalitions' place-frames is striking. While the cultural revivalists strive to reclaim the tribe's agency in the state-/market-led place-making process, the Protestant coalition praises individual achievements in the capitalist society. Whereas the cultural revivalists recall the happy memories of hunting and gathering, the Protestants refer to the hardship of shifting cultivation and celebrate modern lifestyles. Although they share the pan-ethnic identity as '*yuanzumin*', a depreciatory association is not uncommon when it is invoked in the place-frame. For instance, an informant whose family are all devout members of the Tanan Presbyterian Church deliberately chose a living environment without indigenous residents when working in Taipei in one of several Japanese-invested electronics companies that mushroomed during the export-oriented industrialization period in the 1970s. "I don't drink, smoke, or chew beetle nuts, but *yuanzumin* love these activities when they gather together," he said. He added, with a sense of pride, "that's why many people said I don't look like a *yuanzumin*."

Similarly, the socio-economic challenges facing indigenous communities in the modern society are highlighted and ascribed by several informants to the ignorance of an uncultivated tribal society characterized by dysfunctional families, low levels of education, drinking problems, and poor financial management skills. Churches are framed as bringing a gospel of modernity to such deprived communities, helping locals improve their socio-economic conditions with charity works that provide free extracurricular education, food through food banks, and emergency relief, amongst other things. A vivid example that illustrates the life-long impacts of the Protestant churches on their followers was provided by an informant who conveyed to me her childhood yearning to escape the miserable life in a dysfunctional indigenous family and her sincere gratitude toward the church for the education received in a church-run school. The virtues she learned from the school, such as planning for the future, pursuing higher education, and helping other community members who are in difficulty, "shaped who I am".

This appreciation of churches and the Protestant value system was accompanied by a devaluation of land-based faith and culture, which were considered opposed to Protestant doctrines and irrelevant for the accumulation of social and financial capital in modern society. Accompanying this was the depreciation of the cultural authority of traditional elites who did not obtain a higher socio-political and economic status by modern standards (such as by means of a good education and higher income level), whereas Protestant churches are celebrated as an emancipatory force that could defy traditional authority.[45]

This frame shares a strong place attachment to Taromak, yet has different spatial connotations. As an active member of the Free Methodist Church stated, "Taromak's soil is very sticky", indicating that most members whoever leave the place would yearn to return and spend the rest of their lives here. However, the sense of place in this frame is confined to the current living space where church activities take place and is detached from the biophysical environment on which traditional culture is centered. Even though the tribe is surrounded by nature, she was not familiar with the mountains and forests, while her children were "utterly ignorant of nature" and had to learn about it in school. Moreover, this place identity is subordinated to the religious identity. The pilgrimage to Jerusalem was vividly memorized and recalled by a key actor in the Presbyterian churches, with equal enthusiasm as the young cultural revivalists recalled their trip to the sacred places in the traditional territory.

Additionally, the Taromak identity is mingled with other place sub-identities as a result of the bottom-up place-making process. As several informants of western Rukai descent acknowledged, they claim to be and are recognized by other community members as 'the Taromak people'. Nevertheless, since the origins and membership of the Ilira Presbyterian Church and the Free Methodist Church are associated with the western Rukai migrants who arrived in Taromak after WWII, the life experiences in the original tribes contributed to their place/bundles and political mobilization. Strategically, this sub-identity was invoked by the candidate associated with the Ilira Presbyterian Church in the 2014 village head election, contributing to the defeat of the convener of the CE project.

The place vision of this coalition is to transform Taromak into a Protestant community to better adapt to the modern, capitalist society. In contrast with

[45] It is worth noting that the Protestants have their own interpretations of 'culture'. For instance, one informant stated that Taromak's cultural roots are in its language rather than in the land faith, whereas another argued that only the traditional costume and virtues of the Rukai people (such as their hospitality) should be preserved. Overall, they celebrate the cultural elements that can be integrated into the church-centered modern lifestyle while dismissing the rest as superstition or as formalist practices that are irrational and out of date.

the call for autonomy, there is a propensity to rely on external institutions to further local development, such as expert knowledge, external financial support, and government leadership. Renewable energies in this framing are positively associated with modern technology and environmental protection and are viewed mainly as an investment. The attitude toward the CE project diverges between individuals, ranging from enthusiastic interest and passive support to doubt. Unfamiliarity with the technology, uncertainties about the cost-effectiveness of the investment, and the fact that the initiative is promoted by their political rivals all contribute to the general hesitance to participate. The DCDA president, for instance, showed solidarity in press conferences and stated that churches should lead the development of CE. Nevertheless, as a cultural revivalist noted, he discursively avoided cultural references and regarded himself as a facilitator of the external actors and the convener, who in his view should assume responsibility for planning and securing resources for the project.

3.5 Identity politics and the Taromak CE project

> Two decades ago, many elders in our tribe were very humble. They had traditional Rukai tattoos on their hands and liked to wear traditional dresses. But they dared not show up in these costumes in public and would hide themselves in the shadows, smoking. When I initiated community development projects, I tried very hard to urge them to step out of the darkness and took pictures that showed them in all their glory. Through various activities in which they saw people applauding for their hand tattoos and images, they became self-confident [...] Nowadays, it is very natural for the tribe members to put on traditional dresses for any ceremony and festival. When they become parents, they will voluntarily prepare traditional dresses for their children as a gift they receive when they become adults. Through these practices, self-esteem increases among our people. The tribe has established strong confidence in itself.

This statement from a pivotal cultural revivalist and campaigner for tribal autonomy illustrates how self-identifying as an indigene became shameful to the community members with the collapse of traditional culture owing to the rapid capitalist modernization. To him, the place vision of reconstructing the ecocultural environment concerned not only the resumption of traditional rituals and costumes, but also the restoration of a sense of pride in and identification with the indigenous identity. Yet one of the greatest challenges he and other cultural revivalists have encountered comes from the community itself. A conflict at the millet harvest festival in 2016 arose between revivalists and the Protestants, who argued that the traditional prayer conducted by the chief at the opening

ceremony should be replaced by a Christian prayer led by the church—an argument they had made at the inaugural ceremony of the statue of the guardian god around two decades ago (Fu, J. 1997).[46] Protestant leaders also have a vision of reshaping the shared collective identity of the Taromak people in accordance with their Christian faith, and have sought to realize this vision by running in the elections of most community-wide organizations in Taromak in recent years.

The competition between the two coalitions with divergent place-frames reflects the hybridity of Taromak nowadays. In a sense, it demonstrate two opposite, yet typical reactions to the identity crisis of indigenous peoples in Taiwan in the rapid process of '*chihouka*' (Chi 2005, Fu, Y. 2001, Matsuoka 2018, Hsieh, S. 1987). One echoes the interests of nationwide indigenous movements and champions their dignity in the assertion of their indigenous identity, while the other internalizes the 'stigmatized identity' of indigenous peoples in the eyes of dominant others and strives to discard or modify it by seeking recognition in the modern value system. In Taromak's context, the identity politics is observable in the apparent competition between framings of culture and faith: the Protestants insist that Christian faith comes first in cultural affairs, whereas the cultural revivalists stress the subjectivity of the tribe to which the churches are just recent guests, regardless of their contribution to local development. Although the differences between the two coalitions seem insurmountable, they are loosely united under the CE project to serve the common interests of the community and thus carefully maintain their solidarity in the public.

Before discussing the ways in which internal identity politics related to these place-framings shaped and were reshaped by the development of the CE initiative, it is important to note that the boundaries between the two coalitions are often blurred due to the intricate networks of kinships following generations of

[46] Another internal obstacle in the mid-1990s came from a few mainlanders and community members who had Sinicized and occupied political positions at the local level. However, this trend has largely faded away over the past two decades as the migrant mainlanders passed away and their children moved to cities. It is also worth noting that some descendants of the mainlanders and Han migrants who still stay in the village had tried very hard to integrate into the indigenous culture and have built a strong sense of self-identification with the indigenous culture through their mothers' ties to the tribe and active participation in tribal activities. This shows that the process of assimilation does not simply occur in one direction, namely, the marginalized indigenous people integrating themselves into the dominant Han culture in the broader Taiwanese society. Inside the community, where the population is predominantly indigenous, people of Han descent often found themselves fighting for recognition as a community member, with extra effort taken to show that they identify with the indigenous culture. Several of them became active cultural revivalists in the process, including the president of ERCEA, the former general director of DCDA cited above, and the executive director of the 2016 millet harvest festival.

intermarriage, lifelong friendships since childhood, and the spatial proximity of a small, concentrated village. Kinships, personal relations, and party preferences, like religion, are identified by many informants as powerful, though not determinant, factors for local politics.[47] The fixing of boundaries is also challenged by the interconnection of places facilitated by modern transportation and communication technologies. For instance, the relatively strong binding force of the Protestant churches is challenged by the free choices of the villagers, who can easily access different religions and churches in other places. In fact, the cultural revivalists have closely worked with some high-profile figures in the Presbyterian churches in the community and elsewhere who actively participated in the indigenous cultural revitalization and the indigenous rights movement.[48] Christianity is thus understood by them in a relational way: it is not God, nor the church, but the leading actors acting on their aspirations, value systems, and life experiences who define a church's political engagement.[49]

Local politics were very dynamic during the time the CE project emerged. Neither of the two coalitions had hegemonic power in Taromak. Three leadership positions are particularly vital for local politics and the development of the CE project: (1) the village head, who is in charge of the administrative area under the instruction of the township office; (2) the president of the DCDA that sustains other community-wide groups with grants from the government; and (3) the chair of the tribal meeting, who symbolically represents the tribe.[50]

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[47] One informant of western Ruaki descent, for instance, is a lifelong member of the Tanan Presbyterian Church and the brother-in-law of the village head; instead of supporting the former pastor of his church, he voted for the leading cultural revivalist in the election of the chair of the tribal meeting in 2016—his childhood playmate and hunting partner.

[48] One of the strongest allies in their campaign for tribal autonomy was a Presbyterian pastor from another tribe, whereas one well-respected senior member that had actively participated in restoring Taromak culture since the 1990s was a Protestant, suggesting that the overall mismatch of the Protestant churches in Taromak with traditional faith does not prevent some of their members from participating in cultural revitalization activities.

[49] The leading members of the two Presbyterian churches in the community happen to be pro-KMT and distance themselves from social movements, which differs strikingly from the general attitude of the Presbyterian churches in Taiwan, which are known for close cooperation with DPP against KMT's Sino-centric ideology and support its active participation in the indigenous rights movement and the anti-nuclear movements (Chin 2010, Chiu, K. 2014, Guo 1985, Hsieh, S. 1987, Juan 2015, Stainton 2002). The atypical political attitude demonstrates the importance of employing a place-based, relational approach to investigating local political dynamics.

[50] Tribal meetings are promoted by the government in the state-approved tribes for facilitating self-determination over tribal affairs. Like other positions, the chair's political power relies on the actor's aspirations in combination with his internal and external networks, rather than as essentially given to the particular organization or position.

Resulting from the dialects between the two historical place-making processes, they represent three different, but often overlapping spaces of collective life in Taromak: the administrative (village), the social (community), and the ethnic (tribal) spaces.

The three positions were assumed by cultural revivalists when the campaign to take over the hydroelectric power station was launched. In the process, however, the convener of the CE project narrowly lost the seat of the village head in 2014 and then the presidency of the DCDA in 2016 to his Protestant rivals. This had immediate, direct impacts on the CE project. Had the convener not secured a leading position as the chair of the tribal meeting in 2016 thanks to the backfiring of the DCDA president's proposal to replace the traditional prayer with a Christian one at the millet harvest festival, he might have quit as leader of the project, which would have been a serious blow for the CE project's development. The political dynamics also resulted in the sudden dropping of the application for a government grant of 50 million NTD (around 1.36 million euros) due to the unexpected change in the DCDA presidency.

The project itself also became an implicit political arena. The installation of the PV system at the Tanan Presbyterian Church is a case in point. Although some cultural revivalists showed up at the press conference for solidarity and welcomed the church's support, discontent grew amongst them as this subproject was privately negotiated by the DCDA president with NGOs without notifying them and without following the collective decision-making mechanism. In response, the anti-nuclear activists who had been carefully engaging with both sides followed their proposal and facilitated the next installation at the Catholic Church.

The proposal for the installation of a 20 kW PV system at the Free Methodist Church in 2018 provides a different example of the interaction between the two coalitions. The pastor's sincere support for renewable energies prompted him to support this proposal in cooperation with leading cultural revivalists despite his suspicion of their motivations in other community-wide programs, while the latter welcomed his participation in the CE initiative despite their disagreement with his previous attempt to join the DCDA. Although this proposal was later withdrawn due to the church's rule against making profits with its property (such as by selling electricity to Taipower), it shows that the CE initiative is not yet considered as politicized as other community projects and that there exists a certain amount of room for cooperation between community members who usually belong to different political groups.

These events demonstrate the twofold effect of the CE project in relation to local politics. On the one hand, it aligns with modern lifestyles and traditional culture and can open up a space to engage the two coalitions to work together on the same project. As the common interests of the community are viewed by

both sides as the ultimate motivation for their political engagement, solidarity for the CE project that has earned Taromak nationwide fame is likely to remain. On the other hand, the project also deepens the disagreement between them by facilitating an increase in resources for competition and subsequently affects local power relations. Consequently, the CE project so far has had a limited effect on the reconciliation of the two coalitions.

In a broader sense, the political dynamics moreover indicates that an ideological politics between the state space and indigenous territories also occurs at the local level. For the cultural revivalists, the campaign for self-identification against what they call 'internal recolonization' (i.e. the 'Protestanization' agenda that seeks to replace traditional land-based faith with Protestantism) inside the community is as crucial as the indigenous rights movement against colonial states. Their identity claim is to empower the community members regardless of their descent and religion to confidently identify with Taromak's land and land-based culture, which was first denied by the colonial states and then demeaned by the Protestant coalition. In this sense, the consolidation of the place identity as the Taromak people is less concerned with exclusive boundary-making, serving more as "a force for inclusion and empowerment" (Castree 2004: 155, italics in the original) to tackle "the challenge of living together" in a place of historically constructed plurality (Massey 2005: 155).

Certainly, the 'inclusive' power of this identity claim may differ in relation to a member's bloodline and self-identification with the nobility-centered culture. It is also likely to be compromised if the fundamental disagreement on the priority of faith over culture (or tribe over church) remains unaddressed. Nevertheless, all community members, regardless of their religious preferences, have an equal right to attend community-wide events and are very much needed in the conduct of tribal affairs—as long as the boundaries between religion and culture are tacitly respected. Because the CE initiative is perceived as religiously neutral, it potentially decreases political barriers for community members to join, regardless of their religious preferences, while their participation in turn is essential for the initiative's development in the community.

The CE project may affect local identity politics in favor of the cultural revivalists in the long term. Apart from using 'energy autonomy' to promote tribal autonomy, Taromak's nationwide fame for pioneering CE can contribute to the community members' self-confidence and pride in the tribe. Additionally, by bringing new interpretations and practices to traditions (e.g. by linking traditional culture to modern renewable energy technologies), the cultural revivalists authenticate their creed of 'growing new shoots from the roots' and defend traditions against the label of 'backwardness'. In so doing, they point out a way besides 'Protestanization' to help the community thrive in modern society on its own terms. In this sense, the CE project could help them obtain 'autonomy'

not only in terms of gaining control of the resources on the traditional territory or greater energy independence from the state-run utility, but also in terms of the internal confidence to resist other forms of authority that stigmatize their land-based traditions and identity.

3.6 Conclusion

This chapter demonstrated that a grassroots innovation does not occur in a geo-historical and political vacuum. In the case of Taromak, the leading grassroots actors replaced their original call for the demolition of the hydroelectric power station with a focus on CE as part of their ongoing campaign for tribal autonomy that was lost in a process of colonization and modernization spanning more than a century. While the CE initiative was first proposed by external environmental activists to support their agenda for increased civic participation in the nationwide energy transition, these grassroots actors were motivated by their concerns about the exploitation of natural resources by the state for the benefit of the capitalist system on their traditional territory. This CE initiative is thus entangled with the development history of this indigenous community as part of its ongoing endeavor to remake the place and to reconstruct a place identity from the very beginning.

External activists in seeking to promote and nourish a renewable energy grassroots innovation in an indigenous community with historically created plural identity had to be careful from the very beginning to embed the idea of CE in the existing place vision for tribal autonomy and to show their respect for the subjectivity of grassroots actors in tribal affairs. Contextualizing the CE initiative according to these place-based needs and ends not only increased its appeal to and connection with the grassroots actors who are supposedly the main actors and beneficiaries of the project, it also helped external actors place CE in a favorable light in public and media. They could obtain support within and outside the community by highlighting the reciprocal relations between renewable energies and the indigenous culture. Owing to their alignment with key local actors and responsive media reports, a grassroots green niche space was created in this place, leading to increased access to local resources and members through the networks of leading grassroots actors, on the one hand, and those from the political system and the energy sector to sustain its development through the networks of the environmental activists, on the other. In so doing, the environmental activists also advanced their campaign for increased civic participation in energy transitions.

Although this win-win strategy (joining forces to further energy transitions and indigenous rights through a single initiative) does not erase the potential tension between the two agendas in practice (see Chapter 6), nor exempts the

project from all socio-material obstacles, it nonetheless demonstrates that a grassroots innovation takes place not mainly because it is somewhat protected from the socio-technical regime, but in fact because of its strategic engagement and co-evolution with the geo-historically produced complexity and politics of a community.

As the place is imbued with historically produced hybridity in terms of ethnicity, religion, value systems, identities, and more, the development of the CE initiative also has been influenced by the existing political interaction of two broad coalitions of divergent interpretations of the place's 'stories-so-far' and their competing visions for its future development—the one seeking to build a place-centered metabolism through reconstructing the land and land-based culture lost in the processes of colonization and capitalization, the other relying on churches to improve the socio-economic status of the 'deprived' community to help it adapt to modern capitalist society.

The findings suggest that the development of the CE initiative in the context is not only associated with the political success and failure of the leading actors; it also contributes to the political rivalry by bringing in more resources. Nevertheless, the positive connotations of renewable energies that could fit into both traditional culture and modern lifestyles also provide an opportunity for cooperation among community members supporting different place-frames and visions. While the long-term impacts of the CE initiative on the identity politics in the community is yet uncertain, it can be potentially conducive to the cultural revivalists' agenda for the reconstruction of the community's pride in its place-based indigenous identity. In this sense, the CE initiative is a grassroots place-making endeavor both in physical as well as cultural and psychological terms: it provides an opportunity for the community to proudly express its past, present and future to the outside world while securing fame and visibility that help boost the community's self-confidence in the once stigmatized place identity.

Prologue to Chapter 4

After having shown in Chapter 3 that internal place-making politics matter for the development of grassroots innovations, Chapter 4 will advance the discussion by exploring how grassroots innovations can emerge as a result of and link to external place-making politics. This is enabled through an examination of resistance to state-led land expropriation in Wanbao, a rural community in western Taiwan. While it may seem sudden to move from a focus on renewable energy grassroots innovations to those concerning agri-food practices, this was a conscious decision informed by three considerations. First, from a place-centered perspective, there is a continuity between the grassroots innovations in Taromak and Wanbao, as both cases involve reclaiming the subjectivity of grassroots actors in their attempts to regain control over their land and protect a land-based socio-culture that have been eroded in the modern capitalist society. Second, because the politico-economic marginalization of the rural community central to this case is also fundamental for the grassroots actors' experiences in Taihsi Village detailed in the next chapter, the discussion in this chapter could help the reader better understand the compound challenges facing the latter. Third, the cases of agri-food and energy grassroots innovations are shuffled in accordance with the aim of the thesis to challenge the sector-orientation assumed in conventional grassroots innovations studies and transitions theories in general.

This chapter is based on a paper submitted to *The Journal of Peasant Studies* in August 2020 titled 'Placing Land and Food Struggles in Structural Challenges for Rural Development: Insights from Wanbao Village, Taiwan', with several modifications made to the text. As the paper was written to address research gaps in land grab studies and alternative food networks (AFNs) studies, part of the theoretical section was shifted to Chapter 1 of this dissertation, and the introduction was revised to better link to the discussion on grassroots innovation studies that the thesis aims to advance. Similarly, while the order of the sections and main text remained largely unchanged, the subtitles, analysis, and arguments have been revised in accordance with the objectives of this thesis. For the same reason, the term 'AFNs' here has been replaced with that of 'agri-food grassroots innovations'. Lastly, a new conclusion has been written to

match the revised analysis, while more information regarding the community's development history, the political mobilization of the growth coalition, agri-food initiatives, local perceptions of 'sustainable development', and rural gentrification have been added to assist the discussion.

4 Defending Rural Space: Interlinking Organic Agri-Food Initiatives and Land Struggles in Wanbao Village

4.1 Introduction

> I told my youngest son that I wish to break new ground from here. All the lands will be passed down to him one day, so we must keep on cultivating even if it yields nothing. I feel affection for the place and my homeland, as we still live from agriculture. I don't want the lands received from my father to be lost in my hands. The past has hit a dead end. I do [organic farming] now to find a way out for my father's lands, and if I succeed, it could also be a new way out for the homeland.

When Chang Mu-tsun in 2004 explained to a journalist why he devoted his time to an organic agri-food initiative in Wanbao Village (灣寶里) in northwestern Taiwan (Feng 2004: 4), he did not know that the farmlands—the sacred inheritance that he had protected from an attempted land grab through a state-led industrial project around a decade prior—would face another industrial land grabbing attempt just a few years later. At that moment, he was only concerned with the future of conventional farming and the slim chances this rural village had to thrive in an industrial milieu. Organic farming for him served as a means to regenerate the rural place after the decades-long systematic sacrifice of farming and farmlands in Taiwan to industrial and urban development. To local farmers like him, farming and farmlands were not only a means of livelihood, but also the foundation of their sense of belonging.

His thoughts show that land, place, agricultural production, and rural development are intimately intertwined and present in the everyday realities of living in a rural place where agri-food grassroots innovations can emerge as an alternative means for rural development in a highly industrialized modern society. However, such place-based aspirations and emotions central to his devotion to the organic agri-food initiative and land struggles are likely to be overlooked by grassroots innovation studies that downplay site-specific needs and ends in favor of the formation of a systemic socio-technical transition beyond a single place. They are also likely to be put aside by alternative food networks (AFNs)

studies that investigate alternative agri-food initiatives in relation to global, industrialized food systems (Maye et al. 2007, Maye and Kirwan 2010) rather than to the structural challenges of agricultural and rural development alongside domestic industrialization processes. In addition, both lines of study are likely to fall short in exploring both land and food struggles in a synergetic manner that can capture the grassroots experiences of this community, which is known both as embodying the most successful struggle against land grabbing in the land justice movement in Taiwan and for its organic farming initiatives taking place alongside the land conflicts (Chen, Y. 2017, Chen, Y.Y. 2011, Chiang, H. 2013, Chiang, J. 2013, Hsu, H. 2014, Lai, S. 2011, Li, Y.H. 2011, Wu, C. 2011, Yeh, C. 2012, Yeh, M. 2012).

This chapter aims to investigate how a green niche space for agri-food grassroots innovations comes into being in this rural community and the role that external place-making politics play in the emergence of this hybrid space. It takes both land and food struggles as grassroots place-making actions responding to the broader pro-industrial politico-economic structure that has led to a socio-spatial transformation in this rural village over the past century, as the land grabbing attempts of two industrial projects here discussed show.

Thus, instead of studying Wanbao's land struggles in relation to a politics of control over land and land-based resources (Borras and Franco 2013, Hall et al. 2015, TNI 2013), this chapter situates them—as well as the agri-food initiatives—as part of a politics of place-making entailing the ongoing discursive and material construction of a place through the dynamic interrelations between daily practices *in situ*, such as agricultural activities, and geo-historically produced politico-economic processes beyond it, such as resource frontier-making of industrial capitalism, policies, global trade and more (Massey 2005). Struggles arise when the external projects and processes violate and ignore the residents' collective imaginaries of and visions for a place, whereby collective actions such as land struggles and agri-food initiatives can be organized by grassroots actors to assert their subjectivity in defining the past, present, and future of a place.

The chapter comprises four parts. It first traces the shared origin of domestic land grabbing in Taiwan and the prevalence of fossil fuel-intensive agriculture in rural areas that have significantly affected the development history of Wanbao so as to unpack the structural interconnections between the land and food struggles in this rural community. Second, it investigates local concerns over and reactions to external place-making projects through attempted land expropriation by two state-led industrial projects, showing how the place-frames evolved from inward- to outward-looking and invoked emotional people-place connections to defend the rural space. Third, it examines how three agri-food grassroots innovations emerged in the place and engaged with the capitalist agricultural regime and the broader socio-economic structure. Last, it

discusses the ways in which the agri-food grassroots innovations as place-making actions have the potential to address the socio-spatial differentiation and politico-economic marginalization facing the agricultural and rural sector in the capitalist industrial society through dynamic interrelations with the land struggles. I argue that the agri-food grassroots innovations and the grassroots green niche space in Wanbao emerged and developed not in isolation to the agri-food regime and the underlying politico-economic structure, but by actively engaging with a place-making politics of capitalist devaluation and exploitation of agriculture and rural space.

4.2 Responses to the marginalization of agriculture and rural areas

The origins of land grabbing and fossil fuel-intensive, industrialized, smallholder agricultural systems in Taiwan can both be traced to the commencement of the post-war capitalist industrialization period. As discussed in Chapter 2, the nationalist (KMT) regime carried out several rural land reforms between 1949 and 1953 after withdrawing from mainland China to the island, whereby smallholder farmers became the dominant force in agricultural production and the major landowners in rural areas (Ho 2015). With consequent changes in class relations, rapid industrialization was enabled by the state-led exploitation of agricultural surpluses to 'nurture' the nascent industrial sector (Gold 1986, Kay 2009, Lee, C. 2012). Heavy taxes and the state's strict control of the inputs and outputs of agricultural production were implemented often through rural socio-political institutions controlled by local elites in patron-client relationships with the KMT regime. As profits remained low, small-scale farmers increasingly relied on multi-locational and multi-sectoral income sources (Hsu, S. et al. 2016). Despite several policy measures having been introduced in the 1970s to address lagging agricultural profits and increasing labor shortages, such as those promoting mechanization and export-oriented cash crops, the overall downward trend persisted, while the agricultural sector became characterized by fossil fuel-intensive, industrialized agricultural practices serving to sustain further capitalist industrial development.

This section draws on recent studies on agriculture and farmland policies, land exploitation schemes, and land enclosures in Taiwan to outline how this political-economic structure gave rise to the development of state-led land grabbing in the form of industrial and development projects, which has been the most conspicuous attempt to change the rural landscape of Wanbao over the past few decades. It then shows how the socio-physical landscape of this rural community has come into being through community-led agriculture spanning generations, alongside the general marginalization of agriculture and the rural sector. The point here is to contextualize the following discussion on the

land struggles and the agri-food grassroots innovations in relation to the top-down and bottom-up place-making dialectics.

4.2.1 Domestic land grabbing in Taiwan

Land enclosure in Taiwan, which has attracted a great deal of public and political attention thanks to the efforts of the land justice movement in the early 2010s (Tsai, P. 2010), is driven primarily by domestic capital in the form of government-led non-agricultural development projects. Although most projects individually comprised areas smaller than 700 hectares, the land subject to controversial expropriation projects, as registered by activists between 2010 and mid-2016, totalled more than 11,000 hectares of public and private land, often involving prime farmland owned by the state-run sugar corporation and smallholder farmers in rural areas (Hsu, S. 2016).

The farmland rush associated with the industrial expansion and urban sprawl has its historical roots in the politico-economic marginalization of the agricultural sector, which has been ongoing since the 1960s (Lee, C. 2012). Since the 1970s, the profits of land speculation have served as a pivotal source of politico-economic power for business elites and local politicians (for details, see Chao, Y. 1998, Chen, D. 1995, Jou and Chen, D. 1998, Chen, M. 1998, Lee, C. 2012, Wang, J. 1993). From the late 1980s, these elites were able to influence land policies, taking advantage of conflicts within the KMT in the country's democratization process to further their own agendas. They came to present a 'new landlord class' (Lee, C. 2012), or a dynamic 'growth coalition', along with bureaucrats and politicians in central government that steered land grabbing activities in Taiwan (Chung L. and Hsu S. 2012a, Jou and Chen, D. 1998, Hsu, S. 2013, Hsu, S. and Liao, L. 2011, Lan and Lee, C. 2015, Yang, Y.R. and Su, I. 2005).

The realignment of the state, consortia, local factions, and associated land interests (Chen, D. 1995, Chu, Y. 1992, Hsu, S. 2012d, 2016, Wang, J. 1993) drove the neoliberal turn in farmland policymaking since the late 1980s that produced institutional conditions favorable for land frontier-making through speculation and acquisition (Lan and Lee, C. 2015, Lee, C. 2012). Spurred by neoclassical economic thought popular among technocrats and in academia, the state launched a series of relaxations of farmland regulations to boost industrial and commercial development, including the Farmland Release Policy of 1995 and the Amendment of Agricultural Development Act of 2000; together these reduced the transactional and administrative costs related to the purchase of farmland (Hsu, P. 2014, Lan and Lee, C. 2015, Lee, C. 2012, Lo 2001). Thereafter, the protectionist regulations governing the control of farmland were replaced by near-free-market conditions. As a result, the following decades witnessed an acceleration of land speculation and the loss of farmland

that have seriously compromised the objective of the agricultural policies of reshaping rural space as sustainable 'ecological-production-living' space (Lan and Lee, C. 2015).

Such acts of domestic land grabbing are institutionalized and mostly enacted by the state in the name of economic development, resulting in a 'regime of dispossession' (Levien 2015), in which the state appropriates land from small landowners by means of extra-economic coercion on behalf of capitalists to serve particular class interests. They can be initiated either by central government in the name of national economic projects or by local governments for countywide industrial and development projects (Tsai, P. and Hsu, P. 2011). Either way, it usually involves the formulation, expansion, or modification of urban plans by local governments to allow for the generation of windfall profits through the conversion of agricultural land into commercial and residential land, with consequent skyrocketing prices. Most profits generated from the sale and purchase of estates, construction works, and financing are funnelled to the 'growth coalition' (Lee, C. 2012), thereby "redistributing landed wealth upwards" (Levien 2015: 147).

This regime of dispossession has been integrated into the country's democratic politics, whereby politicians and the government across scales play not only the role of main infrastructure investors and land brokers, but also that of key beneficiary of the political and economic gains. Land enclosure helps county governments, often linked to local factions, to address their financial backlogs by increasing land taxes facilitated by land-use change and by selling expropriated land while producing rents that are vital for consolidating the power of local factions (Hsu, P. 2014, Hsu, S. and Liao, L. 2011, Hsu, S. and Cheng, C. 2011, Hsu, S. 2016, Tsai, P. and Hsu, P. 2011). Additionally, development projects framed as economic injections help politicians win votes (Lin, L.X. and Tsai, P. 2012, Tsai, P. and Hsu, P. 2011). Consequently, as Ben-Chuan Liao (2013: 155-156) notes, the Land Expropriation Act "becomes the most convenient tool for the powerful" that enables them to maintain their politico-economic interests (Figure 4.1).[51]

[51] Two mechanisms of land expropriation exist in Taiwan: 'government-purchased land expropriation', whereby land is confiscated at a fee much lower than the market price of the land, and 'zone expropriation', whereby landowners can choose between monetary compensation and compensation in the form of smaller pieces of land at an equivalent market value. As zoning expropriation is often framed by the government as a means of 'joint land development', albeit the landowners are forced to join, and allows more space and land for land speculation, it became the most popular tool for the state-led land grabbing, and was criticized most by the land justice movement (for more discussion, see Chan, S. and Lee, M. 2012, Chung, L. 2011, Chung, L. and Hsu, S. 2012a, 2012b, Hsu, P. 2014, Hsu, S. 2016, Hsu, S. and Cheng, C. 2011, Hsu, S. and Liao, L. 2011).

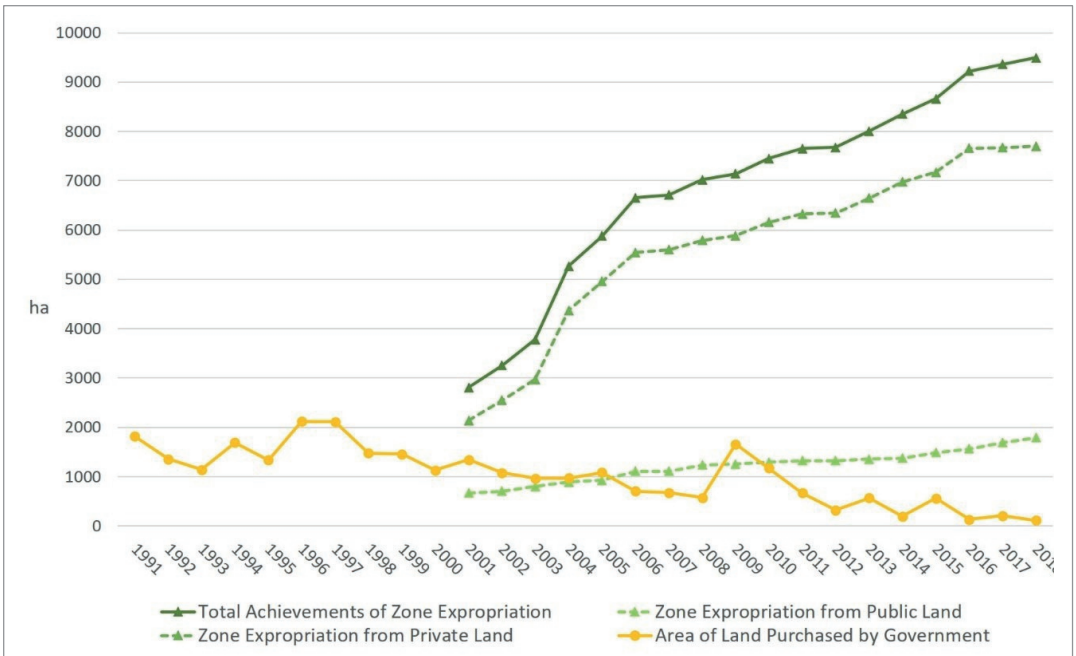


Figure 4.1: Land expropriation in Taiwan since 1991. Despite the absence of data on zone expropriation as a form of land expropriation before 2000, the graph nevertheless shows how the past two decades have witnessed a decline in government-purchased land expropriation (yellow line) and a dramatic increase in zone expropriation (green lines), especially from private land. Source: Figure created using data from MOI (2000, 2019).

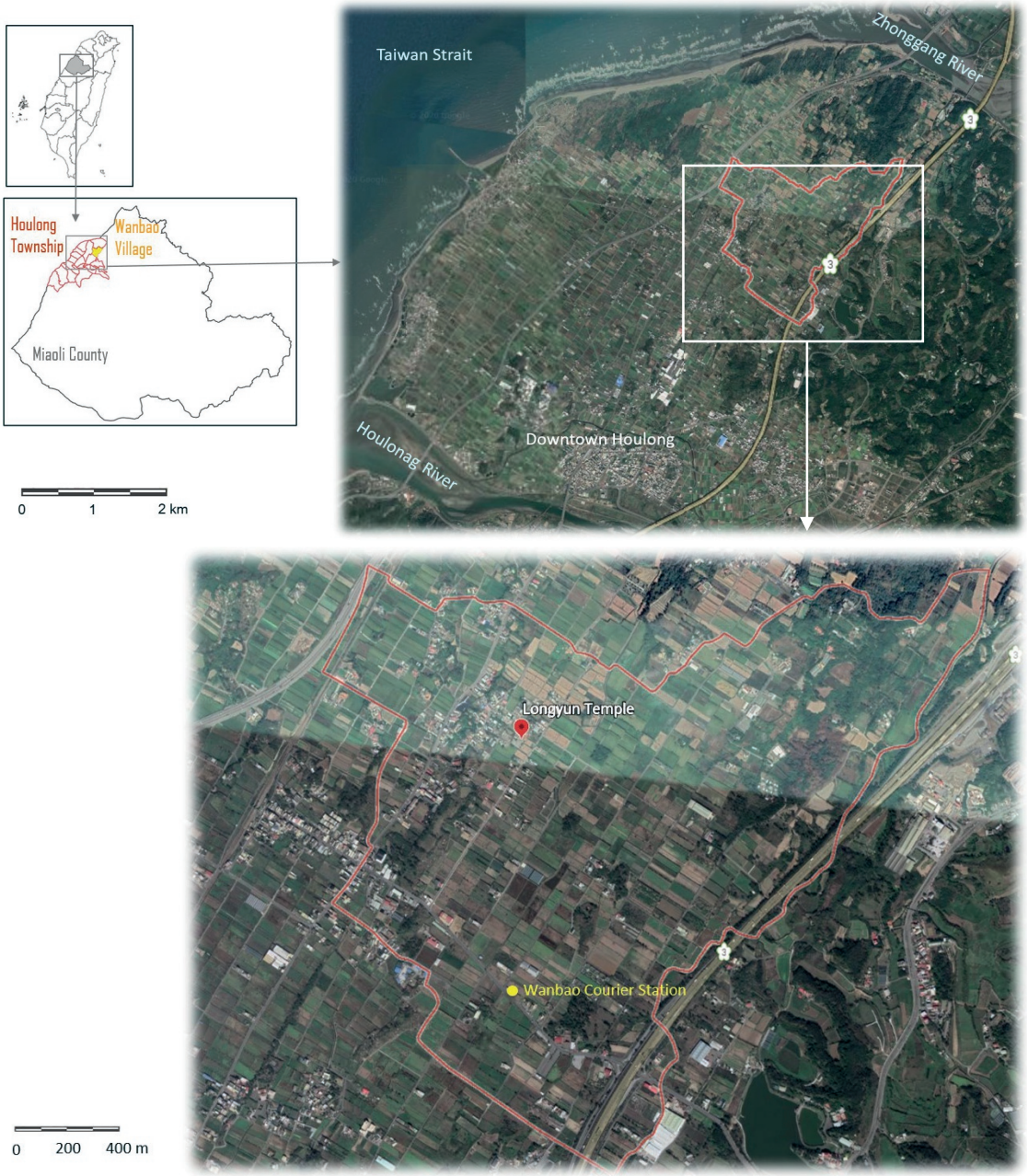
Land grabbing in Taiwan after the 1990s therefore can be seen as a combination of real and 'virtual' land grabbing (McCarthy et al. 2012): behind the façade of land acquisitions for economic development often lies a hidden agenda of land speculation and the consolidation of political power by land-related interests. Unlike the developmental, state-led economic projects of the 1970s and 1980s, many of the projects proposed by the 'formalist developmental state' are in effect decoupled from actual industrial and housing needs (Lee, C. 2012, Hsia, C. and Chi, C.L. 2012, Tsai, P. and Hsu, P. 2011). Many costly industrial complexes erected after the acquisition of land remain underused, suggesting the impropriety and cost ineffectiveness of these projects (Control Yuan 2017). Despite growing criticism from scholars and activists, more than 100 development projects were proposed by vote- and rent-seeking candidates across parties during the 2014 local election (Wu, Z. 2014), while the amount of land subject to expropriation for state-proposed projects nearly doubled between 2011 and 2014 (Lin, H.J. 2014).

State-led land enclosure is often justified by two interrelated ideological myths prevalent in policy and media discourses. First, land expropriation is often described as necessary for development projects, whereby the opponents of land expropriation are condemned as impeding economic development (Hsu, P. 2014). Underlying this myth is the capitalist obsession with economic growth consolidated during Taiwan's 'economic miracle' in the 1970s and 1980s, which normalizes the loss of prime farmland to industrial and urban projects in the name of 'progress' and 'development'. Second, it is assumed that the private interests of a handful of landowners can be sacrificed in the name of an ambiguous 'public interest' embodied by state-endorsed projects (Chan, S. and Lee, M. 2012, Hsu, S. 2012b, 2012c, 2013, 2016). This calculative perspective degrades victims rejecting land expropriation to selfish fortune seekers and frame their struggles as merely an instrument for better terms of incorporation (Liao, B. 2013, Hsu, S. 2012c).

To counter domestic land grabbing accelerated by the economic slowdown and intensified competition in elections over the past two decades (Lee, C. 2012), the land justice movement composed of scholars, activists, students, and affected communities emerged in 2009 (for details, see Tsai, P. 2010). Led by a civic organization, the Taiwan Rural Front (TRF), it became one of the most influential social movements in Taiwan over the past decade. Wanbao Village, as one of several foci of the movement, is a rare success in countering land grabbing.

4.2.2 Agricultural development and grassroots place-making in Wanbao

Wanbao Village, home to a declining population totalling fewer than 1,500 people, is located in Houlong Township (後龍鎮), Miaoli County (苗栗縣) in northwestern Taiwan, where industrial development has lagged behind that of neighboring Hsinchu and Taichung counties due to the county's rugged, mountainous terrain (Map 4.1) (Miaoli County Government. 2020). Most of the village's 356 hectares of farmland is used for growing rice and watermelons, along with sweet potatoes and other vegetables for the domestic market. This landscape, that has been transformed from sand hills covered by grass and sparse chinaberry trees into agricultural farmland, is a result of three centuries of agricultural endeavors.



Map 4.1: The administrative borders of Wanbao Village (in red). The community that mobilized in the land struggles roughly resides in, but is not confined to, the area. Source: Compiled by the author based on Google Earth images.

For centuries, the place now known as Wanbao had not appealed to indigenes and Han migrants due to its marginal location and the relatively harsh physical environment unsuitable for agricultural production. It was once a hunting ground for deer and grazing land for cattle belonging to the Taokas people,[52] who gradually assimilated into the agricultural society of Han migrants who rushed into the Houlong area in the mid- and late eighteenth century (Chen, Y. 2017, Huang, P. 2002, Huang, W. 2011, Kuo 2003, Shu 2008). The area remained relatively underdeveloped in the following century, even though the riverside to its south started to thrive through its connection to Houlong port, for trading local products with other ports within Taiwan and in south-eastern China. After the mid-nineteenth century it became a hub for the trading of lucrative camphor and tea products produced upstream along with local agricultural products that were exchanged for handcrafted products from China.

The community in this place was established by a few Han families migrating from the Kinmen Islands in the eighteenth century who adapted to the area's windy winters and were able to work the water-permeable, infertile, sandy soil by utilizing the hilly terrain as a windbreak and a large natural pool as a source of water to irrigate and cultivate rice and other crops (Chang, H. 2008, Chen, Y. 2017, Huang, P. 2002, Shu 2008). When the pool dried up in the late eighteenth century, rain-fed crops were cultivated up to the mid-twentieth century. As was common elsewhere (Chen, C.N. 1990), the early residents depended on cooperation between family members to cultivate the land and to protect their estates (Chang, T.B. et al. 2003, Chang, T.B. 2009), whereby kinship became the primary social institution driving social mobilization and economic production. While conflicts between families for land were not uncommon, they shared the same culture and lifestyle imported from Kinmen, which contributed to the formation of the community.[53]

Thanks to the limited amount of water needed to grow rice and sugar, the community was safeguarded from direct exploitation by the Japanese colonial government and sugar capital (Chen, Y. 2017, Hu 2015). Despite relatively poor production conditions, place attachment was strengthened in the twentieth century when peasant families obtained land through the release of shelter-forest

[52] The Taokas people formed a sub-group of the Pingpu peoples (the 'plains indigenous peoples') living in the Hsinchu, Miaoli, and Taichung areas (Chang, H. 2008, Huang, W. 2011).

[53] Few records remain about the life of Wanbao in the eighteenth and nineteenth centuries, but oral histories suggest that a few new families migrated to the area and that one of the earliest families left Wanbao somewhere in the following two centuries (Chang, T.B. et al. 2003, Chang, T.B. 2009). Most residents in the village belong to one of the four extended families who first settled in the place, despite the fact that many of their members have migrated to cities since the mid-twentieth century (Chang, T.B. et al. 2003, Huang, P. 2002).

land by the Japanese colonial government and from the largest local landowning family through post-war land reforms (Chen, Y. 2017, Hu 2015). Like other rural areas in Taiwan, the agricultural technologies introduced and smallholding-based landownership consolidated by the Japanese colonial government in the early twentieth century and the nationalist government in the 1950s, boosted local agricultural productivity. Nevertheless, the state-led exploitation of the agricultural surplus for industrialization triggered an unremitting population outflow to nearby downtown areas and cities since the 1960s (Chang, T.B. et al. 2003, Hu 2015).

A great transformation of the local agricultural landscape took place alongside state-promoted agricultural modernization in the 1970s (Chang, T.B. et al. 2003, Chang, T.B. 2009, Chen, Y. 2017, Hu 2015). Local farmers seized this opportunity to improve production conditions. They donated 18% of their land in participating in the government's farmland readjustment scheme, whereby the rugged, fragmented farmlands were transformed into flat, checkerboard-like fields with well-ordered irrigation channels and roads. Consequently, Wanbao was officially declared a 'special agricultural district' in 1975, signifying the institutional recognition of local farmland as high-quality agricultural land. Moreover, with tremendous effort and investments by local farmers in soil improvement and the completion of the Minde Dam in 1970 partly enabled by special tax collected from farmers in this region, the local farming system changed to one of paddy-upland crop rotation, whereby a newly introduced variety of watermelons became the primary economic crop.

Yet the shift to capital-intensive farming with the introduction of chemical pesticides in the 1970s and agricultural mechanization in the 1980s came at a socio-ecological price. A visible decline in local biodiversity was observed by the locals, while migration persisted (Huang, P. 2002), leading to the erosion of kinship ties that had structured the community's social and economic relations. Moreover, this migration trend and the parallel implementation of the fallow land policy led to an increase in unattended land in the following decades.

Nevertheless, the sense of community was maintained with the establishment of the Longyun Temple in 1968 and its reconstruction in 1998 following general agreement and community fundraising efforts (Chang, T.B. et al. 2003, Chang, T.B. 2009). As the community's spiritual and community center, the temple's religious activities have helped preserve and strengthen local social networks, the traditional culture, and a rural lifestyle (Chen, Y. 2017). With community-wide support, Chang Mu-tsun's wife, Hong Hsiang, won a seat on the township council in 1993, which not only resulted in another upgrade of agricultural infrastructure financed by the Council of Agriculture (COA) in the early 2000s, but also helped strengthen local resistance to the first land grab.

4.3 External place-making politics: bottom-up resistance to top-down land grabs

Despite improved agricultural production conditions after collective endeavors of the community, Wanbao was not free from the land rush associated with industrial expansion emerged alongside the marginalization of agriculture and the rural sector in the process of capitalist industrialization. This section investigates resistance to land grabbing attempts through two state-led industrial projects in relation to the grassroots actors' sense of place. These moments of place-making politics are important for studying grassroots innovations from a bottom-up perspective not only because they present one of the most urgent concerns facing the community, but also because they can shed light on how the grassroots actors perceive the place and imagine their relations with it. As I will show in the following sections, these moments have helped set the stage—socio-politically and epistemically—for the formation of the agri-food grassroots innovations.

I focus on the place-frames that emerged in the land struggles in which key actors/institutions discursively grounded their political actions by means of the strategic selection and interpretation of the community's geo-histories (Pierce et al. 2011). In so doing, I will show the role of place attachment that stood out in the place-frames in challenging land grabbing in rural areas, as well as the evolution of these place-based collective-action frames from an inward-looking to outward-looking place identity that justified and increased public mobilization (Benford and Snow 2000, Hunt and Benford 2004, Martin 2003, Polleta and Jasper 2001, Snow 2001).

4.3.1 'A village of sadness' and the first land struggle (1995-1996)

In 1994, the National Science Council (NSC) initiated the fourth expansion phase of the Hsinchu Science Park project —HSP4—as part of the country's shift toward high-tech industries in response to the neo-protectionist economic policies of advanced economies (Chu, Y. 1992). Three locations were proposed in alignment with diverse political interests, of which the Houlong location proposed by KMT legislator Liu Cheng-hung, a staunch promoter of agricultural land deregulation in the 1990s (Wu, Y. 2007), became the preferred option in January 1995 due to the comparative lowest estimated cost of land acquisition (Chen, Y. 2017, Chiang, J. 2013).

The community of Wanbao, which enclosed the majority of private land in the 356-hectare Houlong location, was divided on the issue of land expropria-

tion. The village head and a minority of affected landowner established a registered organization to support the project,[54] whereas the remaining landowners tried to oppose it by forming a self-help group supported by the local township councilwoman. After collecting signatures from landowners opposing land expropriation, the self-help group lobbied the NSC, Miaoli County government, and the township government to halt the project. Partly due to these acts of resistance, and partly due to competition among local factions, the Houlong location eventually fell away as candidate location in June 1996, ending the one-and-half-year land struggle of these landowners in Wanbao.

As the site selection was closely linked to competition between local factions, local mobilization to support the Houlong location was in a sense an extension of the pre-existing rural politics. As political followers of Liu, who is the head of a powerful political family in Houlong (Huang, P. 2002, Li, M. 2002), the village head and the majority of politicians in the township welcomed the project as providing an economic stimulus. They presented themselves as the 'local' voice of the township, downplaying the objections of most affected landowners in Wanbao Village by proclaiming these a negligible exception.

To counter this narrative, the opponents in Wanbao drew on stories of historical land reclamation, highlighting the painstaking devotion to the improvement of the local agricultural environment (Chang, T.B. et al. 2003). In their petitions, they framed the place as the result of residents' collective agricultural endeavors that had started before the nationalist state ruled the island and had received little support from the state. In this way, they strove to obtain the moral high ground by justifying their struggle against land expropriation as resistance to their expulsion from a place of their own making, in addition to as exerting their 'right to live' which is enshrined in the country's constitution, and as protecting the sacred inheritance passed down by their forefathers.

Paradoxically, they did not challenge the capitalist rationale underlying the economic development narrative when criticizing local politicians' motivations and procedural misconducts in promoting the Houlong location. They accepted the official geographical imaginary of Wanbao as one of the least-developed areas in Houlong, framing it as 'a village of sadness' that was consequently chosen to be sacrificed for the industrial development of this area (ibid: 41) despite their suspicion that this disadvantaged status was intentionally constructed and maintained by the state to legitimize land expropriation under the guise of balanced regional development. Similarly, their main critique of the HSP4 was related to the siting, rather than to its necessity. This indicates an

[54] Around 30% of affected landowners gave their consent for the proposed land expropriation, who owned less than 25% of the private land located in the Houlong location (Chang, T.B. et al. 2003).

inward character of their place-frame not unlike NIMBYism ('not-in-my-back-yard-ism'): they rejected land grabs in this place, but not those occurring elsewhere. Indeed, the victory of their land struggle unintendedly facilitated—and was partly enabled by—land grabbing in other locations advocated by other rent-seeking, land-related interests.

Nevertheless, the land struggle significantly changed the community's internal politics. To retain political momentum, the leading opponents converted the self-help group into the Wanbao Community Development Association (WCDA) in 1996 following the state's promotion of 'community building' in the 1990s. To secure internal political support for the WCDA, they nominated 'their own man' to run in the village head election in 199, who won the seat and has occupied the position ever since (Hu 2015). These socio-political changes strengthened their capacity for community-wide mobilization, which was crucial for the success of the second land struggle.

4.3.2 An embodiment of rural areas and the second land struggle (2008-2011)

After becoming the Miaoli County magistrate in 2005, Liu Cheng-hung initiated the Houlong Science and Technology Park (HSTP) project, an industrial complex for traditional manufacturing at the Houlong location that had been proposed for the HSP4. Like its predecessor, most private land suggested for land acquisition together belonged to around 430 landowners in Wanbao Village and the nearby area.[55] After learning about the project in late 2008, around 300 affected landowners—many of them having resisted land expropriation more than a decade prior—immediately established a self-help group to kickstart action with the support of their families and relatives living in and beyond the community. This time, with the commitment of a local artist who moved back to Wanbao after the first land struggle, they reached out through the Internet and personal networks for support from environmental and agri-food scholars, activists, college students, independent journalists, and legislators. By boycotting all local stakeholder meetings and organizing 14 protests in Taipei, the two-and-half-year struggle ended in a victory when the Regional Planning Committee (RPC) of the Ministry of the Interior (MOI) rejected the project in April 2011 due to the county government's failure to obtain majority consensus and to adequately motivate the need for a change in land use within this special agricultural district (CPA 2011).

[55] According to local estimations, fewer than 30% of affected landowners in the community welcomed this land expropriation effort, for three main reasons: they were either in need of money, had moved away and had no senior family members who remained, or had jointly owned the land and preferred to receive their shares in monetary form.

Similar local politics were at play this time around. The county government-led coalition supporting the HSTP, which comprised almost all politicians at the township level, again invoked an economic development narrative, casting the project as a solution to the area's 'underdevelopment'. Similar to the 'marginal lands' argument common in the global land rush (Borras and Franco 2013: 1729), the county government downplayed the agricultural performance in Wanbao in favour of the HSTP's purported benefits, thereby contradicting its earlier praise of this place as the "main production area for watermelons in Houlong" (Yeh, L. 2008: 16).

Although this narrative was refuted by opponents and examiners in a RPC meeting in mid-2009 (CPA 2009), the project continued for another two years, likely owing to the magistrate's political power at both the local and central government levels. Besides a smear campaign and peer pressure to weaken the local opposition, as had happened before, the growth coalition launched a petition signed by almost all local elites to promote the project, even though some of them have strong interpersonal relations with the leading opponents in Wanbao. This illustrates the magistrate's power over local politicians who needed county government budgets to construct vote-attracting infrastructure. It also created a public impression of local 'solidarity' with the magistrate, enhancing his bargaining power with the then-KMT-led central government while casting the opponents as an impediment for local 'public' interests.

Place identity also played a role in the pro-HSTP campaign. As a key element of social relations and rural politics in Taiwan (Chen, M. 1998) and an effective political tactic to win votes in this area, territorial bonds were invoked by the magistrate to increase his credibility in the eyes of local opponents. As a promotional leaflet declared, "Magistrate A-Hung is a son and brother of our Houlong and has lived in Houlong for 64 years. He cares for this land with love" (Miaoli County Government, cited in Hong, C.P. 2010). By referring to himself using a rural-style nickname and by stressing his identification with this area, he replaced the community-based place identity of the self-help group—as the Wanbao people—with one based on the township—as the Houlong people—whereby he became 'one of our own' while marginalizing the dissent in Wanbao with the township-wide pro-HSTP voice.

To counter pro-HSTP political mobilization at the township and county levels, the Wanbao self-help group stressed action at the community and national levels. Internally, drawing on lessons learned during the previous struggle, they strived to build a sense of community solidarity by persuading villagers who welcomed land expropriation to withhold their opinions. As the village head explained,

> We reasoned with them, telling them that it's fine to agree [with land expropriation], but not to talk about it. [...] Our protest may fail in the end, but at least it might help you [pro-land expropriation landowners] to get a better expropriation price and better terms for your land.

Even if the wooing tactic failed, it would have been difficult for the landowners who welcomed land expropriation to mobilize in an organized manner, as no socio-political leader in the community sided with them this time around. Due to the completion of local agricultural infrastructure upgrades, the village head was not subjected to the magistrate's influence through the allocation of county government budgets. His firm support for the self-help group led by key actors in the WCDA created a unified socio-political atmosphere in the community in support of the resistance to the land grab.

Externally, the self-group drew significant public attention to their cause through trans-local mobilization in collaboration with the TRF and other land struggle movements across the country, including by means of an overnight mass demonstration against land enclosure in July 2010 triggered by another controversial case in Miaoli. The growing social pressure urged the premier to voice his disagreement with the conversion of high-quality agricultural lands for non-agricultural purposes. This led to the COA's attitude shifting from respecting to rejecting the land-use change proposed for the special agricultural district in Wanbao, which contributed to the RPC's decision to reject the project in April 2011. In this sense, extroverted place-based activism helped the self-help group obtain extra-local social and political leverage "to create changes in the opportunity structure" that came to surpass the magistrate's political power (Borras and Franco 2013: 1733, Yeh, M. 2012).

Reframing Wanbao in the nationwide land justice movement

External networking with the land justice movement transformed the place-frame of Wanbao. On recommendation of TRF-associated scholar-activists specializing in rural development and land policies, Wanbao became depicted as a state-endorsed, fully functioning rural community suitable for organic farming, whereas the industrial project was cast as a threat to the community's sustainable development. This place-frame joined the movement's discourse in demanding that the state acknowledge and defend the multiple values of smallholder farmers and agriculture against industrial land enclosure. In this way, the land struggle became a form of resistance to the systematic exploitation of the rural areas and farmers across Taiwan, as much as embodying the rejection of an industrial project in a specific rural village.

The discourse also challenged the ideological myth of industrial projects as the best means of delivering 'economic development' and 'public benefit'. It

stressed the threat that HSTP would pose to food security, agricultural development, and national spatial planning objectives for the sake of the personal gain of a few rent-seeking elites. By redefining 'economy' from the perspective of the affected farmers and the commoners, the protection of 'private' land ownership and agricultural practices was turned into the defense of the 'public' interests of society at large.

Notably, in addition to land ownership, the self-help group strove to defend the right that "the future of the place should be collectively decided by the community members" (MHWSG 2011). As Huang, H.H. and Hsu, S. (2017) argue, the controversies over land expropriation concerns not merely the state's abuse of power in transforming land use, but also the institutional exclusion of the residents in deciding the future development of their place. Farmland in this place-frame thus can have other values and meanings besides merely serving as economic input and a locale for agricultural production. As one press release by the self-help group stated (MHWSG 2009),

> We have learned from experience that land is valuable in terms of 'affection' and 'identification'. Our forefathers repeatedly told us that 'land is hope'; our proverb goes: "farmland first, wife and children second." […] Everything we have is a gift from the land. The land is our lifeblood and roots.

This emphasis on the emotional value of land challenges the reductionist, materialist perspective of agricultural land in the economic development narrative. The story of land reclamation was reinterpreted to testify of the grassroots actors' attachment to and responsibility for the land. By means of inter-generational agricultural production, farmland became a vessel containing family histories and collective memories of the community. It became a metonym of the place, representing the homeland, the lives they built on it, and their individual and collective identities. In this way, land grabbing became place grabbing and life grabbing in that it involved not just an expulsion from and dispossession of the land, but also the brutal erasure of the community's 'stories-so-far' and the denial of their subjectivity in determining the place's future and their ways of life (Massey 2005: 130).

This emotion-imbued place-frame was strategically deployed by the self-help group to balance the power asymmetry between them and the technocrats. With the help of TRF scholar-activists' problematization of 'scientific' knowledge informing policy and regulations, they focused on articulating local knowledges about the place to discredit claims made by local authorities. As the village head explained, "When we were talking about how the land became the way it is nowadays, the committee members and county government officials were unable to retort, because no one knew better than us locals."

To authenticate their attachment to land/place, they invited different speakers, mostly senior farmers, to express their feelings at each committee meeting and press conference and rejected any attempt to negotiate the terms of incorporation. By engaging these voices in the place-framing process, they also enriched the campaign discourse and drew more media attention and public sympathy. In this way, this place-framing contributed to public mobilization both within and beyond the community.

More importantly, these stories about emotional connection to land and the place illustrates the importance of renouncing the capitalist episteme and its terminology to counter land grabbing, which has been stressed in the land justice movement. On the one hand, the emotional discourse challenges the 'scientific', 'objective' language that dominates modern industrial civilization and the policy domain (Tsai, P. and Hsu, P. 2011); on the other hand, it articulates the disruption of sense of place and the injustice brought about by the failure to recognize this (Hsu, S. 2012a, Hsu, S. and Liao, L. 2011, Huang, H.H. and Hsu, S. 2017, Schlosberg et al. 2017).

The second land struggle was thus much more critical than its predecessor: along with political resistance to land expropriation, it tried to challenge the epistemic and institutional structure that sustained industrial land grabbing at the expense of agriculture and rural development. By strategically shifting from an inward-looking to an outward-looking place-frame with an emphasis on place attachment, opponents in Wanbao managed to transform the defensive activism against land grabbing in this rural village into part of a critical movement that challenged the broader agriculture-industry power asymmetry.

4.4. The emergence and development of three agri-food grassroots innovations

Three innovative agri-food initiatives emerged in Wanbao after the victory of the first land struggle. In addition to the preservation of farmland, the unified socio-political atmosphere in the community that was retained afterwards created 'an alternative milieu' conducive to grassroots experiments (Longhurst 2013, 2015). This section examines the development of these agri-food grassroots innovations in relation to the socio-technical regime in the agricultural sector and the underlying politico-economic context articulated in the place. The findings suggest that the agri-food niche practices' potential for systemic transformation is likely to be limited if the structural challenges that sustain the marginalization of small-scale agriculture and the rural sector remain unaddressed.

4.4.1 The 'Organic Ecosystem Art Village' and community development (2002-2005)

Given the low levels of industrial pollution in this village, the WCDA deemed organic farming fit and promising for the development of this rural community when a local ceramist working for the WCDA proposed the idea. In 2002, it initiated the 'Organic Ecosystem Art Village' project as a central part of its community-building drive with the sponsorship of two central government agencies and in partnership with the Homemakers Union Consumers Co-op (台灣主婦聯盟生活消費合作社, HUCC), a civic organization that pioneered the promotion of organic agri-food production and consumption in the 1990s (see Chapter 1). The HUCC provided the know-how on organic watermelon farming through two educational excursions and twelve training sessions in addition to offering a space on its own sales channel to sell the products (Hsieh, L. 2009). Six of a dozen farmers receiving the training tried their hand at organic watermelon farming, but in the end only three of them, including Chang Mu-tsun and Hong Hsiang, became organic farmers contracted by the HUCC while others gave up due to a poor market response in the initial phase. Despite the limited achievement and scale, this initiative sowed the seeds for organic farming in the community and brought about cognitive change regarding chemical-intensive conventional farming for the three farmers and their families (Chang, M. and Hong, H. 2009: 40), who continued organic farming in cooperation with the HUCC after the project came to an end in 2005.

Along with the initiative, the WCDA conducted several parallel activities that enhanced the community's sense of place. This included an exhibition of historical pictures and stories provided by villagers, whereby the collective memories forged by dwelling in and making this place through agricultural production were articulated, exchanged, and formalized. They were published by the WCDA along with the documents on the first land struggle in a book as part of *The Story of Our Village* (Chang, T.B. et al. 2003). Another activity conducive to community cohesion and place attachment was the annual watermelon festival that has been organized since 2002, in which watermelons are celebrated as a symbol of the place, articulating and embodying the unique biophysical environment, the hard work of farmers, and the community's shared life experiences (Chang, C. 2013, Su 2009). The festival also provided a unique space where consumers could connect with local farmers and the community (Figure 4.2).

Figure 4.2: The ninth annual Wanbao watemelon festival took place in front of the Longyun Temple in Wanbao on June 9th, 2010. HUCC staff and members joined the event and had group photos taken with the farmers it contracts. Source: Photo taken by the author.

4.4.2 The countryside as a 'Green Magic School' (2011-2012)

Between 2009 and 2012, a group of students who supported the second land struggle, known as the Fangu Youth (返穀青年 literally meaning 'young people who return to grains' and a homophone of a phrase meaning 'rebellious youth'), formed a partnership with the community and launched the second agri-food initiative in the community after the struggle.[56] Echoing the discourse of the

[56] Most members of the group majored in land economics and urban planning and were inspired by a course on public participation at the Center for the Third Sector at National Chengchi University, chaired by a prominent TRF scholar-activist. Despite being in line with the TRF's emphasis of 'encouraging young generations to enter and forward the countryside' (Tsai, P. 2011), they did not consider themselves part of the TRF and worked mostly on their own. As such, this agri-food initiative seldom referred to the idea of food sovereignty as introduced by the TRF in alliance with the international peasant movement La Via Campesina (Lin, L.X. and Tsai, P. 2012).

second land struggle, they aimed to "search for the possibilities of the future of the countryside and to prove that rural areas can represent a significant future direction for development" (Fangu Youth 2013). With the support and help of leading local actors and a government grant, they started a scheme of purchasing agri-food products directly from a few local farmers and organizing three farming workshops, whereby urban families could visit the place and get hands-on experience in growing watermelons, peanuts, and rice in an organic manner. This initiative paid less attention to promoting organic farming practices to local farmers or to transform the fossil fuel-intensive farming system in this place, which were beyond the capacity of these students who had limited agricultural experience and prior knowledge.

This initiative differed from its predecessor in several ways. First, the students relied heavily on the hospitality, social networks, and agricultural knowledge of the leading grassroots actors to carry out the initiative, who thus came to play multiple roles ranging from agri-food producers and knowledge and resource providers to homestay hosts. Second, this initiative tried to engage villagers beyond the leading actors' circles in community affairs, including by establishing a community library for children and holding workshops on place visions to enhance local participation (Wu, C. 2011). Third, this initiative concerned agri-food education more than it did production and consumption in line with the Fangu Youth's mission to 'learn from the rural areas and help the rural areas learn' (Fangu Youth 2011). The workshops were thus designed to connect participants with the land, crops, and farmers called 'teachers in the field', whereby farmland became an educational space—a 'Green Magic School'—in which to learn about the non-monetary value of agriculture and rural space. As such, despite an overlap in membership and shared emphasis on environmental protection, food quality, and respect for agri-food producers, this initiative ran mostly in parallel with the organic farming activities associated with the HUCC.

4.4.3 The joint farming team (2013-present)

The third agri-food initiative emerged after the Fangu Youth left the community in late 2012. When Chang Mu-tsun passed away in early 2013, five of Hong Hsiang's siblings living nearby, the village head, and the other farmer contracted by the HUCC accepted Hong's invitation to form a joint farming team to continue with organic farming. The better price for organic products, mostly sold to the HUCC under contract, provided sufficient profits to sustain the operations: in keeping with smallholder farm customs, members shared the risks and profits and did most of the farming with the help of family members and occasional external workers recruited through local social networks (Figure 4.3).

Hong Hsiang made the decisions on when, what, and where to grow and harvest after consulting other members and considering the requirements of sales channels, the climatic conditions, and agricultural policy changes. They grew watermelons, sweet potatoes, daikon, and rice on a rotational basis without any chemical inputs on around ten hectares of land scattered around the village, mostly self-owned and partly rented from other landowners. They also sustained the spirit and momentum of previous initiatives by carrying out similar activities, such as organizing the watermelon festival and experience-farming activities, albeit at a much smaller scale (Figure 4.4).

Figure 4.3: Team members working together to transplant watermelon seedlings in March 2017. The plastic covers and the hedges along the field serving as windproofing measures were typical of the landscape of this windy village. Source: Photo taken by the author.

Figure 4.4: A watermelon farming activity held in March 2017. Resembling the farming workshops co-held with the Fangu Youth, it took place at the newly built 'Wanbao Courier Station', where the joint farming team held mini farmers' markets on weekends and organized other activities from time to time. Source: Photo taken by the author.

Of the three agri-food grassroots innovations, the joint farming team can be considered the one most embedded in this place. It was composed of and effectively run by local actors bonded by place-based social relations and familiar with local farming habitudes.[57] They had access to resources linked to conventional agri-food systems in the area, including seedlings from local agricultural material suppliers and the services of a farmer with a tractor for ploughing and harvesting. This 'alternative' agri-food initiative was thus hybridized in that it operated partly by appropriating the system elements from the industrialized agri-food system (see for example O'Neill 2014, Sarmiento 2017, Watts, D. et

[57] The reciprocity norm that was typical of the rural areas in Taiwan was actively at work in the interpersonal interactions in Wanbao and facilitated the operation of the initiative. For instance, the neighbors who received sweet potatoes as gifts from the team would turn up next morning to help them work to return the favor. Similar reciprocal exchanges of gifts were also very common among the team members, who shared food, seeds, and knowledge and offered their hand to each other on a daily basis.

al. 2005). As such, its operation was enabled through selectively linking up with the agri-food regime rather than in isolation from it (Dóci et al. 2015). In this sense, it provides a good opportunity to examine how a grassroots innovation is sustained by making use of, as well as is constrained by, the geo-historically produced socio-spatial conditions and local articulation of the broader politico-economic structure.

4.4.4 Structural opportunities and challenges in nurturing grassroots innovations

Embedded in existing local socio-material networks, the third agri-food initiative responded to the place specificity arising from the socio-spatial differentiation accompanying post-war capitalist industrialization. For instance, it effectuated the role of agriculture and the rural sector as a social safety net for the team members, who had access to fewer opportunities on the capitalist job market due to their age and limited education—not uncommon for residents of rural areas, especially women. The initiative provided them with a decent income and more autonomy and companionship in comparison to factory jobs. In turn, they provided the initiative with an experienced agricultural labor force that was in short supply in most rural areas.

Moreover, the team helped revive unattended farmlands in the community whose owners had stopped farming or left the community in the wake of the urbanization and industrialization processes. Although not all unused farmlands were acquired by the team given its limited capacity, they tried their best to meet the request of acquainted landowners in accordance with the reciprocity norm. Through traditional trust-based oral deals, they leased around three hectares of farmland from seven landowners in 2016 and 2017 by guaranteeing the latter the government's fallow land subsidies as rent.[58] Taken together, the team secured the basic resources for agricultural production and the operation of this grassroots innovation by revitalizing the lands and labor marginalized in the capitalist system and appropriating government schemes in a non-capitalist manner to further its aims.

Nevertheless, the scaling up of the agri-food grassroots innovation in this place was impeded by structural challenges associated with the marginalized agricultural and rural sector. The absence of additional stable sales channels limited the team's ability to acquire more land and recruit more local farmers. Yet, even if more customers could have been secured, issues such as labor

[58] The fallow land subsidy required at least one crop season in cultivation while one lay fallow. The landowners could acquire the subsidy by leasing the land to the team, who would pay an amount of money equivalent to the subsidy to the landowners themselves if the subsidy was not granted.

shortages and an ageing population seriously restricted the expansion of organic farming in this place. As a local informant observed,

> Without enough labor to carry out more farming works, the limited farm income is not sufficient to sustain a family, which makes agriculture even less attractive to young people. Consequently, only old people keep on farming, but they are too old to weed manually and have to keep on using herbicides. [...] Sometimes, using herbicides is not because farmers want to save themselves the trouble, but because they have no choice.

This statement reveals the vicious interplay between the demand of the industrial capitalist system for cheap food, the low regard of agriculture in an industrial society, a shrinking rural labor force, and the consolidation of the fossil fuel-intensive agricultural system, as discussed in Chapter 2. In this context, farmers with limited economic capacity could choose either to expand their cultivated areas with the help of chemical inputs to sustain their livelihoods or to leave farming to older farmers whose deteriorating physical condition also led them to rely on chemical inputs to sustain farming operations. Either way, chemical-intensive farming became not only an easy choice, but also *the* 'logical' decision for farmers. Put differently, this *structural lock-in* originating from state-led, asymmetrical agriculture-industry relations starting in the 1950s constrained farmers' ability to shift from fossil fuel-intensive agri-food production to organic farming practices.

The implications for agri-food grassroots innovations' transformative potential are profound. Despite increased recognition of farmland's multiple functionalities among farmers affected by land grabbing (Wang, Y. et al. 2015), the possibility for an overall shift away from conventional farming practices in this place has remained seemingly small. On the one hand, according to the village head, most local farmers had little incentive to go to the trouble to switch to another way of farming given the fact that they were planning to retire in few years. On the other hand, farmers who indicated a preference for organic farming, including the other farmer contracted by the HUCC, found its higher labor demand increasingly beyond their physical capacity and could not participate (continuously) in this organic agri-food initiative. Indeed, the initiative's long-term development will also be impeded if it fails to secure a younger labor force in the coming decades. This suggests that agri-food grassroots innovations' potential to survive and thrive in a place can be seriously hampered by local articulations of the politico-economic structural lock-in, leading to the systemic lock-in of local farmers forced to engage in conventional agri-food practices.

This implies that the structural constraints are unlikely to be solved simply through systemic solutions such as socio-technical innovations in 'greening' and '(re)localizing' the production and consumption of the agri-food system in

a place. For one thing, chemical-intensive farming practices have prevailed in this place and most rural areas in Taiwan exactly because they have been better adapted to the context of marginalized rural communities lacking a young agricultural labor force in an industrial society. For another, like the alternative agri-food initiatives, they were also vulnerable to resource grabbing by the industrial sector. The fundamental problem that impedes a transition to a socio-ecologically sound agricultural system thus lies not in industrialized agri-food systems per se, but in the agriculture-industry power asymmetry resulting from and dominated by industrial capitalism. Without addressing this structural marginalization of the agricultural and rural sector, system-centric strategies, including the shortening of food supply chains or enhancement of producer-consumer connections to generate systemic transformation, though meaningful in their own sense, may likely fall short.

4.5 Interlinking agri-food grassroots innovations and land struggles in defending rural space

As the quote by Chang Mu-tsun at the beginning of this chapter suggests, grassroots innovations in this context are concerned not merely with 'greening' the agri-food socio-technical system, but also with preserving farmlands and rejuvenating this rural place, which has been marginalized as a result of the industrial society's socio-spatial differentiation. The underlying politico-economic structure that favors industrialization over agricultural and rural development has led to land struggles as well as has constrained the development of agri-food grassroots innovations in Wanbao. Conversely, resisting the decline of agriculture and rural areas, as many TRF scholars have noted, requires not only political action against resource grabbing, but also agri-food practices that can create and amplify their multiple values (Hsu, P. 2014, Lii 2011, Lin, L.X. and Tsai, P. 2012, Tsai, P. and Hsu, P. 2011, Tsai, Y. 2014). In so doing, the transformative potential of grassroots innovations is not confined to socio-technical terms, but also lies in resisting the capitalist politico-economic structure. This section explores how the agri-food grassroots innovations in Wanbao engaged in the external place-making politics against the industrial projects through dynamic intra-action with the land struggles, as well as their potential contribution to the defense of a rural place against external, capitalist place-making projects.

4.5.1 The mutual effects of the two place-making actions

Agri-food practices in Wanbao played a central role in the second land struggle (Lai, S. 2011). Whenever the self-help group travelled to Taipei, a group of senior female volunteers would prepare traditional rural food such as sticky rice dumplings in the Lonyung Temple's kitchen for them to take along. The self-

help group would display this food and local agricultural products at their press conferences as a testimony of the productivity of their lands (Figure 4.5). Afterwards, they would share the food with journalists and external supporters, which strengthened their reciprocal ties with these actors. In this way, the agri-food products embodied their place-frame as a rural village of material and cultural wealth, which they used to counter the growth coalition's devaluation of the place.

Figure 4.5: A protest held in front of the Construction and Planning Agency in April 2011 on the day on which the HSTP project was turned down. Local food products were displayed to show how Wanbao was thriving. Source: Photo taken by the author.

The three agri-food initiatives also significantly contributed to the defense of the land/place. The state-awarded first agri-food initiative was invoked in the land struggle to attest to the value of their land/place and to question the legitimacy of the industrial land grab, whereas the historical photos and life histories of the place became powerful testimonies of villagers' devotion to the place. Additionally, the annual watermelon festival that drew visitors and journalists to the place helped increase the visibility of the community's agricultural achievements and the threat they faced. The HUCC for instance invited its

members to the festival for them to learn about the farmers' struggle, whereas the comradeship built by participating in the protests strengthened their support for local agri-food products and activities. Similar mutually reinforcing effects between these two forms of place-based activism can be discerned in the second agri-food grassroots innovation, which was enabled by the reciprocal alliance between the Fangu Youth and leading grassroots actors forged during the second land struggle.

Nevertheless, the sense of comradeship built through the land struggle, although conducive to the short-term mobilization of alternative agri-food initiatives, is not necessarily translatable into long-term cooperation if cognitive differences between external and local actors are not reconciled. Despite the Fangu Youth's eagerness to keep the community momentum of the land struggle going in the agri-food initiative, not all leading grassroots actors were equally enthusiastic, as they were exhausted after the hard-won victory. Moreover, the multiple roles the grassroots actors played complicated their relations with the students, compounded by the lack of clear guidance for their interactions in public and private spaces. The confusion of their relations and roles in the initiative increased the risk of misunderstandings, especially when the mode of cooperation and the engaged local socio-political networks changed. This seemed to happen when the students tried to engage more with other community members and changed the payment scheme to reward farmers who facilitated the workshops. By emphasizing the educational function of agri-food activities, the students also tended to downplay the economic function of agriculture, which farmers considered the most important. These differences eventually led to the initiative's termination in late 2012.

While the third agri-food grassroots innovation did not involve external actors to the same extent as its predecessors did, it also experienced the mutually reinforcing effect of the land struggle, which contributed to its formation. As the village head explained,

> The county government wanted our land, so we must build our strength, especially if we have no other bargaining chips we could use to fight for it. […] We do this to show the outsiders [our land's value]. Otherwise, when they come here later, they will say 'you boasted about your land, but have nothing special to show'.

This illustrates the co-constitution of these two forms of grassroots activism in Wanbao's place-making politics: the agri-food initiative could pro-actively strengthen the community's political leverage to resist land grabbing, while the victory of the land struggle in turn necessitated the existence of the agri-food initiative in the place. In the former, the positive connotations of organic farming, such as higher quality of production conditions, were appropriated and

transformed into bargaining power to counter the authorities' devaluation of their land/place to justify the industrial land enclosure. In the latter, the agri-food practices were the means to translate the place vision depicted by the campaign discourses into reality.

Additionally, the visibility and reputation that resulted from the land struggle benefited the initiative in several ways. First, they helped expand sales channels by attracting new customers of agri-food products. Second, the bonds forged with external supporters, especially activists and journalists, enabled the team to access more resources, such as reliable food processing facilities, whereby they increased the variety of commodities and the capacity to process excess products. Third, the land struggle added unique social value to their agri-food products: purchasing these products supported smallholder farmers' fight to protect rural areas from the exploitation of industrial capitalism as much as it did their socio-ecologically friendly mode of production. The stories of struggles against state-led land expropriation in Wanbao and elsewhere were reiterated in the agri-food activities that took place at the 'Wanbao Courier Station', especially when scholar-activists and victims of other land struggles were invited by Hong Hsiang, who has attended the latter's protests in solidarity. In this sense, the agri-food grassroots innovation became a continuation of resistance to the encroachment of domestic land grabbing and capitalist industrialization on rural space.

However, community-wide mobilization during the second land struggle ceased after the external threat disappeared and the Fangu Youth left. By contrast, suspicions persisted, likely derived from the smear campaign in the land conflicts, regarding the leading actors' political motivations for holding the agri-food activities, including that they were trying to consolidate their own politico-economic privilege in the community. This contributed to—and was reinforced by—the fact that local mobilization of the third agri-food initiative tended to be limited to those forming part of the inner circle of the leading actors. As such, despite the absence of explicit political competition within the community, implicit tension existed that could potentially counter the expansion of grassroots innovations by discouraging broader participation.

4.5.2 Sustaining agriculture for sustainable rural development

Gathering from discussions with local informants, little discussion about 'sustainable development' has taken place among community members; some of them have never heard of the term. Nevertheless, they shared a traditional covet that interlinked the defense of farmland and agricultural production to a 'sustainable' livelihood: that people can survive with enough food as long as they retain possession of the farmland and keep on farming. For the leading actors in both place-based activisms, the organic grassroots innovations that protected

the health of the farmers, the environment, the consumers, and the land—instead of exploiting them with poisonous chemical inputs to boost productivity for the maximization of profits in the market—were deemed a promising way for the more socio-ecologically sound development of the rural community.

Yet, rather than romanticizing agriculture or a rural life, as some external actors tended to do, they kept a realistic attitude toward agricultural and rural development owing to their first-hand experience with agri-food production, the socio-economic marginalization of farmers and rural villages, and the agriculture-industry power asymmetry. They did not expect the agri-food grassroots innovations to be protected from broader structural influences, nor did they try to convert all community members' farming practices to mirror their own. Nevertheless, they would share the know-hows and resources with whomever was interested, and pledged to do whatever they could to preserve and hand on the farmland to the next generations, who could then make their own decisions regarding the future of the land and place.

Indeed, capitalist land frontier-making continuously occurred in this rural place in different forms, including through market transaction and gentrification. After the second land struggle, two clusters of upmarket flower and vegetable gardens run by land brokers emerged in the community, drawing on the allure of the rural idyll to attract an urban, middle-class clientele (Figure 4.6). This capitalist agri-food alternative, which came to be enclosed by walls and iron gates fashioned in a European style, were anything but embedded in the local socio-physical landscape or agri-food system in the place. As it took place at a limited scale on the private properties of other community members and did not pose an immediate socio-ecological or economic threat to the community, the grassroots actors I interviewed did not feel entitled to take any action against it, despite some expressing disagreement with this highly commodified, decontextualized form of agriculture and the windfall profits the land breakers obtained from, in their words, the 'fools' who bought the expensive gardens.

This commodification of (imagined) rural lifestyle and space illustrates the latest form of land speculation targeting cheap, unattended farmlands resulting from the marginalization of the agricultural and rural sector. Its existence indicates that the revaluation of agriculture and rural areas itself is subject to capitalist co-optation, namely the commodification of (imagined) rural lifestyle and space. This demonstrates the flexibility of capitalism in appropriating its countermovement, whereby the rural socio-economic problems "become new (and exciting!) frontiers for capital accumulation" (Arsel and Büscher 2012, 60).

Figure 4.6: One of the upmarket gardens that emerged in Wanbao after the second land struggle. The sign on the left wall reads 'private property, right of admission reserved'. Source: Photo taken by the author.

Nevertheless, this trend of rural gentrification that also prevailed in other areas in Miaoli was checked in Wanbao in part by local landowners' unwillingness to sell land. This suggests that emotional people-land relations are effective in countering this new form of capitalist land enclosure, as with the resistance to industrial land grabs. However, the extent of psychological place attachment has significantly declined, especially among the younger generations, along with physical estrangement after decades of rural exodus.

In this sense, the transformative potential of an agri-food grassroots innovation in structural terms lies in sustaining the people-land relations, along with (and more than) reversing the capitalist devaluation of agriculture and rural areas that has prevailed among farmers, the public, and policymakers through social campaigns and educational activities. To this end, it needs to operate in ways that can revitalize unattended farmlands, strengthen economic and emotional connections of off-farm landowners and their lands, and generate a more reasonable economic return to sustain young farmers' livelihoods. Put differently, the first step toward 'sustainable' agricultural and rural development in an industrial society like Taiwan requires social innovations that help sustain

agricultural practices, associated culture, and people-land relations in rural space.

Overall, although agri-food grassroots innovations can hardly tackle the structural challenges in themselves, they do hold some potential to check structural disadvantages facing the agricultural and rural sector, not only in interlinking with land struggles to challenge the capitalist political economic structure and episteme that depreciate non-monetary values of agriculture and rural areas, but also in providing opportunities to sustain the non-capitalist people-land relations that could serve as an effective antibody to rural space to resist various forms of capitalist land enclosure.

4.6 Conclusion

This chapter explores the entanglement of agri-food grassroots innovations, land struggles, and rural development in a rural community by recasting grassroots innovations and land struggles as grassroots place-making actions intertwined with external place-making politics. I showed that the marginalization of agriculture and the rural sector stemming from the structural shift toward industrial capitalism has consolidated the dominance of a fossil fuel-intensive agricultural regime in Taiwan as well as setting the stage for a spike in domestic land grabbing in the recent decades. Wanbao as a rural community, suffering from an unremitting population outflow to cities, seized the opportunities emerging alongside the industrialization process to improve its agricultural production conditions, whereby it switched to a chemical-intensive agricultural system and transformed the place into a state-endorsed agricultural production base for watermelon and other crops.

For most landowners in Wanbao, their political reactions to land grabbing attempts through two state-led industrial projects were not necessarily enacted to compete for material resources for production, but more about defending their sense of place and to reclaim the subjectivity of place-making. Through changing place-frames and an emphasis on emotional place attachment, they transformed the defensive activism against the dispossession of farmlands in the name of economic development into a component of the nationwide land justice movement that sought to resist the capitalist devaluation of agriculture and the rural sector.

Three agri-food grassroots innovations emerged through dynamic interlinkages with the land struggles in external place-making politics. The land struggles created a grassroots niche space with a favorable socio-political atmosphere, external social networks, and reputation that facilitated the emergence and development of grassroots innovations, whereas the grassroots innovations preserved the socio-political momentum and enhanced the affected landowners'

bargaining power to defend the rural place against land expropriation. Nevertheless, the scaling up and long-term development of the agri-food initiatives were also constrained by the ongoing marginalization of agriculture and the rural sector, evident in labor shortages and an ageing rural population. The agriculture-industry power asymmetry that persisted despite some achievement of the land justice movement presents the primary structural challenge for a local socio-technical transition in this context.

This demonstrates a structural interlinkage between the grassroots innovations and the land struggles and that the transformative potential of the former also lies in its contribution to challenging the skewed politico-economic structure by interlinking with the land struggles and by strengthening the people-land/place relations in defending the rural space against capitalist devaluation and land enclosures. Consequently, agri-food grassroots innovations that instantiate the place visions depicted in the campaign discourses and generating positive material and emotional people-land connections can be conducive to the agricultural and rural development in the face of various forms of capitalist land enclosures.

These findings have several implications for grassroots innovation studies. First, a grassroots niche space can be created through the community's political reaction to the external place-making politics, whereby grassroots innovations occur and develop as part and a continuation of the land struggles against state-led industrial projects. Second, local articulations of structural challenges, such as labor shortages resulting from socio-spatial differentiation in the process of capitalist industrialization, can have fundamental impacts on the development and transformative potential of grassroots innovations. Systemic strategies of 'greening' production and consumption of a socio-technical system are likely to find their limits in tackling such a structural lock-in that sustains the dominance of the socio-technical regime. Third, agri-food grassroots innovations can be initiated to rejuvenate and defend the marginalized rural place against capitalist appropriation, whereby social-technical experiments like organic farming are a means rather than an end. Such place-based aspirations should not be sidelined in studying grassroots innovations, as they can reveal much about the challenges and meanings of the community's 'sustainable development' as well as the transformative potential of grassroots innovations in socio-spatial and structural terms. As the next chapter will show, downplaying grassroots motivations and aspirations as exceptional place specificity in pursuit of a nation-wide socio-technic transition can become problematic for the search of the more socio-ecologically just development of a disadvantaged community.

Prologue to Chapter 5

Chapter 5 discusses another renewable energy grassroots innovation in a rural community in western Taiwan. It aims to demonstrate the importance of using a place-centered approach to study grassroots innovations by unpacking the potential tension between grassroots objective for socio-spatial reconfiguration in a way that can rejuvenate a damaged rural community and a national agenda for socio-technical transitions. As the last of the three empirical chapters, it draws on several dynamics highlighted in the previous two chapters, including the marginalization of the rural sector, state-introduced industrial projects, asymmetrical agriculture-industry power relations, and the aspiration to remake a place after a decades-long, dramatic socio-spatial transformation. Focusing on a disadvantaged community confronting multiple challenges—social, economic, and biophysical—for its survival, this chapter offers a valuable chance to investigate the social values and transformative potential of grassroots innovations fighting environmental injustice induced by fossil fuel-intensive economic structures.

This chapter is based on a paper titled 'Foregrounding the Community: Geo-Historical Entanglements of Community Energy, Environmental Justice, and Place in Taihsi Village, Taiwan' that was submitted to the journal *Environment and Planning E: Nature and Space* in June 2020 and revised for this thesis. Like in the previous two chapters, the introduction and conclusion have been rewritten in accordance with the focus of the thesis, with some parts of the theoretical section moved to the former. The case description in the paper had been moved to Section 5.4 of this chapter, which has been added to explore one of the thesis's research questions, namely, how this grassroots innovation intra-acted with place-based political dynamics. In addition, more details have been added to other sections to improve the clarity of the argument and strengthen the analysis. Particularly worth stressing is the leading actors' conceptualization of 'sustainable development', discussed at the end of Section 5.3.2, which will be further elaborated on in Chapter 6.

5 Foregrounding the Community: Entanglements of Community Energy, Environmental Justice, and Place in Taihsi Village

5.1 Introduction

> Taihsi is at the edge of a marginalized rural town, suffering from long-term industrial pollution. If this place can get a chance to be reborn through green energy, then this will be extremely valuable and meaningful both for environmental justice and energy transitions.

The above statement of the organizer of the Taihsi Green Energy and Health Community Initiative (台西村綠能健康社區計畫) cited in a news interview (Chen, W. 2017) conveys a special meaning of a renewable energy grassroots innovation to a marginalized, damaged place such as Taihsi Village: it is a means to achieve environmental justice and to rejuvenate the place as much as a bottom-up experiment conducive to nationwide energy transitions. Subjected to serious environmental degradation related to one of the world's largest petrochemical complexes, Taihsi Village in western-central Taiwan has become well known among activists, policymakers, and the general public for pioneering a CE initiative in 2016 in Taiwan (Fang et al. 2019, Kao, P. 2019), a country where energy transitions are not only urgently needed, but also on the rise (Chou, K. 2017a, 2017b, Chou, K. and Chang, K.H. 2017, 2018). Before and after the CE initiative was undertaken, the community anchored in the village along with some relatives and friends living nearby were actively engaged in a series of place-based struggles against petrochemical pollution since 2019; these included resistance to the state-endorsed Kuokuang Petrochemical Complex project and several campaigns against toxic pollutants emitted by the nearby 6th Naphtha Cracker Complex (hereafter the 6th Naphtha). After the Democratic Progressive Party (DPP) government in 2016 assumed office and started to promote a nationwide energy transition, leading community actors decided to launch the Taihsi CE initiative as a means to rejuvenate a community scarred by environmental hazards linked to the petrochemical industry.

This chapter explores the interrelation between place, environmental justice (EJ), and CE in this community (hereafter Taihsi) to deepen an understanding of the roles of a community's development history, place-based concerns, and existing political dynamics in the formation and development of grassroots innovations. Following the discussion in Chapter 4 regarding injustices related to the disruption of a sense of place, it will further discuss how the pursuit of environmental justice objectives in relation to the asymmetrical agriculture-industry power structure has played out by focusing on these grassroots actors' perceptions and enaction of this grassroots innovation. In so doing, it will show how the 'win-win' relations between the pursuit of environmental justice and the agenda for energy transitions as hinted in the above quote are compromised by an implicit tension between the two priorities, whereby revealing the possible conflict between place-based and citizen-oriented CE projects.

Site-specific context is important for understanding how justice relates to environment change and energy systems. As the notion of environment in environmental justice literature is often understood as the place where we live, work, play, and eat (Gottlieb 2009), injustice occurs when these place-based practices, cultures, identities, and senses of belonging are disrupted or not recognized (Schlosberg et al. 2017). Consequently, EJ scholars have stressed the need to contextualize the inherently diverse meanings and practices of EJ and have cautioned against the Cartesian understanding of space as an abstraction (e.g. the linear distance to a radioactive waste landfill) (Holifield et al. 2009, Walker and Bulkeley 2006, Walker 2009). Similar insights can be applied to the rapidly growing research on energy justice (Bickerstaff et al. 2013, Bickerstaff 2017, Fan 2006, Jenkins et al. 2016, McCauley et al. 2019, Sovacool et al. 2017, Sovacool et al. 2019).

As Broto and Baker (2018: 3) argued, a spatial and relational approach to energy studies "brings forward dimensions of justice, access, and distribution" in several ways. First, it opens up the inquiry of distributional injustices' by emphasizing connectedness between places involved in different nodes of an energy commodity chain (Massey 2004). Second, it stresses 'injustice in terms of capabilities' by relating to geographically uneven patterns that differentiate the capabilities of different communities to access energy services (Day 2017). Third, it helps redress 'injustice in terms of recognition' by acknowledging the socio-cultural diversity of perceptions and reactions toward certain energy technologies, resources, and facilities (Whyte 2017). Last, it draws attention to 'procedural injustice' in energy policymaking and siting processes by politicizing energy "as a social relation" as opposed to its neutral framing as "an economic asset, ecological phenomenon or a resource" (Bell and Carrick 2017, Broto and Baker 2018: 3).

In a pioneering study of the interplay of community energy, place, and justice, Forman (2017: 655) noted that "strategies for achieving energy justice both exceed energy-based goals and are often tailored to reflect local circumstances". Beyond-energy circumstances can play a decisive role in defining local perceptions of justice, especially in the case of an 'internally oriented' CE project that focuses more on 'intrinsic benefits' *in situ* than on the geographical expansion of renewable energies (Dóci et al. 2015, Seyfang and Smith 2007). This suggests that justice in relation to CE cannot be examined merely by using an energy-centric scope, but has to be situated in its broader, site-specific context.

Following the same line of thought, this chapter comprises four main analytical steps. It first explores the geo-historical trajectories that have contributed to the dynamic site-specific context and concerns of Taihsi Village. Second, it examines how the emergence of the CE initiative was embedded in and changed the grassroots actors' framing of the place and place-based concerns over environmental injustice. Third, it unpacks the ways in which leading grassroots actors have carefully navigated local political dynamics in and around the community to create a socio-political atmosphere conducive to the initiative's formation. Last, it discusses how the place-based framing and objectives of CE engage with the advocacy of citizen participation in energy transitions in Taiwan and how their differences may hinder the grassroots endeavor of creating self-reliant socio-material relations, with CE as an alternative to the financial patronage provided by a polluting industry.

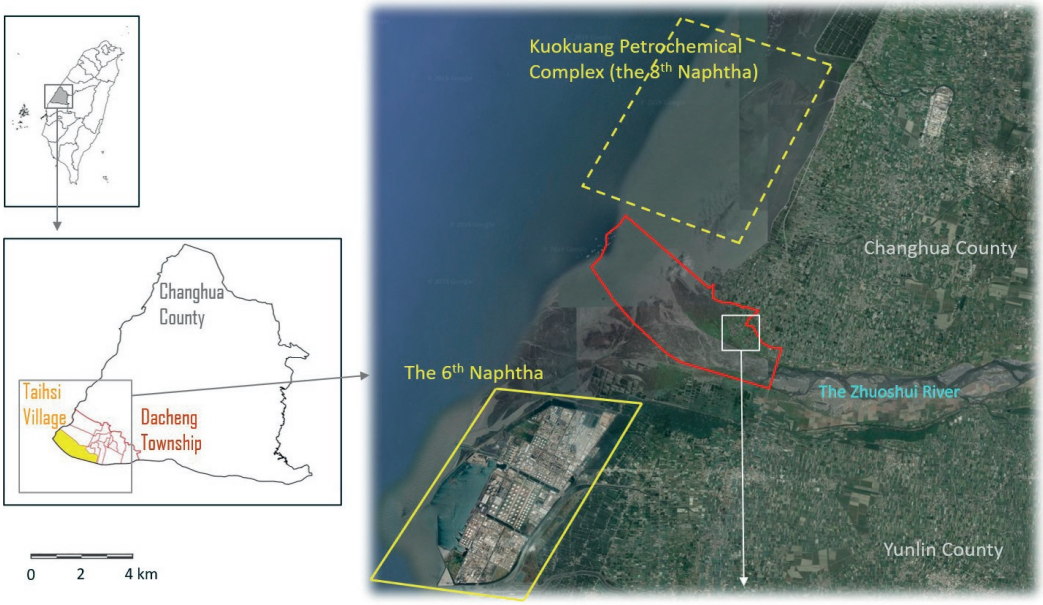
I argue that a relational analysis of place specificity is necessary for understanding the meanings and values that grassroots actors assign to a CE initiative. Moreover, such an analysis helps address the conventional tendency in grassroots innovations studies and CE advocacy in Taiwan to prioritize 'citizens' in a decontextualized sense over 'communities' grounded in a relational space, which can be crucial for policymakers and CE advocates to achieve a just low-carbon transition and to enhance the transformative potential of a CE project in disadvantaged communities.

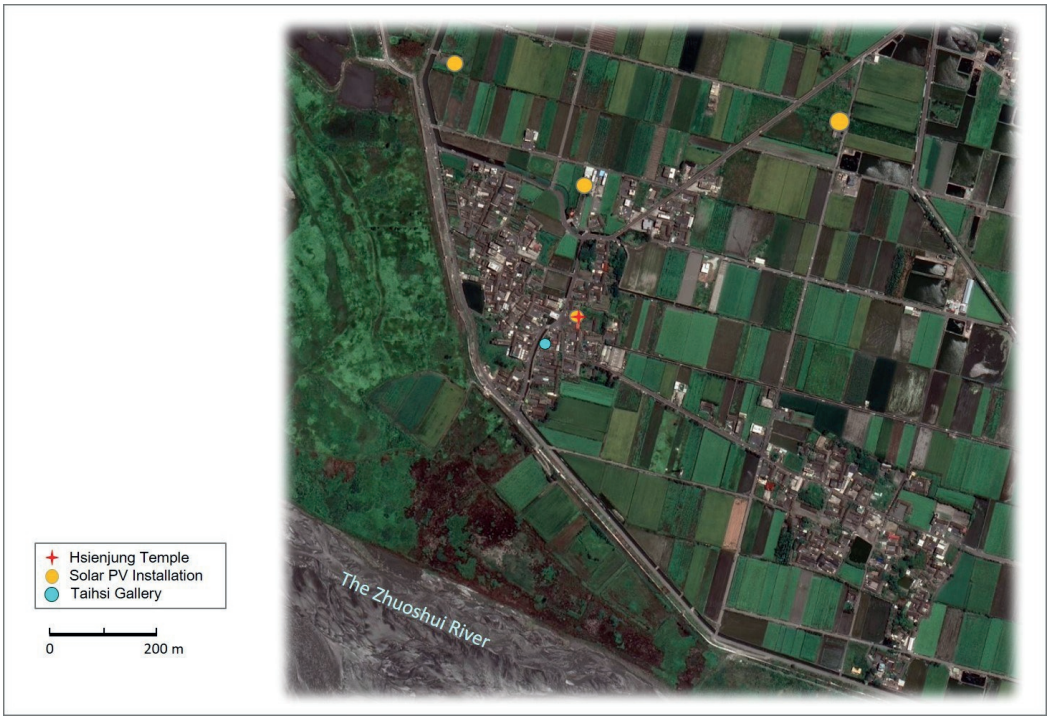
5.2 The development history of Taihsi

Taihsi Village (台西村), which is named after of its location (i.e. 'the west of Taiwan'), is a small seaside rural village housing around 500 residents at the southwestern point of Dacheng Township (大城鄉), Changhua County (彰化縣) (Map 5.1). Described by some villagers as 'the periphery of the periphery', Taihsi impresses on a visitor a rural landscape in decline, with its largely abandoned traditional quadrangle houses, many fallowed farmlands, and very few young people to be seen (Figure 5.1). Two prominent geo-historical trajectories

have contributed to this landscape: one concerns the socio-economic marginalization of the place during the country's rapid industrialization; the other involves the spatial expansion of the petrochemical industry at the neoliberal turn of the country's industrial policymaking.

Figure 5.1: A typical view of Taihsi Village, with the 6th Naphtha, situated beyond the Zhuoshui River, visible in the distance. Source: Photo taken by the author.





Map 5.1: The administrative borders of Taihsi Village (top figure, in red) and the two main residential areas in the village (bottom figure), which are locally known as *Tuā-tsng* (left) and *Kue-á* (right). By 2020, five rooftop PV systems had been installed in and around the village, one of which in a nearby township and therefore not visible on the map. Source: Compiled by the author based on Google Earth images.

5.2.1 Where the water ends and the wind begins: a marginalized rural place in an industrial society

Coastal areas in western Taiwan are described, often derogatorily in economic terms, as places 'where the water ends and the wind begins' (風頭水尾). Taihsi is one such location, situated at the mouth of the Zhuoshui River and at the forefront of salty winds blowing from the sea. It is subject to relative freshwater shortages, unpredictable flooding events in summer, and strong northeastern monsoon winds during its winters (Chang, S. 2014, Hong, C. 1994).

Since the arrival of Han settlers in the region in the eighteenth century, Taihsi Village, and the entire Dacheng Township, has been the least developed area in Changhua County (Chang, S. 2014, 2016, Chen, Y.Z. 1987, Hsia, C. 1988, Shih, T.T. et al. 1977). Still, people sustained themselves through upland farming, some extent of rice cultivation, fishing, and gathering activities, and built close relationship with the river, sand dunes, and the sea. At the turn of the twentieth century, after Taiwan was incorporated into the regional division of labor with Japan, i.e. 'industrial Japan, agricultural Taiwan', agricultural production conditions were gradually improved through colonial state-led measures of land reclamation and the establishment of an embankment in 1920 to 'discipline' Zhuoshui river (Chang, S. 2014, 2016, Hokutogun Office 1937).

Later, typical for Taiwan's rural areas, Taihsi was integrated into the state-led project of capitalist industrialization after the nationalist regime withdrew from China in 1949. As discussed in Chapter 2, to feed around two million migrants and to strengthen its survival chances during the Cold War, the regime introduced several policy measures to squeeze out surplus and cheap resources from the agricultural sector for industrialization (Chang, H. 2004, Gold 1986). Although the area in Dacheng on which rice was cultivated significantly increased in the 1950s and 1960s (Chen, C.F. 2005), agricultural income stagnated, subjected to low prices, heavy taxes, and high input costs (Hsu, S. et al. 2016, Tung, C. 2012). Farmers in Taihsi had to join the manual paddy harvesting team, taking on temporary assignments on farms across western Taiwan to supplement their income, while several female villagers travelled to sugarcane plantations in Okinawa as provisional migrant workers.

When Taiwan entered the international division of labor in the 1970s at the bottom of global commodity chain with its labor-intensive industries, the lack of opportunities for non-agricultural income in southwestern Changhua triggered an relentless migration of young people to cities with better socio-economic prospects (Chen, Y.Z. 1987, Hsia, C. 1988). To tackle labor shortages and to improve rural income levels, the state introduced nationwide agricultural modernization measures and cash crops. Watermelon cultivation introduced in the 1970s yielded a relatively good income to the community, yet the outflow

of people continued. With three-quarters of local farmland converted for watermelon farming in the following two decades, this crop became a symbol of the community, bringing with it a bustling, hopeful atmosphere to the otherwise quiet, forgotten village that many villagers still vividly recalled.

Freshwater agriculture, especially the farming of tilapia, provided another income source for coastal areas in southwestern Changhua (Jiang, L. 1991). In the 1980s and 1990s, the freshwater clam industry, which could thrive in the harsh coastal environment with higher profit and lower labor demands, became a commodity on which this least-industrialized and populated township in this agricultural county marginalized in the process of rapid economic development pinned its hopes for prosperity (Changhua County Government 2018, Chen, C.F. 2005).[59] Soon, the west coast of Dacheng, including part of Taihsi, was transformed into one of the main clam farming bases in the country, accompanied by duck farms that became a hallmark of the area. The high demand for non-saline groundwater, however, led to serious incidents of land subsidence, flooding, seawater intrusion, and groundwater and soil salinization in this area (Chang, S. 2014, Chen, Y.J. and Lee, G. 2002, Executive Yuan 2011).[60]

While this exacerbated the socio-economic challenges of this disadvantaged rural community, it was the environmental harms done to the village by the mega petrochemical complex erected just across the river in the 1990s that struck the deadliest blow.

5.2.2 When the river dried and the wind became toxic: a sacrifice zone for petrochemical expansion

Despite the dearth of petroleum resources, the petrochemical industry was identified in the 1970s by the developmental state as the engine for industrialization and economic growth (Chu, W. 1995, 1997, 2001, Tsai, W. 1997, Wang, J. 1995). With several protectionist policy measures and investments from party-state capital, the 1st Naphtha Cracker Plant was completed by the Chinese

[59] The number of factories operating in Dacheng, most of them engaged in food processing activities, totaled 32 in 1996, dwindling to 29 by 2001 and 24 by 2016 (Changhua County Government 2018, Chen, C.F. 2005, Chen, Y.J. and Lee, G. 2002). By contrast, there were 1,393 factories in Changhua City, the county capital, in 2016 (Changhua County Government 2018). Meanwhile, the registered population density in Dacheng was 266.50 persons per km^2 in 2017—around 22.3% of the average in Changhua County and 41% of the national average—whereas the rates for natural and social increases were -5.02% and -12.31%, respectively, ranking it second-lowest and lowest in the county (ibid.).

[60] Dacheng Township witnessed the greatest subsidence rate recorded in Taiwan in the 1990s and was officially listed as an area facing severe land subsidence due to having had the country's third-highest maximum accumulated subsidence depth (of over 210 cm) between 1992 and 2017 (Chen, Y.J. and Lee, G. 2002).

Petroleum Corporation (CPC) in 1968 to manufacture basic chemical materials such as ethylene and propylene, with naphtha produced in petroleum refineries. Seizing the opportunities following Japan's and the US's restriction on petrochemical industries in the name of environmental protection, and to meet skyrocketing demands in the export-oriented plastic and artificial fiber industries, three more projects followed over the next 16 years, increasing the ethylene production capacity from 54,000 tons to 845,000 tons per annum.

The expansion was checked by the state's industrial restructuring plan in the early 1980s to tackle the country's high energy dependency and vulnerability during the oil crises. However, the developmental state was losing its power to discipline local private capital, which had become the main force controlling the industry (Tsai, W. 1997). In 1985, the policy was reversed by a pro-petrochemical cabinet that launched a series of measures, including deregulation and opening competition for upstream markets, to fuel the industry's expansion while inviting capitalists, including the founder of the Formosa Plastics Group (FP), to the industrial policymaking arena (Chu, W. 2001).

The FP's 6th Naphtha project was a symbol of the new state-capital relationship from the onset of "the neoliberal phase of capitalist development" (Chu, Y. 1992, Wang, J. 1993, Harvey 2001: 29). At the national level, despite a booming anti-pollution movement pressuring the state for clean industry and reductions in pollution, the FP secured the state's full support in meeting procedural and financial requirements and in resource acquisition by threatening to move the project to China (Chu, W. 2001, Hsia, C. and Hsu, J. 1997, Wang, J. 1993, 1995). At the county level, it invested in more than one location to increase its power to bargain with local governments. The magistrate of Yunlin County in particular ardently welcomed the project, as it was in line with his plan to transform this 'poor and underdeveloped' agricultural county into the largest industrial hub, where the 6th Naphtha project was celebrated as a solution to socio-economical marginalization (Hsia, C. and Hsu, J. 1997).

In 1991, a 2,603-hectare offshore industrial park customized for the needs of the 6th Naphtha was sited off the coast of Mailiao Township in Yunlin County. With a similar spatial-political strategy, the FP expanded the permitted ethylene production capacity of the 6th Naphtha from 0.45 million tons in 1992 to 2.935 million tons in 2007 (73% of total ethylene production in Taiwan). This not only significantly strengthened Taiwan's lock-in to the high-carbon, energy-guzzling industrial structure (Chou, K. 2017b),[61] but also helped make FP the second-highest-earning business conglomerate in Taiwan (CCIS 2019) and the second-largest polyvinyl chloride (PVC) manufacturer in the world

[61] The 6th Naphtha contributed 38% of the industrial greenhouse gas emissions and around 18.5% of the total greenhouse gas emissions in Taiwan in 2007 (ibid.).

(Schellerer et al. 2016). With a total investment of 841.7 billion NTD (25.06 billion euros), the 6th Naphtha has grown into a mega industrial complex comprising 53 plants, including three naphtha cracker plants, a petroleum refinery, three operating coal-fired power plants with a combined electricity production capacity of 1.8 GW, and 16 cogeneration coal- and petcoke-fired power facilities with a combined installed capacity of 2.75 GW (FPCC. 2019). In so doing, it has become the largest independent power producer in Taiwan selling electricity to Taipower. This clearly illustrates the co-constitution of the energy-guzzling industry and the rocketing increase in energy supply (see Chapter 2).

The 6th Naphtha project has given rise to significant socio-spatial transformations in Taihsi since 1994, first by reclaiming land from the sea, with sand extracted from the river mouth (Liu, Y. 2010), and then by intercepting the river midstream by constructing a mega diversion weir (Chang, S. 2014, Chou, K. 2017b). This disrupted the ecological system at the estuary and the river's flow, as well as the ways in which people related to the environment. Collecting bird eggs in winter, for instance, was made impossible with the dramatic decline of sand dunes and the seabirds that nested there. The cost of agricultural production increased as farmers were forced to install electric water pumps to irrigate land covered in sand blown in from the dry riverbed.

When petrochemical manufacturing and electricity generation using bituminous coal started in 1999, toxic pollutants, such as volatile organic compounds and metals, were pumped into the atmosphere and soil. Despite the dearth of scientific investigations on the causes of pollution, the community itself witnessed the collapse of the ecosystems at the river mouth. Fishing activities, including lucrative glass-eel catching, dramatically declined, and watermelon cultivation almost disappeared as crops stopped fruiting properly (Chung, S. and Hsu, C.T. 2013). A senior villager recalled his first encounter with the air pollution:[62]

> We were enjoying the cool air [at the watermelon field nearby the embankment] when we noticed a strange odor. Then we saw the smoke coming from the 6th Naphtha toward us, which looked suspicious. And then the watermelon

[62] The informant also sold his two rafts due to the dramatic decline in fish catches. Although similar problems relating to watermelon cultivation have occurred in this place before (Hong, C. 1994), it never occurred at such a large spatial-temporal scale. To avoid air pollution in the summer, local farmers first switched to farming watermelon varieties that could thrive in the winter, but had to give up in the end, as the vegetation period kept on increasing, the yields dwindling and the transaction costs growing as farmers became older and older. According to local estimations, the total size of watermelon fields in Taihsi Village and nearby Dingzhuang Village dropped from 250 hectares before 1999 to a single hectare in 2016.

stopped fruiting that year, causing losses of around 500,000 to 600,000 NTD [around 15,000 to 18,000 euros] per person for all of us.

Staggering economic losses borne solely by residents were compounded by psycho-physical distress from long-term exposure to toxic pollutants: the incidence of cancer among residents of Taihsi is almost fifteen times higher than the national figure (by non-adjusted rate, MOHW. 2016, Taiwan West Coast Conservation Alliance 2013). Thus, those who have benefitted the least from industrialization have suffered the most.

5.3 From a village of cancer to a village of hope: Shifting place-frames through CE

To understand how CE emerged and what it means to a community of place with such a development history, this section examines the place-framing that unfolded through a series of campaigns against petrochemical pollution since 2009, through which the community collectively made sense of these socio-spatial transformations and acted on them. In particular, it examines how environmental injustice was perceived in relation to the ways in which the place was represented (place-frame) in campaign discourses, with a strategic selection of elements regarding the geo-historical trajectories that helped create a place-based collective identity, facilitating mobilization based on certain socio-spatial objectives (place visions). By unpacking the shift from this 'defensive' place-frame against petrochemical pollution to a 'proactive' place-frame that emerged alongside CE, I argue that the grounded value of this CE initiative lies not in its potential for facilitating local participation in energy transitions, but in its potential to deliver urgently needed hope to the damaged community to allow it to break away from a further lock-in to a socio-material reconfiguration centered on the fossil fuel-intensive industry.

5.3.1 A village of cancer: petrochemical pollution and environmental injustice

In 2008, the state-endorsed, CPC-led Kuokuang Petrochemical Complex was sited along the coast north of Taihsi. The Changhua County Magistrate and most local politicians associated with the nationalist party (KMT) ardently supported the project in the name of economic development (Changhua County Government 2009, Shih, Y. 2012). In response, a former village head, his daughter, and other villagers mostly living in *Tuā-tsng* initiated the Taihsi self-help group in 2009 in alliance with a nationwide movement fighting against the construction of the complex (Chen, P.H. 2011, Huang, Y. et al. 2011, Tsai, C. 2012, Wu, S. and Wu, M. 2011) that in 2011 successfully pressured the state and the CPC to halt the project. Afterwards, the key local campaigners initiated

and participated in a series of campaigns to continue articulating their distress and to get more help and access more resources.

The publication in 2013 of a photo book, *South Wind*, by an independent journalist and the former village head's son was particularly influential (i.e. Chung, S. and Hsu, C.T. 2013). The striking images and a collection of villagers' stories narrating the environmental changes brought about by and health impacts of the 6th Naphtha enabled, for the first time, a complete framing of the place as a victim of the petrochemical industry. This narrative was broadcasted by several media reports, giving rise to a series of follow-up activities, including several photo exhibitions between 2014 and 2016, a powerful 'testimonial play' (Figure 5.2), along with two health examinations and several studies that verified the abnormally high health risks Taihsi faces (Chen, J.L. 2018, Jhuang 2018, Lin, H.C. 2017).

Figure 5.2: The 'testimonial play' presented in Taishi in 2016 in which seven villagers enacted traditional ways of living and culture in this place, narrated their everyday experiences of facing environmental degradation, and pinpointed the harm the 6th Naphtha has brought to the place and their bodies. Their dress revealed their rural identity as farmers or fishers. Source: Photo provided by Hsu Cheng Tang.

The place-frame of Taihsi in these campaigns was intrinsically centered on the community's experiences of environmental injustice, manifested in various

forms and spatial terms. It depicted Taihsi as a rural village that was first deprived of its fair share of economic benefits and then subjected to a disproportionate burden of environmental costs resulting from the country's rapid industrialization. This distributional environmental injustice was experienced as a sense of "disconnected geographies of responsibility and outcome" (Walker 2009: 623). A recurring theme in *South Wind* was the unfairness of sacrificing the poor and vulnerable in this rural village for the sake of the rich and powerful living in cities. Equally frustrating for them was a disconnection between the people affected by the environmental harms and those invited to the decision-making arena. Despite its geographical proximity to the 6th Naphtha, the community was not institutionally recognized as a stakeholder until recently, as it was located in another administrative area. The villagers were thus left with little access to information on associated health and environmental risks for more than a decade, while their lives were fundamentally changed without their consent or government compensation. The fact that another mega petrochemical project was sited near the village showed them that their distress was again systemically ignored. These distributional, procedural, and recognition-related injustices strengthened their place identity as a long-ignored victim of industrial pollution.

In addition to the 'trivalent' dimensions of EJ (Schlosberg 2004), the place-frame emphasized the injustice associated with "disruptions to [positive] place attachment" brought about by detrimental environmental changes (Schlosberg et al. 2017: 594). The 'economic development' narrative depreciated the place by attributing the socio-economic 'underdevelopment' of this area to its geophysical features and its reliance on agriculture, whereby the Kuokuang project was presented as an opportunity for 'industrial transformation' (Hu 2010). To counter this place stigmatization, the leading campaigner defended this place by calling it "the apple of our eyes, the place where we exist" (Huang, H. 2015: 102). Elements that illustrated positive human-environment relationships were selectively stressed, including once-abundant ecological resources and the rural culture grown from the place-based practices over generations. Ignoring this positive place attachment was interpreted as spurning their ways of life. To verify the disruption of this positive sense of place, they highlighted the environmental harms associated with the 6th Naphtha, best demonstrated by the dramatic decline in watermelon cultivation and the dwindling glass eel population. In this way, the campaign discourse challenged the competing place-frame by framing the petrochemical industry as the primary challenge for local development.

The disruption of positive place attachment was accompanied by "the pain or distress caused by the loss of, or inability to derive, solace connected to the negatively perceived state of one's home environment" (Albrecht et al. 2007:

S96). The transformation of the community's relationship with the south wind best exemplified this feeling of 'homesickness' despite being at home (ibid.). This "wind of the hometown" that used to bring solace to the villagers with "the smell of land and river as heaven's blessing" was replaced by a toxic odor associated with petrochemical pollution and became the source of their misery (Chung, S. and Hsu, C.T. 2013: 183).

This deprivation was compounded by the pain of 'getting stuck' in the place with associated high environmental and health risks—"the financial, physical, social and cultural inability to physically escape environmental bads" (Schlosberg et al. 2017: 595). As a senior villager said, "we don't know how to read and write; we can't find an alternative way for living or leaving the place. Now only the old people are left in the village, waiting for death" (Chung, S. and Hsu, C.T. 2013: 17). This sentiment was strengthened in the place-frame by tales of the physical and economic vulnerability of several villagers suffering from cancer. For instance, one story included in *South Wind* that is often recounted tells of the heavy psychological and financial burden borne by a poor villager who took his own life to ensure the economic survival of his family. This selection of place-bundles cast the village as a place in great danger, thereby legitimizing the campaigns against petrochemical pollution as necessary for its survival.

5.3.2 A village of hope: community energy and place rejuvenation

Although this place-frame helped the community successfully obtain a degree of institutional recognition for their dire situation and much-needed resources to address it, in 2016 grassroots actors changed this place-frame in response to two socio-political challenges.

On the one hand, the emphasis on the desperation of the village risked demoralizing the community, especially when they realized that politicians across levels had little capacity or political will to effectively reduce the pollution of the 6th Naphtha (Tu, W. et al. 2014). On the other hand, the FP successfully wore off opposition in Mailiao Township, where the 6th Naphtha was located, after several explosions occurred at the complex in 2010 and 2011. It strengthened the economic ties with local elites through donations and by outsourcing jobs to their companies and introduced several 'philanthropic' programs in local communities, including a monthly electricity subsidy of 600 NTD (around 17.5 euros) per person and lunch programs at local elementary schools (Fang et al. 2019, Jobin in press). The financial patronage of the 6th Naphtha, which funded more than 80% of the township's annual budget, transformed social relations between residents and the FP from one of 'victims versus the polluter' to 'beneficiaries and the sponsor' (ibid.). It not only created a favorable political climate for the FP, but also generated distrust in protests that were framed either as futile or as co-opted by rent-seeking politicians and individuals (Huang,

S. et al. 2014, Lin, H.Y. 2019). Consequently, local activism for pollution reduction was significantly weakened. Paradoxically, the 'fairer' distribution of the profits to the affected communities who bore the environmental costs became detrimental for—rather than conducive to—the pursuit of environmental justice.

To avoid such a dependence relationship akin to 'compensation traps' (Van Rooij et al. 2012), CE was welcomed by campaigners in Taihsi in 2016 as a way out of the political impasse. As the public health scholar who recommended CE to local campaigners explained, "the aim of renewable energies is to replace fossil fuels"—what would be a more meaningful means than a CE project for victims of petrochemical pollution to show their resistance to this fossil-fuel-intensive industry? Although it could not directly address the environmental problems, the leading local campaigner who then initiated the CE project aimed to bring about epistemic emancipation by showing that there was a possibility to enforce change. If change could be enacted by the vulnerable victims of environmental pollution in this damaged place through the CE project, there would be no excuse for powerful actors, especially the 6th Naphtha, to fail to act to curb pollution.

Besides symbolizing the possibility of change and action, the CE initiative contributed to the community's pursuit of environmental justice in at least two ways. First, the community could negotiate with the state to have it sponsored as a form of compensation. The initiator reckoned that this would deliver justice to this damaged, super-aged community in a more timely and concrete manner than filing a time-consuming lawsuit against the FP—an approach some victims in Yunlin County adopted in 2015 (see Jobin in press for details about the case).

Second and more significantly, the CE initiative could help the community resume agency in defining its future and the relation with the petrochemical interests despite huge power asymmetry between them. As the organizer explained,

> Taihsi Village does not receive the 600 NTD, but we can earn the money by ourselves with green energy. […] Once you take money from the 6th Naphtha, you cannot ask it to do anything anymore; you will have no dignity.

He envisioned enhancing the community's 'autonomy' with CE, not in the sense of converting energy consumers into producers, but in the sense of transforming the helpless victims at the mercy of the polluter into self-respecting citizens who could sustain themselves with income generated in environmentally friendly ways. Crucially, renewable energies here were not seen merely as technologies or economic assets in contrast to the 398 smokestacks in the 6th

Naphtha; rather, they represented an opportunity for the community to determine how to identify and maneuver itself in relation to powerful actors and to resume its subjectivity in place-making by establishing more self-reliant socio-material relations in the place.

The symbolic meaning of CE supported a change in Taihsi's place-frame—from being framed as a village dying of cancer, it was now framed as a village in hope of rejuvenation. The new place-frame was publicized through media reports on the initiative and several concomitant activities organized by key grassroots actors and external supporters (Figure 5.3). The slogan of the green energy camp, for instance, read 'from a place of petrochemical pollution to a village of hope via green energy'. CE was also combined with other community projects in Taihsi, such as the '*Hsuyuan* Village' (許願村) project (*hsuyuan* means 'making a wish' or 'the Hsus' wishes') using solar energy in the religious practice of lighting up the '*guanmingdeng*' (光明燈) in the Hsienjung Temple, and the Taihsi Gallery founded by the organizer in 2018 to revive the local culture and to strengthen the sense of community. In these place-making efforts, place-based struggles and the previous place-frame were invoked to strengthen the value and legitimacy of the CE initiative.

Figure 5.3: A special exhibition on fine particulate matter at the National Museum of Natural Science in 2017, where Taihsi was presented as a case in point of local communities as victims of air pollution. The plaque on the wall read 'Green Energy Renewal', illustrating a desire to resist the environmental injustice brought about by the air pollution through the renewable energy grassroots innovation, whereas the plaque on the model read 'Green Energy: Wishing the Village A Future'. Source: Photo taken by the author.

To provide an alternative to the FP's financial patronage, the organizer designed the CE initiative to fund bottom-up social welfare projects that could strengthen the community's chances of survival despite the political deadlock and lack of government funding for the village (Hsu, C.T. 2018). The income obtained from selling generated electricity to the utility was crucial to this end at least in two ways. First, it could be used to upgrade local infrastructure and the healthcare system such that it would be customized to the needs of the residents. Second, it was key to the success of the initiative also in terms of amplifying the community's engagement and confidence in the initiative, as ideals like 'citizen-based energy transitions' had little selling power to this deprived peasant society in comparison to tangible benefits. The profits could help incentivize local participation in social learning activities designed to enhance

community cohesion and citizenship formation, such as discussing what residents wanted to do with the money to make Taihsi a better place.

In this sense, a crucial epistemic change that could be brought about by the CE initiative lay in challenging the feeling of learned helplessness shared by many villagers and in empowering them to hope for and create a more sustainable future for this community. Indeed, most villagers I interviewed had little consideration for or faith in 'sustainable development'. One farmer dismissed the term as a useless government slogan that failed to take into account the poor governance capacity of township offices in disadvantaged rural areas that could not make and implement a plan for local development. This reaction reflects the villagers' long-term frustrations regarding the ignorance and inaction of governments across levels in addressing their environmental and economic distress.

While sharing the view of state failure and its being a root cause of the community's 'unstainable' status quo, the leading actors in the CE initiative did not give up the pursuit of 'sustainable development' in this place. For them, 'sustainable development' required the rejuvenation of the place that was damaged by industrial pollution resulting from an imbalanced agriculture-industry relationship. At the core of their conceptualization was an appreciation for and identification with the culture, lifestyle, and values grown from the place, which could be passed down to future generations. Without increasing the place's environmental burden, CE was envisioned to contribute to this goal by attracting people to the place to address the urgent issue of population ageing and loss, and by providing a stable income to help establish a self-sustaining economic, cultural, and social system. In so doing, this CE initiative became a tool for "sustainable place making" and rural development (Slee 2020: 164), resonating with many CE projects in Scotland and elsewhere (Bomberg and McEwen 2012, Jeong et al. 2012, Slee 2020, Van Veelen 2017).

5.4 Engaging the community: the development of CE and place-based politics

The Taihsi Green Energy and Health Community Initiative project was kicked off in November 2016 with the installation of a roof photovoltaic (PV) system of 3 kW at the main public space of the village, the Hsienjung Temple; it formed part of a two-day green energy camp co-held with local and extra-local non-governmental organizations (NGOs) (Figure 5.4).[63] This event was followed by

[63] The secretary-general of the Taiwan Environment Protection Union (TEPU) took the lead in organizing this green energy camp based on those that had been organized in Taromak. His

a long negotiation between the initiator and external facilitators representing central government and business sector to work out feasible financial, legal, and technological arrangements. Limited results could be seen by the time the initiator moved out of Taihsi for family reasons and handed over the initiative to her brother in mid-2017, who resigned from his position as a middle manager of a big company and then led the project.

Figure 5.4: The roof PV system at the Hsienjung Temple. Source: Photo provided by Hsu Cheng Tang.

The new organizer started a new phase of the initiative by gathering the signatures of around one-third of the villagers and in late 2017 establishing a civic organization, the Taihsi Green Energy and Health Community Promotion Association (TGHPA), composed of 30 villagers and six external supporters. In early 2019, the Taihsi CE initiative obtained a grant of two million NTD (around 58,300 euros) from a pioneer CE subsidy scheme provided by the Bureau of Energy (BOE). With the grant and investments by 16 local stakeholders and external supporters, four public meetings in the village and two educational trips to other renewable energy initiatives were held in 2019. Additionally, four roof PV systems with a total installed capacity of 56.1 kW were completed and

participation in the consequent development of the project was limited, partly due to a lack of time and energy and partly due to his wish to forwarding local leadership.

integrated into the national grid to sell electricity to the utility on the rooftops leased by local supporters and a local environmental NGO, which had been a strong ally of the campaigns against petrochemical pollution since the time of the anti-Kuokuang movement. The organizer oversaw the operation and basic maintenance of these micro PV plants with the goal of establishing a green energy 'B corporation' owned mostly by the community members, with 10% of profits going to community-wide social welfare projects.

As income generated from the sale of electricity was important for the success of the project, the organizer chose to establish a 'B corporation' that stressed both profit-making and social benefits. He rejected to form a social enterprise or co-operative that have been upheld Taiwan's CE advocates and some scholars for their democratic structure (Becker et al. 2017). Paradoxically, the 'one-member-one-vote' principle of a co-operative was unpopular among some local shareholders in this disadvantaged community, who regarded it as 'unfair' and demanded a corresponding return on the hard-won money they invested. The organizer thus argued that co-operatives were more suitable for middle- or upper-class citizens, who would be less bothered by investment losses and had more capacity in terms of time, interests, and knowledge to participate in project management activities.

Similarly, the organizer took the responsibility of most of the planning, implementation, and decision-making activities of the initiative, which other local participants could discuss with him in daily conversations. Underpinned by existing social networks and a spirit of resistance commonly found in CE projects (Simcock et al., 2016), this single-person leadership was not seen by local informants as elite domination or violation of an energy democracy, but as a convenient arrangement in a community where younger, educated, and devoted members who could help carry out the task were in short supply. As most local participants were above the age of 60, this arrangement helped exempt them from laborious technological and administrative tasks that were beyond their energy, knowledge, and interests. With mutual trust, by then it had not caused any tension among participants as it might have elsewhere (Forman 2017). This again cautions against formalist assumptions about the forms and priorities of CE, as they could significantly differ for different contexts.

5.4.1 Creating a favorable socio-political atmosphere

Form the onset, the leading grassroots actors had consciously created a local socio-political atmosphere benevolent to the CE project through careful engagement with local politics. First, they recruited the village head as the president of the TGHPA and the resumed community development association, which could be utilized to access resources and organize activities in the name of the community so as to ensure unified interests between them and to win

the support of more community members. Second, they kept politicians at the township level at arm's length given the low level of trust in their pro-Kuokuang standpoint and local government performance. Third, they insisted on obtaining central government's endorsement for the CE project, especially in the form of funding, to enhance the commonality, credibility, and feasibility of this unprecedented initiative in the eyes of community members. Besides government funding, the organizer focused on recruiting local shareholders during the second phase of the initiative with the aim of building genuine connections between the initiative and community members and creating a sense of ownership.

As in the campaigns against petrochemical pollution and other community-wide projects, interpersonal ties based on the existing social fabric proved the most effective means to engage community members at an early stage. The leading actors' father, a respected senior community member, was in charge of local mobilization through his personal networks and socio-political capital.[64] The earliest and strongest support came from a group of around 20 senior residents in *Tuā-tsng,* nicknamed the 'tea-making party' (泡茶黨) because they often gathered in his living room to drink good tea and chat about politics and local affairs.[65] Ranging from retired teachers to farmers who mostly belonged to the same kinship group, members of the 'tea-making party' were sympathetic toward the political opposition movement in the 1980s (the precursor of the DPP) that fought against the nationalist party's patron-client politics, and had been the core members of the Taihsi self-help group struggling against the Kuokuang Petrochemical Complex project when most villagers kept a distance in fear of offending local politicians. Mutual trust based on kinship, life-long friendship, and shared support for the pro-energy-transition DPP government prompted them to assist the CE initiative as funding members and shareholders.

Additionally, their sensitivity of local people's voting intention and capability to mobilize community members granted them special political capital that

[64] He was the village head in the 1970s and is related to a township mayor who was in office in the late 1960s. Despite having left the political system, he gained social and political influence in the community partly because of being a senior member of the main kinship group and having a higher level of education than most other villagers of his generation, and partly because of offering help to less advantaged villagers.

[65] Most residents in *Tuā-tsng,* the largest residential area in Taihsi (see Map 5.1), belong to the same kinship group (the Hsus), which helps prompt local engagement in community-wide activities, including local campaigns against the Kuokuang Petrochemical Complex project. By contrast, residents in *Kue-á* in general are less active in *Tuā-tsng*-centered activities due to socio-geographical distance between them. They joined in the anti-pollution activities such as health examinations after the victory of the anti-Kuokuang movement.

helped obtain some political support for the CE initiative. As Taihsi was one of the few villages in this area where political preferences deviated from support for the KMT, the former village head had access to some DPP politicians, including candidates for the county magistrate and legislator positions, who sought his advice on local affairs and asked his help in local mobilization. With the victory of the DPP in the Changhua magistrate election in 2014 and the general election in 2016, respectively, the county government and a few DPP legislators in 2017 articulated their support for the Taihsi CE initiative at a press conference, albeit with ambiguous results.[66]

5.4.2 Navigating local political dynamics

When the CE initiative was initiated, Taihsi Village had enjoyed a peaceful political climate within the community, owing in part to the close kinship ties and in part to the lack of economic resources for competition. The institutional failure until recently to recognize Taihsi as a stakeholder of the 6th Naphtha also spared it from internal competition over the financial patronage of the latter. The village head has occupied his position for almost three decades thanks to the political support of the main kinship group, whereas the Hsienjung Temple committee chaired by a member of the 'tea-making party' for almost a decade remained distanced from local politics.

However, perceivable socio-political changes have taken place since 2017, when the FP launched a series of 'philanthropic' programs in Dacheng, including allocating a grant of approximately 50 million NTD (around 1.47 million euros) from the 'assistance fund' to the township office, providing consolation money to low-income households, and organizing free trips for Taihsi villagers to the 6th Naphtha.[67] Meanwhile, the *Kue-á*-born township council chair, who had welcomed the Kuokuang petrochemical project (Chan, C. 2012, Wu, R.

[66] The county government in cooperation with three DPP legislators in 2017 proposed a 'green-energy, low-carbon heath village' project. It was designed to fit into a state mega project for national development, whereby a budget would be allocated to install five large-scale wind turbines in Taihsi. However, the project was not accepted by the central government, and no similar action was taken after the DDP magistrate lost the election in 2018, pointing to the instability of local politics.

[67] Since 2000, independent power producers contracted by Taipower have been required to provide an assistance fund to facilitate the development of electricity infrastructure and ambient communities. The power plants at the 6th Naphtha (Mai-Liao Power Corporation) failed to follow this obligation until it was legalized through the amendment of the Electricity Act in 2017. Thereafter, 0.6% of its annual assistance fund was channeled to the Changhua County Government and 2.5% to the Dacheng Township Office, whereas civic groups in Changhua can also apply for grants (Mai-Liao Power. 2018). Despite the purported aim of promoting 'mutual prosperity with ambient communities' (ibid.), this fund had raised concerns over political corruption (Chen, W. 2019).

2011), expanded his political networks inside the community by helping his preferred candidate win the position of chair of the Hsienjung Temple committee in mid-2018. In 2019, he led local politicians to protest against the 6th Naphtha, appropriating EJ campaign discourses (Yen, H. 2019, Zhong and Tsai, M. 2019).

While elected representatives serving in the interests of affected communities and seeking to address the unequal distribution of environmental harms and benefits seemed a reasonable and welcome move, the leading anti-pollution campaigners expressed their suspicions about opportunistic motivations of these local politicians. Both the township council chair and the township mayor were detained in mid-2020 over charges of extorting money from cable construction companies working on local solar energy projects by threatening to send thugs to and initiate local protests against these companies (Chen, K. 2020).

This political maneuver supported the leading grassroots actors' distrust of local politicians while verifying their concerns that a symbiotic relation between local political elites and the FP similar to that in Mailiao was in the making. Indeed, they observed an attitude shift in the community regarding the campaigns against petrochemical pollution, which had once enjoyed community-wide participation. Some villagers who acquired contingent employment in the 6th Naphtha with the council chair's help, for instance, became silent about the pollution.[68]

The financial patronage that gradually filtered into Dacheng with the help of local political elites had detrimental consequences for trust and social cohesion in the community, which hindered the development of the Taihsi CE initiative perceived by the pro-6th Naphtha villagers as 'anti-6th Naphtha'. For one, it became very difficult for the organizer to enroll shareholders and find sites for installing PV facilities in *Kue-á*, where the attitude change was most conspicuous. For another, the change of the Hsienjung Temple leadership led to the termination of the '*Hsuyuan* Village' project and the potential investment of the temple in the CE initiative. A surprising dispute occurred in late 2018, when

[68] According to the organizer's estimations, one-third of the community members, many of whom are associated with the township council chair's socio-political network, were in favor of the 6th Naphtha (or at least no longer vocally opposing it) in early 2019, which increased to around one-half in 2020. The organizer reckoned that the proportion was unlikely to increase in the future, as the community members who remained on their side—including the 'tea-making party'—were hard-liners in opposing the 6th Naphtha. Nevertheless, local momentum for anti-pollution campaigns decreased alongside the deterioration of local discussions about petrochemical pollution. For instance, the leading campaigner was asked by some residents in Dacheng in 2020 how much money they could get from the 6th Naphtha instead of how they could demand that the FP reduce pollution, indicating a shift in focus.

the new chair accused the solar company, who had donated and installed the roof PV system, of encroaching on the temple's property. He would have torn down the facility if the former village head had not intervened and mediated the conflict.

The second phase of the CE project thus involved careful navigation of the growing divide of the community. In the organizer's words, "you have to know how politico-economic interests are distributed in a place to make a community energy project feasible". In response, he focused on working with private resources, such as rooftops provided by shareholders within and outside the community, instead of using public resources that could trigger local political tensions. Additionally, he strategically kept a low profile in heading the initiative, as the project had not been economically robust enough to challenge the politico-economic ties and patronage associated with the 6th Naphtha. Questioned by the pro-6th Naphtha villagers on the representativeness of this 'community' energy initiative, he welcomed benign competition from other CE projects in the community, if any, as it could benefit the entire community.

Overall, the development of the CE project was enabled by the careful political arrangement of the socio-political fabrics in the place, first by consolidating support from close friends and relatives, then by avoiding direct conflicts with local political elites whose influence in the community increased with the introduction of the FP's financial patronage. The changing socio-political atmosphere in the community demonstrated that a grassroots niche space is not a closed space exempt from hindrances and socio-political competition in and beyond the community, despite leading actors' proactive protective measures. It also verified the pressing need for alternatives to the emerging economic ties with the 6th Naphtha. However, the development of the CE project was challenged by this local socio-political change, reflecting the politico-economic asymmetry between the grassroots actors and the petrochemical interests. In this sense, the chance to realize the place vision of rejuvenating the community by helping it achieve socio-economic autonomy would hinge on engaging sufficient extra-local support.

5.5 Engaging the state: when a place vision encountered an energy transitions agenda

As Creamer et al. (2018: 8) stressed, CE is "unavoidably entangled with a range of different actors and institutions operating at and across scales". In the case of the Taihsi CE initiative, this assemblage of external actors included local and national environmental NGOs, solar companies, sympathetic scholars, renewable energy researchers of the semi-governmental Industrial Technology Research Institute (ITRI), the electricity utility (Taipower), a few DPP legislators,

and the deputy executive director of the Executive Yuan's Office of Energy and Carbon Reduction (OECR), who was also a leading scholar in public participation and climate change. Some of them, especially environmental activists and the public health scholar who introduced the idea of CE to the community, had built trust relationships and forged friendships with leading grassroots actors since 2009 through campaigns against petrochemical pollution. They helped mobilize actors in government agencies and the private sector through interpersonal and political networks to obtain various forms of assistance, including by co-organizing events, donating facilities, and offering technical and legal advice.

Grassroots actors strived hardest to engage with the state, especially central government institutions, not only because it possesses more resources and power in relation to other actors to address the difficulties they encountered, but also because it was deemed responsible for creating and perpetuating the community's distress. Despite abundant wind, sunshine, and fallow land ideal for developing wind and solar energies, the overall built environment in Taihsi could hardly reach the regulatory requirements.[69] Consequently, the first phase of the initiative was dedicated to negotiations with several central government agencies about the possibility of financial support and regulation relaxations (Figure 5.5).

[69] Possibilities for building large-scale wind turbines on the riverbank significantly declined by mid-2017 due to regulatory and financial difficulties. Rooftop PV systems could be installed only at a few houses in the village, as many of the local houses were either too old and fragile or unlicensed due to having been converted from farmhouses or built before the regulation was implemented. Despite several villagers' willingness to lease their fallow farmlands, ground-mounted PV systems could not be widely installed, either, because agricultural land here was not allocated for renewable energy installations, even though it was in an area facing severe land subsidence (COA. 2015). Moreover, as is common in rural areas, many houses and farmlands had multiple owners, which significantly increased the administrative cost of utilizing these sites.

Figure 5.5: Several experts from ITRI, OECR, and other energy-related agencies visited Taihsi in April 2017 to discuss the development of the CE initiative. Source: Photo taken by the author.

5.5.1 Community energy or citizen energy?

The demand for state financial support showed an implicit discrepancy between the EJ-based place vision upheld by grassroots actors and the agenda for public participation in energy transitions pushed forward by CE advocates in government agencies and NGOs. Many pro-renewable-energy activists and scholars had worked very hard to persuade the state of the need for public engagement in energy transitions to complement its emphasis on large-scale, firm-led initiatives to boost the share of renewable energies in the energy matrix. Some of them expressed concerns about the latent adverse impacts of the Taihsi actors' ardent political lobbying for this single case on government agencies' perceptions of CE, which could render their advocacy attempts difficult. Moreover, they saw the grassroots actors' demand for 'top-down' funding as at odds with the 'bottom-up' character of CE. Instead, they suggested public fundraising as a more appropriate way to secure funding, which not only was the primary source of funding for most NGO-run CE projects in Taiwan, but was also celebrated as a key example of civic participation.

While this suggestion was perfectly in line with the notion of citizen-based renewable energy projects, it was dismissed by the grassroots actors as totally missing the point in their pursuit of justice. The initiator wondered: "Why are they asking other people to donate? […] If you believe that Taihsi Village should be compensated, shouldn't it be the government who pays?" The stress on citizens' lead in financing CE in Taihsi's context in effect could be covering the government's failure to discipline the petrochemical industry. Consequently, they insisted that government investment in the initial stage was crucial for starting up the CE project. In the organizer's view, public fundraising and corporate sponsorship might cause unhelpful conjecture about the leading actors' and sponsors' motivations, whereas getting central government on board would help avoid such internal objections. Paradoxically, engaging the state became a strategic necessity rather than an antithesis to public participation in Taihsi's socio-political context.

The tension between the two perspectives, the one citizen-oriented and the other place-based, illustrates a need for critical reflection on the conflation of different forms of CE in Taiwan. CE advocates and policymakers often subsume place-based CE under the general term '*gongmin dianchang*' (公民電廠, 'citizen power station'), whereby they try to maintain 'a flexible space' that could encourage creative experimentation and the formation of a discourse coalition (Walker et al. 2007, Walker and Devine-Wright 2008). As the term '*gongmin*' ('citizens') suggests, they tended to regard grassroots actors as rooted in the abstract realm of civil society, rather than as situated in relational spaces resulting from specific geo-histories. Place specificity was less of a concern for several NGO-run CE projects, which could recruit citizens all over the country as investors and 'rooftop lessors'. Thus, when performing an 'intermediary role' that translates local experiences into knowledge of and policies related to CE (Hargreaves et al. 2013), they tended to downplay site-specific needs and objectives that were at odds with the preference for a replicable model.

By contrast, for the grassroots actors active in the Taihsi CE initiative, the distinction between the notions of 'citizen' and 'community of place' was crucial. By describing the project as 'typically community-based', they prioritized the vision of reviving the community over the external agenda of civic participation in energy transitions. As the initiative was just a means to achieve their place vision, it would lose its meaning to the grassroots actors if site-specific needs and ends would have to be sacrificed for the purpose of the geographical expansion of CE. The place specificities, including an ageing population with limited economic capabilities and low levels of education, were not to be sidelined. Instead, they were the daily reality that consumed most of their energy in the search for a suitable site and a shareholder. For them, 'localization' and 'public participation' in CE entailed not merely a decentralized energy system

in which citizens participated through public fundraising or rooftop leasing, whose "impacts on sustainable place making are likely to be much weaker" (Slee 2020: 164). Rather, it involved embedding CE in local socio-economic relations in ways that could create positive 'social values' for the community.

The implication for the intermediary roles in nurturing and understanding grassroots innovations in general is profound. Resonating with several studies on CE in Scotland (Slee 2020, Van Veelen 2017), this finding suggests a potential hierarchy between different imperatives of CE and the need to avoid a normative, pre-excluding imaginary of the forms, meanings, and values of CE. This indicates that, despite some awareness of place differences, the aim to upscale and replicate CE in advocacy entails a tendency to highlight its universality, thereby disregarding socio-material contexts across places of implementation. The catchall concept of CE, albeit allowing for public mobilization, downplays the differences between projects focusing on civic participation and those emphasizing community of place. Without critical scrutiny, this conflation could unintentionally privilege the former while blunting their sensitivity to the latter's needs and ends (Van Veelen 2017). Paradoxically, such insensitivity to grounded experiences could not only compromise knowledge production on CE for policymaking, but also potentially increase challenges for disadvantaged communities to develop CE.

5.5.2 Redressing or consolidating injustice?

This seemingly fundamental divergence between community of place and citizen participation not only reflects the tension between the particular and the general, or 'local-global dynamics', in transition literature (Coenen et al. 2010, Geels and Deuten 2006, Geels and Raven 2006); it also has significant implications for energy justice from a relational and spatial perspective.

Taiwan's CE campaigns and policy discourses have paid some, yet limited attention to socio-economically disadvantaged groups, including communities in 'remote areas' (townships with a registered population density less than 20% of the national average).[70] Despite receiving much external help, the grassroots actors expressed their frustration with the underestimation of the challenges

[70] Ironically, Dacheng Township did not meet this criterion. This is partly because this measure is based on the 'registered' population of a township rather than the 'actual' population in each village, which in Taihsi's case is around half of its registered population, and also likely because Changhua was once the most populous area in Taiwan thanks to the prosperous agricultural sector (Chang, S. 2014), which ironically became a reason for its marginalization in the uneven development of industrial capitalism after WWII (Chen, Y.Z. 1987). Dacheng Township is classified as a 'relatively disadvantaged' area by other official measures (for instance, see NDC. 2020).

facing the community. For instance, the pioneer subsidy scheme for CE projects coordinated by the deputy executive director of the OECR, functioned as a compromise between government financial support for this CE initiative and the goal of geo-historical expansion of CE. Although it provided important financial support for the second phase of the CE initiative, it nonetheless showed the government's reluctance to directly compensate the victims of petrochemical pollutions as several local informants had hoped for.

The grassroots actors pointed out two additional hindrances they encountered in pursuit of justice through CE. Firstly, from a grassroots point of view, the conventional conceptualization of CE reveals a potential urban, middle-class bias in CE advocacy and policymaking, which risks paying insufficient attention to site-specific challenges and objectives, especially in disadvantaged rural communities. "When they were defining *gongmin dianchang*, they forgot that the cost of the renewable energy installation, in whatever form, is high," the project initiator commented. "It involves a certain expertise that can only be obtained if you're above a certain class. And the high initial costs will produce further class differences." For these grassroots actors, this illustrated the Taipei-based advocates and policymakers' underestimation of the social inequality that constrained this rural community's ability to implement CE, thereby unintentionally reproducing the social hierarchy facing it and other disadvantaged communities.

This also indicates a latent tendency of advocates and policymakers to consider their own experiences and implementations of CE—through co-operatives and public fund-raising—universally applicable and desirable, thereby forgetting their situatedness in specific socio-spatial contexts. Similarly, their devotion to democratizing the process of a nationwide energy transition and addressing political challenges from pro-nuclear interests—although important in themselves—limited their sensitivity to other transformative politics facing marginalized rural communities, such as resisting the emerging alliance between local politicians and petrochemical interests. All these add to the need for them to reflect on their positionalities and to pay more attention to site-specific challenges and perceptions of CE that differ from their own. While it is unlikely to address all challenges in different socio-economic contexts, place-based reflection could help address the pitfalls of sector-oriented institutional supporting schemes, so that they can truly support grassroots actors in carrying out CE in divergent contexts.

Secondly, the grassroots actors identified a tendency of the state to underestimate the social values of a CE initiative and its profit to a disadvantaged community. The current feed-in tariff (FIT) system offered few price bonuses applicable to Taihsi to reward CE's intrinsic value to this community, nor could this CE initiative obtain the maximum price in the FIT system owing to the

rule of the CE subsidy scheme (BOE 2018).[71] Moreover, the BOE preferred to encourage CE to 'self-generate and self-consume' its energy rather than to increase its competiveness in the energy market, and viewed the profits of CE projects as an alternative to 'bank interests' rather than as returns on investment.

These institutional barriers limited the income generated from the CE initiative, which were pivotal for achieving the grassroots actors' place vision and to resist the permeation of the economic ties with petrochemical interests. They represented a form of 'institutional injustice' to the organizer: "You would think that it would have been fair, but I still experienced injustice." For him, this revealed the government's passive understanding of CE and of its role in coordinating the more equal distribution of resources to develop CE in disadvantaged communities.

These opinions, however, tended to be ignored in public meetings on price setting, where the focus was on business actors and the economic efficiency of the FIT, i.e. stimulating greater private investment and cost-effective installations. This observation, along with high travelling costs, discouraged the organizer from further attending these meetings in Taipei, where CE advocates in Taipei often became the representative voice for CE. Such procedural disadvantages strengthened, rather than eased, several grassroots informants' feelings of marginalization and powerlessness arising from longstanding environmental injustices, as their place-based needs were again sidelined—this time for the promotion of nationwide energy transitions.

Thus, despite some attention having been paid to energy justice in the FIT, policymaking, and CE campaign discourses, distributional and procedural inequality can emerge if the site-specific challenges and values of developing CE in disadvantaged communities remain under-recognized in the energy transitions agenda and process.

5.6 Conclusion

This chapter showed that the Taihsi CE initiative arose as part of the community's opposition to environmental injustice stemming from the expansion of

[71] The grant in the second phase of the CE subsidy scheme had to be deducted in the official 'calculation formula' of electricity prices. This was designed to avoid a CE project's receiving a double subsidy in the name of 'fairness'. For the organizer, however, instead of cutting the profits of CE, this was to be achieved in another way, such as by paying back government-invested money. In his view, the FIT system should also set up a separate scheme with more favorable prices for CE to stress its social values instead of sharing the same scheme with business actors.

the petrochemical industry. It also showed that CE was envisioned by grassroots actors as a way to establish self-reliant social-material relations as alternative to those depending on the polluter's financial patronage. To create and maintain a grassroots niche for this bottom-up so experiment, leading grassroots actors engaged community members through existing socio-political networks and carefully navigated local political dynamics. Moreover, they strove to engage central government to overcome the regulatory and financial challenges in implementing CE and to hold the state accountable for the community's distress. However, the demand for the state's investment was taken by CE advocates as at odds with the 'bottom-up' principle. This revealed an overlooked discrepancy between community-based CE and citizen-oriented CE in Taiwan, as well as the tension between the aspiration for sustainable rural development and the goal of civic participation in sustainable energy transitions. Without critical reflection, the emphasis on the geo-historical expansion of CE and the normative assumptions about the forms and meanings of CE in advocacy and policymaking processes risk increasing the injustice facing disadvantaged communities by underestimating and overlooking the challenges and intrinsic values of CE in their contexts.

The disparity and potential tension between frequently conflated, place-based CE and citizen-oriented CE in Taiwan's context has important implications for the study of grassroots innovations. They not only demonstrate the limits of a sector-oriented approach in understanding the geo-historically produced needs and ends of grassroots actors, but also reveal the risks of underestimating the challenges and values of these initiatives on the ground in a way that not only compromises policy measures to support them, but also perpetuates social injustices experienced by disadvantage communities. An uncritical emphasis on citizen participation in socio-technical transitions can lead to a bias favouring other forms and goals of grassroots innovations, which, Van Veelen (2017: 2) argues, "limits not only our ability to understand these practices but especially how they relate to broader social transformations".

This chapter also demonstrated that a place-based relational approach is effective to unpack community motivations, perceptions, and objectives regarding grassroots innovations, thereby supplementing our knowledge of their pluralistic nature and the potential to promote social change. It can also serve as an important reminder to remain reflexively open to diverging interpretations and practices of CE in various contexts. While a functional definition of CE may be necessary in policies and campaigns, it is important to remain cautious of its exclusionary effect so as to strike a balance between the goal of scaling up grassroots innovations' contribution to a certain socio-technical transition and the socio-spatial objectives of grassroots actors who are supposedly the practitioners and beneficiaries of these initiatives.

By unpacking the situated knowledge and values of CE, place-based research can help bridge discrepancies between different priorities and enhance the mutual understanding between grassroots actors, intermediary actors, and policy-makers. The Taihsi CE initiative may not be replicable as much as some CE advocates would prefer in the promotion of participatory energy transitions. Nevertheless, it presents another potential of CE in supporting victims that have still been locked in the fossil-fuel-driven 'system of sacrifice' (McCauley et al. 2019, Takahashi 2014)—equally essential for a just low-carbon transition.

6 Conclusion

6.1 Introduction

The latent tension revealed in Chapter 5 between leading grassroots actors, on the one hand, and CE advocates and policymakers, on the other, raises a critical, yet underexplored question: Can we claim that 'sustainability' is achieved through the 'sustainability' transition of a socio-technical system if the community that carries out the grassroots innovation is still forced to bear an unjust burden of environmental and economic costs?

This question implies a possible tension between the socio-technical and socio-spatial dimensions of 'sustainability' that tends to be overlooked in grassroots innovation studies and transition theories in general. While it suggests a need to rethink 'sustainability' in a synergetic way, it also confirms the need to take into account socio-spatial dimensions when studying and promoting grassroots innovations, in particular the site-specific concerns and aspirations that drive these community-based social experiments.

In this thesis, grassroots innovations were conceptualized as community-based social innovations through greener technologies driven by unmet site-specific concerns and entangled with different networked interests at play in a place. I proposed a place-centered enabling approach to foreground site-specific needs and place-based politics often sidelined in conventional grassroots innovation studies that frequently adopt a sector-oriented, decontextualized approach in accordance with a systemic transition research agenda. To better understand grassroots actors' experiences, motivations, and aspirations, I recast grassroots innovations as grassroots place-making actions, similar to other forms of place-based activism, and focused on three analytical constituents: the development history of a community, place-framings, and internal and/or external place-making politics.

This chapter provides a summarizing discussion of the three studied cases in relation to the research questions and themes identified in Chapter 1 that guided the research. I will discuss how these findings highlight the abovementioned question and which possible solutions or steps toward these a place-

centered enabling approach can offer. I conclude the thesis with some reflections and implications of the study for future academic research.

6.2 Development history, place-framing, and place-making politics

Drawing on three cases of energy and agri-food grassroots innovations in rural areas in Taiwan, this thesis regarded the intra-action between grassroots innovations and the communities hosting them in (re)making a place in order to address the local articulations of socio-spatial transformation alongside the country's structural shift toward industrial capitalism, especially during the Japanese colonial period starting in 1895.

In the case of the Taromak community, its development history characterized by over a century of colonization and modernization involves the collapse of the traditional indigenous socio-political and economic order following its integration into the centralized administration of a modern state (i.e. '*chihouka*') and the reconstruction of its social value systems through its embeddedness in the market economy, leading to an identity crisis over the internal/external stigmatization of the indigenous identity. The site-specific needs for eco-cultural revitalization and decolonization prompted several leading grassroots actors to use community energy as another way to try to (re)make the place in pursuit of their aspiration for tribal autonomy.

In the case of the Wanbao community, the development history involves collective efforts to improve local agricultural production conditions over generations so as to accommodate the broader socio-political changes and industrialization process. The site-specific needs to protect the land from resource grabbing through state-led industrial projects, as well as to find a way out of the marginalization of this rural village in an industrialized, urbanized modern society, led the leading grassroots actors to turn to organic farming that was considered a promising way to sustain the deep people-land connections in a more socio-ecologically reciprocal way.

In the case of the Taihsi community, the development history concerns not only the marginalization of the agricultural and rural sector, but also the detrimental environmental burden borne by the rural place as a waste sink of industrialization. To address the site-specific concerns over the disproportionate socio-economic costs and the unjust environmental and health hazards brought about by the petrochemical industry, the leading grassroots actors chose community energy as a way to revive the damaged community with a self-reliant socio-economic configuration independent of the financial patronage of the polluter.

The geo-historically produced concerns and aspirations to remake the place 'from below' in response to the broader politico-economic trajectories and forces often encountered political challenges from other community members and external actors who had different, competing place-frames and priorities. Place-making politics can be present within a community, as in the case of Taromak, where the cultural revivalists were politically challenged by the coalition of Protestants in local elections and in the organization of community-wide activities. It can also be external, as in the cases of Wanbao and Taihsi, where grassroots actors worked together and networked with external actors to resist state-endorsed industrial projects.

The internal and external place-making politics often occur together and affect each other. Indeed, despite differences in form and degree, all three cases have witnessed the entanglement of political dynamics in, around, and beyond the place with various forms of place-based activism. For instance, the place-based campaign for tribal autonomy in Taromak, like the second land struggle in Wanbao and the anti-pollution campaigns in Taihsi, moved beyond the village to include actors in other places and across regional, national, and international levels to further their aims. In another instance, the Wanbao village head who had supported the industrial project in the first land struggle was replaced by a community member who was supported by the majority of affected landowners opposing land expropriation. This in turn helped the latter head the second land struggle by strengthening the solidarity of the community as well as facilitating the formation of organic farming initiatives as a means of community development and as a proactive defense against state-led land enclosure. Even for places that have long been devoid of internal political competition, like Taihsi, the local political climate changed through local politicians' and residents' responses to the newly introduced financial patronage of the petrochemical company intended to appease local opposition.

Grassroots innovations as place-making actions are inevitably entangled with these place-making politics that exist beyond the associated socio-technical systems. They are part of the place-making politics along with other place-based activisms, as demonstrated by the intra-action between the agri-food initiatives and the second land struggle in Wanbao. Similarly, the Taromak CE initiative was embedded in the local political agenda for tribal autonomy, considered to aid the promotion of energy autonomy, while the Taihsi CE initiative can be viewed as a continuation of the pursuit of environmental justice through resistance to petrochemical pollution and political inaction. There are often mutual reinforcing effects between grassroots innovations and other place-based collective actions sharing similar place-frames and visions; these include amplifying socio-political resources, internal mobilization, and external networking that are conducive to the emergence and development of grassroots niches.

Nevertheless, the social momentum prompting strong engagement in other community-wide collective actions cannot necessarily be attained for grassroots innovations such as those studied. There could be several reasons for this, including a mismatch between the high level of knowledge and capital required and the capacity of a community especially in a disadvantaged setting. It could also be due to differences in the cognitions and expectations of the main actors, such as in the later stage of the second land agri-food initiative in Wanbao. In all three cases, social mobilization in the form of place-based campaigns against external threats, such as land grabbing, air pollution, the violation of indigenous rights and other initiatives, did not entail equal levels of participation in a grassroots innovation, especially when the initiative's direct connection with individual community members has not been established.

In response, leading actors often relied on their own social networks in the community stemming from strong kinship ties, long-term friendships established through living and working together in the community, and comradeship built through participating in place-based activism, such as in the case of the members of 'tea-making party' in Taihsi who joined the CE initiative to show their solidarity with the leading actors. By contrast, community members who took different political stances and place visions from those of the leading actors in the internal and/or external place-making politics tended to be less motivated to participate in the initiatives, if other incentives such as tangible benefits were not provided.

6.3 Nurturing grassroots niches as hybrid spaces

These internal and external place-making politics show that grassroots innovations do not take place in a void, sheltered from internal disturbances and external pressures. The empirical findings demonstrated that grassroots niches as 'hybrid spaces' are created and maintained through strategic engagement with the geo-historically produced features of a community of place and with the elements that sustain and condition the incumbent socio-technical regime.

6.3.1 Coping with socio-spatial hybridity

In terms of socio-spatial hybridity, all three cases testified to the necessity of the strategic navigation of place-based politics for the formation and growth of a community-based grassroots innovation. For instance, in communities like Taromak where internal political tensions run high, grassroots innovations could become an arena of existing political competition, but could also serve as a platform for cooperation between different political coalitions if the initiative could fit into the place-frames of different parties.

The political engagement of leading actors can facilitate the creation and maintenance of a grassroots niche space in two ways: (1) it can help obtain resources and support in social, political, financial and material terms, and (2) it can help avoid potential opposition and stymie boycotts. These tasks are often shouldered by community members who possess higher levels of socio-political capital than most members in the community, including local political elites, opinion leaders, and respected senior community members.

In the context of Taiwan's rural and indigenous communities, socio-political capital does not necessarily result from being a local political leader. The social influence of powerful figures, such as Hong Hsiang in the Wanbao case and the former village head in the Taihsi case, in the community is created more through public commitment to community affairs and their seniority in a big local family or clan, along with their personal connections with some politicians. This social influence is often translated into a political resource conducive to community-wide mobilization in elections and place-based campaigns and is also invoked in the promotion of grassroots innovations.

Nevertheless, securing local political positions or the support of local political elites can be an effective means to obtain institutional resources and legitimacy for the development of grassroots innovations. By contrast, losing these socio-political positions and support often entails the loss of these resources and the need to accommodate associated impacts, as demonstrated by the failure to obtain a large government grant in the case of Taromak after the leadership change in DCDA, and when the new committee chair objected to the roof PV facility at the Hsienjung Temple in the case of Taihsi. Conversely, the result of the grassroots innovation is also likely to influence local political dynamics that in turn can determine the long-term socio-political support available for the development of grassroots innovations. For instance, positive achievements can strengthen leading actors' socio-political status in the community, as it demonstrates their capability to advance the wellbeing of the community, such as by bringing in more external resources for developing the community.

The task of key grassroots actors of preventing local boycotts often involves carefully selecting political allies in and beyond the community and keeping distance from potential opponents. In Taihsi, for instance, this was done by keeping the village head and central government on board while avoiding engaging with corrupt politicians at the township level. In so doing, the leading actors created a more or less unified and supportive socio-political atmosphere within the community that set the stage for experimentation through CE in this community. Nevertheless, this carefully created grassroots niche was not isolated from the political challenges of the petrochemical interests that later filtered into this area, nor was it capable of protecting the grassroots innovation

from the resulting hindrances plaguing the divided community. As the grassroots niche was an open and hybrid space, the leading grassroots actors had to adopt different political strategies to develop the grassroots innovation, such as avoiding direct confrontation with the opposition, strengthening the connection between the CE project and friendly community members in their own networks, searching for support and resources elsewhere, and keeping a low profile until the project was robust enough to be able to face competition.

Even when the socio-political landscape in a community seems to be stable, as in Wanbao's case, the grassroots niche is not exempted from challenges that lurk under the surface. As a leading actor in Wanbao (and leading actors in the other two communities as well) noticed, distrust of and conjectures about their motivations for promoting these initiatives assumed the form of gossip about alleged personal gain or political ambitions driving their involvement. Whether these allegations were grounded in truth, misunderstanding, or lies, they could serve as a political weapon in rural politics; during the two land struggles such rumours were used in the smear campaigns of the growth coalitions to discredit the local leaders. Even when not having a direct political impact, such tactics could potentially counter the development of a grassroots innovation by discouraging wider community participation and by openly questioning the representativeness of the grassroots innovation in an attempt to discredit it.

This limits the capacity of leading actors to mobilize community members and increases their reliance on their small circle of close friends and relatives, which in turn fuels the conjectures of their pursuit of personal gain and power rather than engaging for the wellbeing of the entire community. Interestingly, the leading actors in all three cases tried to live with and accommodate this political plurality by focusing on mobilizing resources and people in their reach while welcoming the voluntary participation of other members, if there were any voluntary participants, rather than actively engaging or silencing different voices through consensus building, which they considered impossible or unnecessary.

In general, key grassroots actors in the three cases shared several competencies and qualities conducive to grassroots niche building: (1) a sound economic position, with more spare time and money to take risks through experimentation; (2) strong local social networks to mobilize community participation; (3) knowledge of the socio-cultural and biophysical conditions of the place to convey the feasibility of projects to the community; (4) a keen awareness of the power dynamics within the community that makes them knowledgeable about whom to engage with and whom to keep at an arm's length; (5) a certain minimum level of education or administrative experience enabling them to tackle institutional, regulatory, and technical issues, such as applying for government grants; (6) a critical mindset that allows them to challenge the status quo and

underlying authority; and (7) a strong place attachment, creating a sense of responsibility to protect the place or improve it. Where these leading actors did not have the required competencies themselves, they were able to recruit community members with the wanting features to help them.

The last two features distinguished these leading actors in grassroots innovations from other community members who were equally or more socio-economically and politically advantaged but did not (actively) participate in the projects. This is partly supported by the fact that the leading actors in the studied grassroots innovations were also the leaders of other place-based struggles and initiatives driven by the same site-specific needs and ends. They also shared a dislike of the patron-client politics often associated with the KMT in rural areas, even though they might not completely detach from the operation of rural politics in and around their communities. Overall, these features equipped them first of all with the social, organizational, cultural, and financial skills along with access to material resources that Seyfang et al. (2014) deem important in setting up and developing grassroots innovations. They also endowed them with political capital and skills to steer a grassroots innovation through turbulent local politics.

6.3.2 Coping with socio-technical hybridity

The alignment of leading grassroots actors and external facilitators is most significant for establishing a hybrid grassroots niche space using elements appropriated from dominant socio-technical regimes such as energy agencies or the national grid and existing resources from national-level niches such as sales channels for organic food products and alternative technologies. In the three cases, the most important external facilitation came from activists, advocacy groups, and supportive scholars who had worked on creating and diffusing the socio-technical niche at the national level, often in cooperation with government agencies, to promote a systemic transition. They often played an intermediary role (Hargreaves et al. 2013), on the one hand introducing the ideas, technical know-how, institutional and material resources, and potential partners in the political system and the business sector to the community, and translating the community's experiences into campaign discourses to raise public awareness and policy support, which in turn boosted the confidence of grassroots actors in the projects, on the other. Diverse external facilitators played different roles and maintained different interrelations with the community and leading grassroots actors.

While in all three cases they refrained from engaging in local politics, those who worked closely with grassroots actors nonetheless were sensitive to local political dynamics and had 'people' skills (Seyfang et al. 2014). The secretary-general of TEPU who proposed the Taromak CE project and facilitated the

Taihsi CE project in its initial stages serves as the best example: he approached the socio-political leaders in these communities in a respectful manner, crediting them in public, linking the grassroots innovations to their place-based agendas, and earning their trust and recognition by bringing in socio-political and material resources from the public, private, and third sectors. Nevertheless, he focused more on the tangible results of CE than on its discursive formation and participated less in the discursive construction of CE in lobbying and public awareness-raising activities, which were largely carried out by other Taipei-based NGOs and activists.

Conversely, leading grassroots actors in both cases also strategically reframed their grassroots innovations discursively to align with the external facilitators' advocacy and policy discourses to repay the favor and to obtain more social and institutional support, such as through increased civic participation in energy transitions, even though in practice they focused on local needs and ends rather than on this trans-local agenda. Indeed, the Taromak and Taihsi CE initiatives were invoked by NGOs and activists to illustrate the feasibility and social benefits of civic participation in energy transitions.

In turn, these campaigns opened up more public and institutional space to increase social and policy support for CE. For instance, a scholar who helped the Taihsi CE project and has worked as the deputy executive director of the OECR since 2016 has helped amplify the influence of civil society in the political system—following Smith's (2012) categories—in substantive terms, for example by coordinating with the BOE and grassroots actors to launch pilot subsidy schemes, in procedural terms, for example by strengthening civic participation in the production process of the Energy Transition White Paper, and in structural terms, for example by pushing for the decentralization of renewable energy generation and sales in the amendment of the Electricity Act. Through this seemingly 'win-win' effort, these CE grassroots niches could be seen as a strategic combination of what Seyfang and Smith (2007: 593) have called 'simple niches' (i.e. those aimed at redressing local problems) and 'strategic niches' (i.e. those aimed at extra-local transformation).

The alignment of leading grassroots actors with intermediary actors also enhanced their interaction with regime actors in the incumbent socio-technical systems, whereby some of the latter became potential allies of these niche innovations. For instance, through the coordination of the deputy executive director of the OECR, the Taihsi CE project received some help from the local branch of Taipower and a special assistant manager of the utility, who later joined the campaign for participatory energy transitions by initiating his own CE project elsewhere. The intermediary work facilitating cooperation between niche and regime actors is particularly striking and important in the case of renewable energy grassroots innovations, as the energy sector in Taiwan has

been highly centralized since the 1940s, which has led to the formation of strong institutional, technical, and psychological barriers between the grassroots and regime actors. By contrast, farmers in Wanbao themselves were actors in the fossil fuel-intensive, industrialized agricultural regime and had direct access to the resources in the highly decentralized, conventional agricultural system.

6.3.3 Hybrid grassroots niche spaces and strategic niche management

Grassroots innovation studies often employ strategic niche management theory (SNM) that are developed from and applied to market-oriented sustainable innovations to explore how a grassroots niche is nurtured through managing expectations, building social networks, and experiential learning processes (Seyfang and Haxeltine 2012, Smith 2012; for an introduction of SNM, see, Geels and Raven 2006, Schot and Geels 2008). The empirical findings from the three cases revealed several significant deviations from SNM theory, suggesting the need for a more spatially informed and politically sensitive perspective to unpack grassroots niche development.

First, all three cases built social networks with multiple types of actors and voices to obtain socio-political resources required for the development of grassroots innovations. However, in Wanbao's case, a considerable share of the networking activities conducive to niche building came from the networks established through the land struggle and the agrarian movement, rather than from the agri-food system per se. Similarly, the social networks arising from the campaigns against petrochemical pollutions also played a key role in helping secure external support for the Taihsi CE project. This suggests the need to expand the scope of networks so that they are not only associated with the targeted socio-technical system, but also with broader place-making politics in mobilizing resources for strategic niche building. Significantly, social networking when it comes to place-making politics is not intended to "create a constituency behind the new technology" (Schot and Geels 2008: 540), but rather to support the community in defending and remaking the place. Thus, the process of social networking by nature is a part of the networked politics of place in which the strategic alignment of selected allies can be more important than the unselective inclusion of multiple voices and interests that SNM scholars tend to suggest.

Second, the articulation of expectations and visions played an important role in justifying the grassroots innovations in all three cases. However, these expectations are place-based rather than sector-oriented: they have less to do with the nationwide transition of a socio-technical system and more with the future development of the community. Moreover, the strength of place visions in niche building is conditioned by the political and material environment of the community. For one thing, the place visions themselves are often contested

within the community as a key component of place-making politics, whose development in turn affects local perceptions and responses to the grassroots innovations. For another, consensus building on place visions may not be helpful for initial niche nurturing (e.g. attracting participation) in the context of a disadvantaged community.

The organizer of the Taihsi CE initiative, for instance, argued that discussing the future development of this dying village was likely to be considered empty talk by most community members whose primary and urgent concern was the material improvement of their livelihoods. He told me:

> Local people often say, 'Dead is dead. What can you do about it?' There is a sense of helplessness. […] The biophysical environment here is not good, neither are the economic conditions. Consequently, they don't have many expectations [about their lives here], meaning they can only live from hand to mouth.

This demonstrates a geo-historically produced socio-cultural barrier for community mobilization and civic participation in this disadvantaged community, namely, the learned helplessness deriving from experiences of government failure, persistent petrochemical pollution, and the marginalization of the rural area for decades. Instead, the organizer first had to show the tangible benefits of the CE project to convince these community members of the value of joining the project and the related consensus building. A similar observation was made for the two other cases sharing a relatively conservative social atmosphere and an ageing population. In these contexts, the substantiation of the potential benefits of a grassroots innovation is a prerequisite for, rather than the result of, discursive expectation management.

Third, in all three cases, social learning took place through the implementation of the grassroots innovations, albeit often confined to a few active grassroots actors. In Wanbao's case, for example, the leading grassroots actors learned the basics of organic farming (first-order learning) and then changed their cognitive framing of conventional farming practices (second-order learning) through cooperation with experts and HUCC activists (for discussion on social learning, see Schot and Geels 2008). The self-run joint farming team that emerged at the third stage of the agri-food experiment can be seen as a result of the learning-by-doing process through which the team members obtained other skills in marketing, sales, and organizing agri-food activities that complement organic farming practices.

However, social learning in these cases was a multilateral process, not unilateral as SNM theory tends to suggest. For example, the Taromak CE project was partly intended to help environmental activists understand the potential regulatory and procedural obstacles in implementing community-based energy projects. As the secretary-general of observed,

> Only when really stepping into a community and trying it out can one understand what the difficulties are on the ground. Otherwise, it is just empty talk. You may be capable of pointing out some potential problems in terms of the wording in a regulation, but you would not be able to know what the real challenges are in implementation.

For him, this pilot CE project also offered a chance for technocrats in government energy agencies to broaden their energy imaginaries. By inviting the vice director-general of BOE to the second Green Energy Camp, for instance, he tried to connect the technocrats to the 'real people' affected by policies, whereby "they could realize that what they were doing is not just about electricity: they could facilitate community development and help people who are socially vulnerable."

Nevertheless, the social learning outcomes on the part of CE advocates and policymakers have often been limited in terms of scale and depth. Intermediary and institutional actors, preoccupied by their own agendas and other work, were not always attentive to lessons learned and needs on the ground. This is more problematic in the case of CE, a new type of initiative in which participating actors are still learning through trial and error. As government agencies were unfamiliar with the concept and practices of decentralized, small-scale, community-based energy companies, they were not able to equip grassroots actors with the skills considered necessary for the success of the CE project, for example in the form of management skills, besides providing limited technical and financial support. The CE advocates and activists who introduced foreign experiences and built their own hands-on experience of CE thus played a key role in elevating the challenges on the ground to the policy domain. However, these Taipei-based intermediary actors were also "struggling in an unstable policy context, and are equally under-resourced and over-stretched in their objectives to support the sector" (Seyfang et al. 2014: 39).

Given the limited capacity and resources available, most of them did not stay in direct contact with grassroots actors who participated in these community-based pilot projects and resided outside the capital city; moreover, they tended to rely on lessons drawn from foreign initiatives and their own CE experiments, which mostly assumed the form of co-operatives and public fundraising activities, in producing campaign discourses and negotiating with government agencies. Yet, as Chapter 5 demonstrated, this gave rise to significant gaps and latent power asymmetries between local experiences, advocacy discourses, and CE policies, leading to a restricted imaginary of the meanings, values, forms, and transformative potential of CE in advocacy and policymaking (Van Veelen 2017). From a bottom-up perspective, further social learning on the part of these external actors about the contextualized socio-technical challenges and grounded cognitions of CE—place-based meanings, values—is

equally essential for niche building, assisting the provision of knowledge, skills, and support that could facilitate the projects' development in ways that truly meet local needs and ends. This in turn confirms the need for and value of place-centered studies of grassroots innovations to help bridge the knowledge gaps and to facilitate multilateral social learning among these actors.

Overall, these findings resonate with Seyfang et al.'s (2014) findings that the applicability of SNM theory, although relevant in the grassroots innovation context, remains questionable. Specifically, these discrepancies between the theory and empirical findings suggest the need for contextualized modifications to recognize the political dynamics at play in a specific place and to meet the grounded experiences and needs. As demonstrated in the three cases, grassroots niches with inherent socio-spatial hybridity are created and maintained through careful engagement with place-based politics. Thus, the challenges for niche building exist not only in socio-technical terms, but also in terms of various site-specific consequences of socio-spatial transformation driven by a structural shift toward industrial capitalism, such as population ageing, relatively low socio-economic capacity (individually and collectively), low governance capacity of local governments, and boycotts from rent-seeking politicians.

6.4 Placing sustainability and transformative politics

The value differences of grassroots, intermediary, and institutional actors and consequent divergent understandings of grassroots innovations reflect a fundamental yet, underexplored bias underlying a sector-oriented, decontextualized systemic approach to studying and promoting grassroots innovations in relation to transformative politics and 'sustainability'. As the research has shown, the 'twin-track' phenomenon in which grassroots and intermediary actors develop a grassroots niche at different speeds (Seyfang et al. 2014: 40) results partly from their diverging priorities, which tend to be overlooked in the 'win-win' rhetoric—of civic participation in energy transitions going hand in hand with community development—common in campaign and policy discourses.

However, as discussed in Chapter 1, conventional grassroots innovation studies have paid insufficient attention to the site-specific needs and ends that motivate many community-based grassroots innovations. As Chapter 5 showed, similar holds true for CE advocacy in Taiwan, where local agendas for 'sustainable' community development often give way to the nationwide imperative for a socio-technical transition to a more 'sustainable' energy system. While the latter seeks to speed up geographical expansion of CE, the success of the former relies more on the embeddedness of a CE project in the socio-material and political context of a specific place that often takes time. A primary concern then remains: Whose idea of 'sustainability' counts, and how to achieve

a genuine 'win-win' relation between different priorities through grassroots innovations?

6.4.1 'Sustainable' community development vs. 'sustainable' socio-technical transitions

For the grassroots actors forming part of this research, grassroots innovations were one of several means to realize the leading actors' place visions, which in themselves were revealing of how 'sustainability' was perceived in the studied local contexts. While the host communities of a grassroots innovation associated with a certain socio-technical system may invoke a 'win-win' rhetoric as a strategy to obtain more resources and to compensate the help of CE advocates, it would be problematic to assume that they share the responsibility of scaling up niche innovations to facilitate the system's 'sustainability transition'.

The initiator of the Taihsi CE project, for instance, expressed her frustration when some external facilitators rejected her request for institutional help tailored to the community's circumstances and place vision and encouraged her to take this community as an experimental space to develop applicable CE model. Similarly, the organizer of the project voiced his disagreement with the overemphasis of the systemic dimension commonly done in CE advocacy and policymaking: "You cannot say sustainability is achieved once you convert to solar energy—nonsense!" For him, community energy was not a silver bullet to address petrochemical air pollution, nor was it a necessary choice. It was chosen—instead of other forms of grassroots innovations such as an agri-food initiative—because it fit into some socio-politically contingent and geo-historically produced conditions. Moreover, it functioned just as one part of a systematic social transformation to the renewal of the community in a self-reliant, socio-ecologically reciprocal way.

When circumstances permit, a community may resort to various grassroots innovations to meet their place-based aspirations. In the case of Taromak, for instance, the leading actors simultaneously launched several initiatives linked to energy, agri-food, and eco-tourism, respectively. As tribal autonomy and the eco-cultural restoration of this indigenous community were prioritized, the leading grassroots actors tended to devote more time and energy to activities directly associated with this place vision, which overburdened them and led to the diversion of their time and energy that could have been spent on the CE initiative to other tasks. Thus, as one cultural revivalist stated in the later stages, the success of the CE projects for them was not measured quantitively by the scale and speed of the local shift to renewable energies, nor was it by its contribution to energy transitions. Rather, it was to be measured by the qualitative social transformation in the community in the process, namely the close, reciprocal human-environment relationships and identification with the land and

land-based faith and culture. From these bottom-up perspectives, adopting a socio-technical systemic approach to understanding and evaluating these grassroots innovations is off the mark.

This suggests a need for reflecting on the mainstream framing of CE that followed such a sector-oriented, decontextualized approach to producing knowledge and policies so as to avoid limiting our vision of how these grassroots innovations could take place and what they could look like. As Chapter 5 demonstrated, overlooking significant differences in rationales, designs, needs, and aspirations between different actors and contexts could lead to asymmetrical power relations in knowledge production and policymaking that downplay rather than acknowledge the agency and subjectivity of grassroots actors. Surely this is not what the advocates, policymakers, and scholars intend to do, and it is not necessarily problematic in every circumstance. In the case of agri-food grassroots innovations, the potential conflicts might have been negligible, and a 'win-win' outcome more easily achieved given the close interrelations between the agricultural socio-technical system and rural development. The lesson here is that honoring the claimed reciprocal relationship requires an in-depth understanding of the grounded meanings and value of a grassroots innovation to the host community in the first place—especially if just transitions and community empowerment are to be enacted. This entails the need to fully acknowledge—rather than sideline—the socio-spatial challenges and objectives that grassroots actors seek to address. By taking these site-specific needs and ends seriously, one can then strive to strike a real balance or make a trade-off between different priorities in policymaking in a fairer, more thoughtful manner.

This is the contribution that place-centered grassroots innovation studies can offer. By contextualizing grassroots innovations, they can help the often-overwhelmed and preoccupied intermediary and institutional actors to learn from the equally over-burdened and less-equipped grassroots actors about the grounded experiences, meanings, and transformative potentials of a grassroots innovation, so as to fulfil the 'win-win' promise and improve policy support based on the more inclusive production of knowledge. Similarly, it provides an epistemological reflection on the conventional socio-technical systemic approach in grassroots innovation studies—another important form of knowledge production informing campaign discourses and policymaking.

6.4.2 Rethinking sustainability from a place-centered approach

As grassroots actors often associate grassroots innovations with certain visions for 'sustainable' community development, recognizing the plural, contextualized perceptions and practices of grassroots innovations from a bottom-up perspective is also important for enriching the discourse and action repertoire of

'sustainability/sustainable development'. While 'sustainability'/sustainable development' was not widely discussed by community members in the three studied cases, several themes regarding 'sustainability/sustainable development' emerged across cases.

First, grassroots actors believe that 'sustainability' entails the end of geo-historically produced injustices imposed on the places, be it in the form of indigenous rights violations, resources grabbing, or environmental and health hazards stemming from industrial pollution. This observation helps explain why leading grassroots actors in the three cases can be seen as having a more critical mindset and strong sense of place attachment, often having taken the lead in place-based struggles occurring before, alongside, and following the grassroots innovations. Significantly, instead of unsettling socio-technical regimes, the aim of these antagonistic and innovative collective actions was to challenge the exploitation of rural and indigenous spaces by the state and vested interests in the industrialized capitalist system. Given the prominent role of the state in leading the structural shift toward industrial capitalism, these actors often highlighted its responsibility of addressing the distress of their communities resulting from the process rather than put the blame mainly on the capitalist systems.

This leads to the second shared feature of 'sustainability' according to grassroots perceptions: a rejection of the capitalist episteme and the state in determining the future development of the places in a way that violates their sense of place. All the leading actors in the three cases were keenly aware that at the core of the marginalization and distress of their communities lay asymmetrical power relations between economic sectors, social groups, and places that emerged along with and were sustained by state-introduced industrial capitalism. For them, tackling the unjust share of the socio-ecological costs of a structural shift toward industrial capitalism requires not only political action 'from below' to resist the exploitation and appropriation of resources in the place, but also epistemic emancipation, whereby the non-monetary values of these places and placed-based culture can be appreciated and protected. A key role of grassroots innovations in all three cases was to amplify, support, and/or recreate these values and practices to defend and redefine the rural and indigenous spaces.

Third, 'sustainability' in their eyes concerns a self-decolonization of the capitalist episteme and people-place relations. Capitalist industrialization as the root cause of the 'unstainable' status quo lies not only in incessant resource grabbing and extractive activities for capital accumulation, but also in the alienation of the local community from their place and land. As an informant from Taromak observed, "After capitalization, you need money to get anything you need [...] Buying from markets is fast, but it also makes you lose the ties you

had with the land." Moreover, rural and indigenous identities, culture, and lifestyles in Taiwan have been stigmatized and devalued in modern, capitalist society and policymaking, as they did not stimulate rapid economic growth.

Such a devaluation of rural/indigenous place and culture has been internalized by many local residents, who would sacrifice the local environment in the name of purported 'economic development'. As the initiator of the Taihsi CE project stressed, "you allowed these things [e.g. detrimental environmental changes] to happen [in the place] because you don't know the value of your existence." For her, as well as for the cultural revivalists in Taromak and leaders of Wanbao's second land struggle, 'sustainability' refers to the identification with the place through obtaining embodied knowledge about the biophysical features, culture, lifestyle, value systems, and activities built through the community's long-term intra-action with the environment. The restoration of reciprocal people-place connections (e.g. knowledges, practices, affections), the eco-social richness of these places, and the confidence in the place identity can in turn serve as an antibody to the economic growth fever sweeping across society through various development projects that often result in the degradation of original socio-ecological conditions.

The fourth shared feature involves a reconfiguration of place-based, self-reliant economic, social, cultural, and ecological systems departing from the skewed metabolic shift resulting from capitalist socio-spatial differentiation (Moore, J. 2015, 2017). Put differently, it concerns the creation and maintenance of a local metabolism in which the community can build a more environmentally reciprocal lifestyle based on the biophysical resources of the place that they control and can pass down to future generations.[72] At the core of this vision is not simply regaining control over resources, but also reclaiming the community's subjectivity in defining and deciding on the future of their places in accordance with the grounded knowledge accumulated over generations.

Thus, resonating with the second feature, all leading actors stressed the importance of autonomy—the social and institutional recognition of their subjectivity in place-making. Grassroots innovations as place-making actions were an articulation of this subjectivity as much as they were part of a systematic reconfiguration. For the latter, they can embody reciprocal human-environmental relations and function as a tourist attraction, a stable and self-reliant income

[72] This metabolic imagination was less discernible in Wanbao's case. Nevertheless, the active actors also expressed a preference for a place-based economic model (e.g. organic farming plus eco-tourism) that could foster reciprocal human-environmental relations, celebrate the non-monetary dimensions of a rural lifestyle, and preserve the farmland for the future generations.

source, a source of employment to keep young talents in the place, and an empowering process in which the community can obtain the capability, confidence, and experiences needed to carry out the place visions.

Nevertheless, such a self-sustained metabolism was not imagined as isolated from or a replacement for capitalist systems in general. The development histories of these communities have endowed them with a keen awareness of the dynamic interrelations between the place and broader politico-economic trajectories, as well as of their vulnerable position. Moreover, the internal political dynamics have made them sensitive to the contemporaneous existence of geo-historically produced multiplicity within the community (e.g. different place visions, place identities, and attitudes toward industrial capitalism). Thus, they did not expect the community to steer away from or be exempted from the operation of the market economy in modern society, striving instead to make use of it in ways conducive to the establishment of the place-based metabolism. Similarly, they also seized the opportunities provided in the political system, for example government grants or supportive bureaucrats, to further this aim, while remaining critical of and antagonistic towards the state's encroachment on their place. Despite internal political competition, they did not seek to erase different voices, interests, values systems, and place-frames from the community. Instead, they wanted to find ways in which they could live together with the internal heterogeneity without sacrificing their own voices, values, and aspirations.

As such, the grassroots actors devoting to the studied grassroots innovations assumed a relatively pragmatic, realistic attitude toward capitalist industrialization: what they sought was not the complete rejection and the replacement of capitalism with the hegemony of a place-based 'alternative', but to increase the chance for the latter to thrive—and to defend itself when necessary—by utilizing opportunities and resources available in the capitalist system. That is, they wished to maintain the freedom, capacity, dignity, and autonomy to choose the ways, terms, and extent of engaging themselves and the place with the politico-economic system. To this end, they demanded the state's support for restoring the community's capacity to fulfil these needs and ends, and regarded it as a way of holding the state accountable for the marginalization of their communities and places in the capitalist industrial society. 'Sustainability' to them thus implies a shift in the power relations between them and the politico-economic elites who carried out the capitalist place-making projects, whereby they were transformed from passive objects subject to oppression and exploitation by the latter into active actors who could decide on the boundaries and ways of relating to them.

6.4.3 Transformative politics and the potential of grassroots innovations

Like the hybridity of a grassroots niche space, the transformative potential and politics of grassroots innovations have at least two dimensions worth noting. In terms of socio-technical 'sustainability' transitions, scholars have suggested several ways in which grassroots innovations can contribute to the process: (1) by nurturing alternative practices that contribute to the formation and development of the socio-technical niche at the national level; (2) by helping unsettle the socio-technical regime in collaboration with oppositional social movements and niche policy advocacy by offering concrete examples and favourable discourses (Smith 2012, Smith and Raven 2012, Smith et al. 2016); (3) by creating a more democratic space for discussing and experimenting with 'sustainable' alternatives through deepening and broadening grassroots participation in policymaking, public debates, and modes of innovation that are often dominated by political and economic elites (Fressoli et al. 2014, Leach et al. 2012, Smith and Ely 2015, Smith and Stirling 2018, Stirling 2011); and (4) by critically challenging the social structural elements that sustain current socio-technical regimes and prevent alternative solutions (Smith et al. 2016).

The three grassroots innovations studied in the thesis more or less showed their transformative potential when the abovementioned criteria are considered—often through their alignment with intermediary actors. Nevertheless, as the grassroots actors tended to focus more on their place-based agendas, they played a less significant role than the intermediary actors in these transformative politics.

In terms of socio-spatial 'sustainable' transformations, grassroots innovations as place-making actions often go hand in hand with place-based struggles in external place-making politics in fighting against broader politico-economic forces (especially the state and/or capitalism) and projects (e.g. development projects, resources grabbing) by resorting to emotion-imbued place-frames and political mobilization. Internally, they could counter the internalization of capitalist, colonialist epistemes at the individual and community levels by discursively and materially creating alternatives to local articulations of the capitalist system.

Moreover, through external networking with communities facing similar consequences of socio-spatial differentiation, for instance industrial land grabbing and pollution in marginalized rural areas, they also contributed to the broader structural transformation. They participated in this transformative politics by offering political resistance to and an epistemic critique of capitalist industrialization. Since the incumbent socio-technical systems are also embedded in the structural shift toward industrial capitalism, as Chapter 2 has shown,

this transformative politics at the structural level have the potential to help challenge the systemic lock-in. Indeed, as Wanbao's case has shown, the systemic strategy of 'relocalizatioin of food, energy, and the economy' (Escobar 2015: 454) alone could hardly address the structural lock-in in the agriculture-industry power asymmetry, since rural/indigenous communities and places in a capitalist industrial society have often suffered from various structural challenges for their own development and survival. This suggests the interlinkages between these three forms of transformative politics and the possible mutually reinforcing effects between them. In Wanbao, land struggles, agri-food grassroots innovations, and the structural marginalization of the agricultural and rural sector were closely interrelated. Linking to land struggles, the community could enhance the transformative potential of grassroots innovations in resisting the capitalist devaluation of rural space and addressing structural challenges facing agricultural and rural development.

The synergetic thinking of transformative politics and potential of grassroots innovations—in socio-technical, socio-spatial, and structural terms—are important, as purely systemic or place-based solutions will likely fall short in tackling structural problems. Conversely, this also suggests the potential to reach a real 'win-win' balance between 'sustainable' community development and 'sustainable' socio-technical transitions by combining efforts on both sides and directing them towards redressing the structural lock-in (epistemically, institutionally, culturally, materially) underpinning the 'unsustainable' status quo. For example, how can grassroots innovations be promoted in ways that can advance both the agendas for 'sustainable' community development and 'sustainable' socio-technical transitions without prioritizing the latter over the former? To do so requires the full recognition of the structural injustice embodied by the site-specific needs and concerns of the host communities and the creation of supportive schemes for grassroots innovations that can enhance their potential to redress local articulations of the structural problems in a substantial way.

This is the main contribution of the place-centered enabling approach in pursuit of transformative pathways toward 'sustainability': by revealing the dynamic intersection of the transformative politics in socio-technical, socio-spatial, and structural terms, it can help policymakers, activists, scholars, and grassroots actors realize the combined transformative potential of grassroots innovations.

6.5 Stories-so-far and stories-from-now-on

There seems to be a tendency when discussing 'sustainability' and transformations to focus on the present and the future by describing the problems we

are facing now and how to enact change to ensure a better future. In so doing, we cast efforts to enact change as 'stories-from-now-on'. Yet even in the era of accelerating climate change impacts and unprecedented socio-technical advancement, the past, or its residuals (Williams 1977), still lingers in the form of various unaddressed socio-ecological problems troubling many communities of place. As a place is an ongoing creation of 'stories-so-far' (Massey 2005), placing 'sustainability' entails looking back and making sense of stories from the past so that the 'old', unmet site-specific needs will not be forgotten in the quest to transform our configurations of socio-political, economic and ecological relations into one enabling a more socially just and ecologically sound future. This is what the place-centered enabling approach and this research sought to do in studying grassroots innovations in Taiwan, and this is also what many grassroots actors aim to achieve through these "bottom-up solutions for sustainable development" (Seyfang and Smith 2007: 585).

As the environmental historian William Cronon (1992) has suggested, no stories about a place is devoid of values that influence the selection of the framework, elements, questions, and perspectives comprising a story. The stories-so-far presented in the thesis are no exception. Many factors enable and condition the thesis here presented: my self-positioning as a political ecologist who sides with marginalized peoples (McCarthy et al. 2015), my own participation in various environmental and agrarian movements that led me to these studied places, my reliance on a wide range of literature that itself is subject to debate and imbued with knowledge gaps, the people I encountered and interviewed in the field, and last, but not least, my capacity as listener and storyteller. Surely there will be different ways to recount these stories according to the different viewpoints, theoretical traditions, and materials of those engaging with these places and communities. For instance, if the voices from the landowners in Wanbao who welcomed land expropriation and those from local politicians and residents in Taihsi who supported the 6th Naphtha had been included, I might have been able to provide a more comprehensive overview of the heterogeneity of these communities. Similarly, if more bio-physical data about these studied places had been available, or if I had been granted with the time and expertise to collect these data by myself, I might have been able to conduct an in-depth exploration of the more-than-human dimensions and the socio-ecological dynamics in these places that are also important for envisioning the ways in which 'sustainable development' can be realized.

Thus, this research does not aim to capture the true, comprehensive stories-so-far of these communities of place, presenting instead a situated, selective snapshot of reality that captures certain grounded perceptions and experiences as accurately as possible in a way that is not only theoretically constructive, but also morally engaged. The stories-so-far in different geographical settings, such

as urban communities and other countries with different development histories, and their lessons for theoretical improvements and lifeworld practices can be the next step for future research.

Several new stories can unfold through employing the place-centered enabling approach. First, this approach is about offering an alternative, geo-historically informed framework for investigating the transformative potential of grassroots innovations in socio-technical, socio-spatial, and structural terms. I have demonstrated its efficacy in investigating the connections between grassroots innovations and other place-based struggles for social change, thereby engaging with critical social studies on indigenous rights, land grabbing, and environmental justice. Subsequent research can also attempt to build potential dialogues with critical studies on other forms of grassroots activism and other aspects of social change, such as those involving different kinds of resource extractivism and unjust electronic waste disposal in places at the bottom of the global commodity chain.

Second, this place-centered approach has widened the scope for the emancipatory potential of grassroots innovations in "imagining and enacting other worlds" in the modern capitalist society (St. Martin et al. 2015: 8). Building mutual learning between experiences from countries like Taiwan unpacked by this approach and the growing search for alternatives to the capitalist imaginaries of growth and development in other places with very different development histories (Gerber 2020, Kallis 2011, 2015, Martínez-Alier 2009, 2012, Martínez-Alier et al. 2010, Schneider et al. 2010), including the discussion and practices of 'diverse economies' (Moore, S. and Robbins 2015, St. Martin et al. 2015) and the designs for the pluriverse (Escobar 2018), will be an interesting topic for future studies.

Last, I have revealed the different understandings of the aims, forms, and meanings of grassroots innovations among grassroots actors, intermediary actors, policymakers, and scholars. It is worth further exploring how these differences can be reconciled on the basis of a better mutual understanding. Moreover, I have demonstrated the importance of a combined investigation of transformative politics in socio-technical, socio-spatial, and structural terms. This synergetic perspective may stand a better chance—than a purely socio-technical systemic approach—to accurately analyse and address the increasing tensions between larger-scale, commercial renewable energy projects in indigenous and rural spaces and local agricultural/rural/community development in Taiwan and elsewhere. I look forward to observing how this synergetic perspective can help further 'win-win' outcomes based on the balancing of 'sustainable' community development and 'sustainable' energy transitions agendas.

Appendices

Appendix 1: Full interview list. A total of 131 people were interviewed over the course of the PhD research, and data from 93 interviews were finally used in the thesis. The research participants include those associated with the Hsichou case who were counted for their active participation in social movements and campaigns related to the three cases considered in this thesis.

No.	Position	Sex	Age	Engagement	Location	Date
1	Grassroots actor	M	62	Taromak CE, campaign for tribal autonomy, cultural revival efforts	Taromak	19/08/2016 07/10/2016 01/04/2017 08/06/2017 19/03/2018 16/01/2020
2	Grassroots actor	M	54	Taromak CE, campaign for tribal autonomy, cultural revival efforts	Taromak, Taitung City	06/10/2016 19/12/2016 19/04/2017 19/02/2019 16/01/2020
3	Grassroots actor	M	57	Taromak CE, campaign for tribal autonomy, cultural revival efforts, indigenous rights movement	Taromak	05/10/2016
4	Grassroots actor, village head	M	64	Taromak CE	Taromak	12/12/2016

5	Grassroots actor, township councilman	M	69	Taromak CE	Taromak	21/04/2017
6	Grassroots actor, village chief	M	71	Taromak CE, cultural revival efforts	Taromak	06/06/2017
7	Grassroots actor	F	52	Taromak CE, cultural revival efforts	Taromak	09/06/2017
8	Grassroots actor	M	64	Taromak CE	Taromak	14/06/2017
9	Grassroots actor	M	30	Taromak CE, campaign for tribal autonomy, cultural revival efforts	Taromak	20/08/2016 19/12/2016
10	Grassroots actor	M	41	Taromak CE, campaign for tribal autonomy, cultural revival efforts	Taromak	15/12/2016 01/04/2017
11	Grassroots actor	M	41	Taromak CE, campaign for tribal autonomy, cultural revival efforts	Taromak	20/04/2017 20/02/2019 16/01/2020
12	Grassroots actor	M	39	Taromak CE, campaign for tribal autonomy, cultural revival efforts	Taromak	10/06/2017
13	Grassroots actor	M	22	Taromak	Taipei	12/03/2017
14	Grassroots actor	F	40	Cultural revival efforts	Taromak	13/12/2016 01/04/2017
15	Grassroots actor	F	30	Taromak	Taromak	24/04/2017
16	Grassroots actor	F	23	Taromak	Taromak	01/04/2017
17	Grassroots actor	F	55	Taromak CE, cultural revival efforts	Taromak	15/12/2016

18	Grassroots actor	M	58	Taromak	Taromak	23/04/2017
19	Grassroots actor	M	61	Taromak	Taromak	11/12/2016
20	Grassroots actor	M	49	Taromak CE	Taromak	11/06/2017
21	Grassroots actor	F	47	Taromak	Taromak	20/04/2017
22	Grassroots actor	F	57	Taromak	Taromak	16/03/2018
23	External facilitator, scholar, NGO activist	M	56	Taromak CE, tribal autonomy, cultural revival efforts, anti-nuclear movement	Taromak	18/08/2016
24	External facilitator, NGO activist	F	38	Taromak CE, anti-nuclear movement	Taitung City	22/04/2017
25	External facilitator, NGO activist, CE advocate	M	40	Taromak CE, Taihsi CE, anti-Kuokuang movement, anti-nuclear movement	Taromak	19/08/2016 20/08/2016 17/03/2018
26	External facilitator, DPP legislator, (NGO activist)	F	62	Taromak CE, Taihsi CE, anti-nuclear movement	Taipei	25/04/2017
27	External facilitator, renewable energy advocate	F	57	Taromak CE	Taromak	20/08/2016
28	External facilitator	F	24	Taromak CE	Taipei	13/04/2017
29	External facilitator, CE advocate	F	58	Taromak CE, anti-nuclear movement	Taipei	25/03/2017 02/04/2017
30	Activist	F	48	Indigenous rights and anti-nuclear movements	Taipei	12/06/2017
31	External facilitator, CE advocate	F	38	Anti-nuclear movement	Taipei	15/03/2018

32	NGO activist, CE and energy transitions advocate	M	33	Anti-nuclear movement	Taipei	17/08/2016 10/01/2017
33	NGO activist, energy transitions advocate	F	41	Anti-nuclear movement	Taipei	17/08/2016
34	NGO activist, energy transitions advocate	M	37	Anti-nuclear movement	Taipei	13/01/2016
35	NGO activist	M	31	Anti-nuclear movement	Taipei	09/01/2017 10/01/2017
36	External facilitator, business actor	M	42	Taromak CE, Taihsi CE	Taipei, Skype, and Changhua	22/05/2017 25/05/2017 27/03/2018
37	External facilitator, business actor	M	47	Taromak CE	Taipei	14/04/2017
38	External facilitator, business actor	M	44	Taromak CE	Skype	04/04/2018
39	External facilitator, business actor	M	37	Taromak CE	Taromak	19/02/2019
40	Grassroots actor	F	48	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taihsi and Skype	30/12/2016 04/03/2017 01/06/2017 08/02/2020
41	Grassroots actor	M	74	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taihsi	03/12/2016 04/03/2017 07/03/2017
42	Grassroots actor	M	50	Taihsi CE	Taihsi	07/03/2017 21/02/2018 11/02/2019 30/01/2020 08/02/2020

43	Grassroots actor	M	58	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taihsi	01/06/2017
44	Grassroots actor	M	84	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taihsi	11/02/2019
45	Grassroots actor	M	71	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taihsi	11/02/2019
46	Grassroots actor	M	66	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taihsi	11/02/2019
47	External facilitator	F	43	Hsuyuan Village project	Taihsi	04/03/2017
48	External facilitator	M	33	Hsuyuan Village project	On the way to Taihsi	04/03/2017
49	External facilitator, scholar	M	57	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Taipei	12/01/2017
50	External facilitator, scholar, deputy director of Office of Energy and Carbon Reduction	M	50	Taihsi CE	Taipei	10/01/2017 14/01/2020
51	External facilitator, NGO activist	F	42	Taihsi CE, campaigns against air pollution, anti-Kuokuang movement	Fangyuan Township (Changhua)	06/03/2017

52	External facilitator, energy expert	M	36	Taihsi CE	Taipei	28/03/2017
53	External facilitator, utility actor	M	61	Taihsi CE	Taipei	21/01/2020
54	Grassroots actor, village head	M	56	Wanbao AFNs & land struggles	Wanbao	25/08/2016 16/05/2017
55	Grassroots actor	M	76	Wanbao AFNs & land struggles	Wanbao	10/09/2016
56	Grassroots actor	F	61	Wanbao AFNs & land struggles, land justice movement	Wanbao	01/09/2016
57	Grassroots actor	M	53	Wanbao AFNs & land struggles	Wanbao	09/09/2016
58	Grassroots actor	M	76	Wanbao AFNs & land struggles	Wanbao	17/03/2017
59	Grassroots actor	M	76	Wanbao land struggles	Wanbao	03/11/2016
60	Grassroots actor	M	73	Wanbao land struggles	Wanbao	04/11/2016
61	Grassroots actor	M	67	Wanbao land struggles	Wanbao	04/11/2016
62	Grassroots actor	F	70	Wanbao land struggles	Wanbao	15/05/2017
63	Grassroots actor	F	55	Wanbao AFNs & land struggles	Wanbao	02/11/2016
64	Grassroots actor	F	52	Wanbao AFNs & land struggles	Wanbao	20/01/2017
65	Grassroots actor	F	36	Wanbao AFNs & land struggles	Wanbao	17/03/2017
66	Grassroots actor	M	33	Wanbao AFNs & land struggles	Wanbao	19/03/2017
67	Grassroots actor	M	22	Wanbao AFNs & land struggles	Wanbao	14/05/2017
68	Grassroots actor	F	48	Wanbao AFNs & land struggles	Wanbao	15/05/2017
69	Mechanized contractor farmer	M	44	Wanbao AFNs	Skype	14/06/2017
70	External facilitator, Fangu Youth	F	31	Wanbao AFNs & land struggles	Taipei	11/01/2017

71	External facilitator, Fangu Youth	M	30	Wanbao AFNs & land struggles	Taichung	15/01/2017
72	External facilitator, Fangu Youth	F	27	Wanbao AFNs & land struggles	Taipei	23/05/2017
73	External facilitator, HUCC worker	M	43	Wanbao AFNs	Taipei	03/06/2017
74	External facilitator, HUCC worker	F	41	Wanbao AFNs & land struggles	Wanbao	16/05/2017
75	External facilitator, activist	F	40	Wanbao land struggles	Wanbao	16/05/2017
76	External facilitator, activist	M	28	Wanbao land struggles	Wanbao	16/05/2017
77	Scholar, TRF activist	M	59	Wanbao land struggles, Hsichou water struggle, land justice movement, anti-Kuokuang movement	Taipei	13/03/2017
78	Lawyer, TRF activist, deputy minister of Environmental Protection Administration	M	54	Wanbao land struggles, Hsichou water struggle, land justice movement, anti-Kuokuang movement	Taipei	13/03/2017
79	Scholar, TRF activist, deputy minister of National Development Council	M	56	Land justice movement	Office Skype	07/06/2017 13/06/2017
80	Scholar, TRF activist, DPP legislator	F	46	Wanbao land struggles, Hsichou water	Taipei	28/04/2017

				struggle, land justice movement, anti-Kuokuang movement, anti-nuclear movement		
81	TRF activist	F	37	Land justice movement, anti-Kuokuang movement	Skype	13/03/2017
82	TRF activist	M	32	Land justice movement, anti-Kuokuang movement	Taipei	23/08/2017
83	TRF activist	M	45	Land justice movement, anti-Kuokuang movement	Lukang Township, Changhua	09/03/2017
84	TRF activist	F	28	Land justice movement, anti-Kuokuang movement	Taipei	19/05/2017
85	Scholar, deputy minister of Council of Agriculture	M	51	Anti-Kuokuang movement	Taipei	17/04/2017
86	Grassroots actor, poet, activist	M	73	Hsichou AFNs & water struggle, land justice movement, anti-nuclear movement, anti-Kuokuang movement	Hsichou	05/12/2016
87	Grassroots actor, writer, TRF activist, employee at Hsichou Township Office	F	45	Hsichou AFNs & water struggle, land justice movement, anti-Kuokuang movement	Hsichou	26/08/2016
88	TRF activist	M	33	Hsichou AFNs & water struggle, land justice movement, anti-	Taipei	23/05/2017

				nuclear movement, anti-Kuo-kuang movement		
89	TRF activist	M	33	Hsichou AFNs & water struggle, land justice movement, anti-nuclear movement, anti-Kuo-kuang movement	Taipei	09/01/2017
90	Grassroots actor, TRF activist	F	35	Hsichou AFNs & water struggle, land justice movement, anti-Kuokuang movement	Hsichou	22/10/2016
91	Grassroots actor, TRF activist	F	36	Hsichou AFNs & water struggle, land justice movement, anti-Kuokuang movement, Taihsi CE	Hsichou	23/10/2016
92	TRF activist	F	31	Hsichou AFNs & water struggle, land justice movement, anti-Kuokuang movement	Taipei	10/03/2017
93	TRF activist, secretary of Hsichou Township Office	M	31	Hsichou AFNs, land justice movement, anti-nuclear movement, anti-Kuo-kuang movement	Hsichou	22/10/2016 12/04/2017
94	Grassroots actor, TRF activist	F	29	Hsichou AFNs & water struggle, land justice movement, anti-Kuokuang movement, anti-nuclear movement	Hsichou	26/08/2016 24/02/2019

95	Grassroots actor	F	31	Hsichou AFNs & water struggle	Hsichou	17/09/2016 31/05/2017
96	Grassroots actor	F	40	Hsichou AFNs	Hsichou	27/05/2017
97	Grassroots actor	M	35	Hsichou AFNs	Hsichou	18/09/2016 02/12/2016 04/12/2016
98	Grassroots actor	F	29	Hsichou AFNs	Hsichou	29/05/2017
99	Grassroots actor, activist	M	36	Hsichou AFNs, land justice movement, anti-Kuokuang movement	Hsichou	24/10/2016 03/12/2016 05/12/2016
100	Grassroots actor	F	39	Hsichou AFNs	Xiluo Township (Yunlin)	23/02/2017
101	Grassroots actor	M	26	Hsichou AFNs	Hsichou	23/10/2016
102	Grassroots actor	M	32	Hsichou AFNs	Hsichou	23/10/2016
103	Grassroots actor	M	67	Hsichou AFNs & water struggle	Hsichou	03/12/2016
104	Grassroots actor	M	69	Hsichou AFNs & water struggle	Hsichou	22/10/2016
105	Grassroots actor	M	67	Hsichou AFNs & water struggle	Hsichou	02/12/2016
106	Grassroots actor	M	69	Hsichou AFNs	Hsichou	25/05/2017
107	Grassroots actor	F	63	Hsichou AFNs	Hsichou	26/05/2017
108	Grassroots actor	M	51	Hsichou AFNs	Hsichou	22/02/2017
109	Grassroots actor	M	65	Hsichou AFNs	Hsichou	14/01/2017 22/02/2017
110	Grassroots actor	M	60	Hsichou AFNs	Hsichou	24/10/2016
111	Grassroots actor	M	49	Hsichou AFNs & water struggle	Hsichou	26/05/2017

112	Grassroots actor	M	48	Hsichou AFNs	Hsichou	28/05/2017
113	Grassroots actor	M	46	Hsichou AFNs	Hsichou	22/10/2016
114	Grassroots actor	F	57	Hsichou AFNs & water struggle	Hsichou	02/12/2016
115	Grassroots actor	M	67	Hsichou AFNs	Hsichou	28/05/2017
116	Grassroots actor	M	74	Hsichou AFNs	Hsichou	26/05/2017
117	Grassroots actor	M	52	Hsichou AFNs	Hsichou	25/05/2017
118	Grassroots actor, facilitator, ecological expert	M	40	Hsichou AFNs	Hsichou	01/05/2017
119	External facilitator, ecological expert	M	39	Hsichou AFNs	Hsichou	12/04/2017
120	External facilitator, ecological expert	M	36	Hsichou AFNs	Hsichou	01/05/2017
121	Grassroots actor, facilitator	M	56	Hsichou AFNs	Hsichou	22/02/2017
122	Grassroots actor, facilitator	M	65	Hsichou AFNs	Hsichou	26/05/2017
123	Grassroots actor	M	50	Hsichou AFNs & water struggle	Hsichou	28/05/2017
124	Grassroots actor	M	29	Hsichou	Xiluo Township (Yunlin)	31/05/2017
125	Grassroots actor, township mayor	M	58	Hsichou AFNs & water struggle, anti-Kuokuang movement	Hsichou	31/05/2017
126	Changhua County Government employee	M	46	Water struggle	Hsichou	20/05/2017
127	Restaurant owner	M	60	Hsichou AFNs	Taipei	16/04/2017

128	Changhua Irrigation Association member	M	49		Yuanlin (Changhua)	26/03/2018
129	Changhua Irrigation Association member	M	53		Yuanlin (Changhua)	26/03/2018
130	Changhua Irrigation Association member	M	59		Yuanlin (Changhua)	26/03/2018
131	Changhua Irrigation Association	M	56		Yuanlin (Changhua)	26/03/2018

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Curriculum Vitae

Huei-Ling Lai (Lynn) (Changhua, Taiwan, 1982) read foreign languages and literatures at National Taiwan University, where she obtained a Bachelor of Arts degree in 2006, minoring in economics. She went on to obtain a Master of Arts degree in Victorian literature in 2008 at the School of English of the University of Leeds before switching to social sciences with an environmental focus, specializing in human geography and political ecology. She was awarded the Chevening Scholarship (co-funded by the British Foreign and Commonwealth Office and the Delta Electronics Foundation) in 2012, which allowed her to study toward a Master of Science degree in Environment, Science and Society at the Department of Geography of University College London (UCL), which she obtained in 2013. In 2014 and 2015, she was awarded the Netherlands Environmental Scholarship from the Delta Electronics Foundation and the Government Scholarship for Overseas Study from the Ministry of Education, Taiwan (R.O.C.), to pursue a PhD at the International Institute of Social Studies (ISS) of Erasmus University Rotterdam in the Netherlands, which she started in 2015. During her PhD, she presented and published widely on place-making politics, community energy, alternative food networks, the green economy, land grabbing, environmental justice, and transformations to sustainability in and beyond Taiwan. She has also worked part-time as a special correspondent, translator, and contributor to several Taiwanese online media platforms since 201, producing in-depth reports about various environmental issues and activities such as the UN Climate Change Conference COP 21 in Paris and COP 23 in Bonn, the 2015 Utrecht Energy City Talks, the National Climate Agreement of the Netherlands, and energy transitions in the Netherlands and the UK.

Profile

PUBLICATIOINS

(Under review) Lai, H.L. 'Foregrounding the Community: Geo-Historical Entanglements of Community Energy, Environmental Justice, and Place in Taihsi Village, Taiwan', *Environment and Planning E: Nature and Space*.

(Under review) Lai, H.L. 'Placing Land and Food Struggles in Structural Challenges for Rural Development: Insights from Wanbao Village, Taiwan', *Journal of Peasant Studies*.

2019 Lai, H.L. (2019) 'Situating Community Energy in Development History: Place-making and Identity Politics in the Taromak 100% Green Energy Tribe Initiative, Taiwan', *Geoforum* 100, 176-181.

CONFERENCE PRESENTATIONS

2020 'Community Energy or Citizen Energy? Placing Environmental Justice in Pursuit of Energy Transitions' at the 3rd biennial conference of the Political Ecology Network: Contested Natures: Power, Possibility, Prefiguration (POLLEN20), University of Sussex, UK, 22-25 September.

2020 'Recasting Land politics as Place-Making Politics: Insights from Taiwan' at the 3rd biennial conference of the Political Ecology Network: Contested Natures: Power, Possibility, Prefiguration (POLLEN20), University of Sussex, UK, 22-25 September.

2018 'A Quest for Sustainable Rural Development: The Anti-Water Grabbing Campaign and the Alternative Food Network Initiative in Hsichou, Taiwan' at the 4th Annual World-Ecology Research Network Conference, University of Helsinki, Finland, 15-18 August.

2018 'More than Energy Transitions: Situating Community Energy in Development History' at the 2nd Biannual Conference of Po-

litical Ecology Network: Political Ecology, the Green Economy, and Alternative Sustainabilities' (POLLEN18), Oslo, Norway, 20-22 June.

2016 'Framing Green Economy: A Discourse Analysis of "Toward a Green Economy in Taiwan"' at the 8th Annual Conference on Development Studies in Taiwan: Environment and Sustainable Development, National Taiwan University, 15-16 October.

2016 'Sustainable Biofuel? A Commodity Chain Analysis of Brazilian Sugarcane Ethanol' at the 2nd World-Ecology Conference, Durham University, UK, 15-16 July.

EDITORSHIP

2020- Review editor, *Frontiers in Sustainable Food Systems*

ADVANCED TRAININGS

2019 STEPS Summer School on Pathways to Sustainability, at STEPS Center, University of Sussex, UK, 13-24 May.

2017 World-Ecology PhD Course on Transformation: Food Systems, Agroecology, and the Web of Life, at University of Helsinki, Finland, 16-20 October.

2017 Annual Political Ecology PhD Summer School on Political Ecologies in/of the Anthropocene: Value, Life and Critique, at Wageningen University & Research, the Netherlands, 19-23 June.

PROFESSIONAL MEMBERSHIP

2017- Student member, the European Association of Development Research and Training Institute (EADI)

2015- Member & Delegate for UN Climate Conference COP 21 in Paris & COP 23 in Bonn, the Young Energy Specialists and Development Co-operation (the Netherlands)

UNIVERSITY SERVICE

2020-2021 Member, Logistics/IT Working Group, 8th International Degrowth Conference: Caring Communities for Radical Change, ISS

2018 Chair, panel on 'Activism and Social Mobilizations', 16th Development Dialogue, ISS

2017 Peer Discussant, Full Draft Seminar of Eunjung Koo (PhD researcher), ISS

2017 Chair, panel on 'Politics and Sustainable Development', 15th

Development Dialogue, ISS

2016 Peer Discussant, Dissertation Design Seminar of Emile Smidt (PhD researcher), ISS

2015 Chair, panel on 'Environment', 13th Development Dialogue, ISS

ANICILIARY ACTIVITIES

2019/02 Speaker, Risk Society and Policy Research Center, National Taiwan University
- Presented in internal seminar on 'Situating Community Energy in Development History: Place-making and Identity Politics in the Taromak 100% Green Energy Tribe Initiative, Taiwan'

2016-2017 Speaker, Green Citizens' Action Alliance, Bureau of Energy, and Citizen of the Earth, Taiwan
- Delivered 3 presentations on 2015 Utrecht Energy City-talks and energy transition

2016-2018 Translator, NPOst.tw
- Translated articles on the development of nonprofit organizations

2013- Contributor, Low Carbon Living Blog
- Contributed 2 in-depth articles as special correspondent for UN Climate Conference COP 23 in Bonn
- Contributed 13 articles as special correspondent for UN Climate Conference COP 21 in Paris, including an interview with Deputy Director-General of Food and Agriculture Organization of the United Nations and a report on Naomi Klein's public speech in Climate Action Zone
- Wrote on Dutch Climate Agreement and energy transition, 2015 Utrecht Energy City-talks, Maastricht University Green Office, and climate change

2010/02- Translator & Contributor, Taiwan Environmental Information Association