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**ECONOMIC THEORY AND THE NATURAL ENVIRONMENT:
A HISTORICAL OVERVIEW***

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Table of Contents

| | | |
|---------|---|----|
| 1 | INTRODUCTION | 1 |
| 1.1 | Growing awareness | 1 |
| 1.2 | Contrasting perspectives on sustainable development analysis | 3 |
| 1.2.1 | Alternative views on the relationship between man and nature. | 4 |
| 1.2.2 | Defining Sustainability: What is to be sustained? | 9 |
| 1.2.3 | Disciplinary contributions: optimists and pessimists | 12 |
| 1.3 | Purpose of the paper. | 14 |
| | | |
| 2 | ECONOMIC THEORY AND THE NATURAL ENVIRONMENT | 19 |
| 2.1 | Introduction | 19 |
| 2.2 | Classical economics | 21 |
| 2.2.1 | Adam Smith | 21 |
| 2.2.2 | David Ricardo | 24 |
| 2.2.3 | Thomas Maltus | 25 |
| 2.2.4 | John Stuart Mill | 26 |
| 2.3 | Recurring themes | 28 |
| 2.3.1 | Contemporary views on population growth, agricultural land and technological change | 28 |
| 2.3.2 | Role of industry and natural resources | 31 |
| 2.3.3 | Technological change as hope for the future | 32 |
| 2.4 | Karl Marx and the Marxian tradition | 33 |
| 2.5 | Neo-classical economics | 37 |
| 2.5.1 | Introduction | 37 |
| 2.5.2 | Neo-classical economics in outline | 41 |
| 2.5.3 | Neoclassical economics and the environment | 45 |
| 2.5.3.1 | Market failure: from exception to the general norm | 45 |
| 2.5.3.2 | Correcting market failure: government vs private ordering | 48 |
| 2.5.3.3 | Is government influence beneficial? | 53 |
| 2.5.3.4 | Conclusion: neoclassical economics and the environment | 54 |
| 2.6 | Other approaches and influences | 56 |
| 2.6.1 | The humanistic paradigm | 56 |
| 2.6.2 | Institutional economics | 60 |
| 2.7 | International trade, international migration and the natural environment | 65 |
| 2.7.1 | Introduction | 65 |
| 2.7.2 | International trade | 67 |
| 2.7.3 | International migration | 69 |

| | | |
|---|-------------------------|----|
| 3 | Concluding observations | 71 |
| | LITERATURE | 73 |

1 INTRODUCTION

1.1 Growing awareness

Since the 1960s debates about the interrelationships between population growth, economic development and the natural resources available to mankind for achieving sustainable development have multiplied and intensified. There are different dimensions to the growing complexity in these debates. At the scientific level, more disciplines have involved themselves in analytical and policy issues. While each contributes within the norms, perceptions, perspectives and terminology of their adherents, inclusive of the value judgements of individual contributors, the resulting cacophony of viewpoints may make effective interdisciplinary dialogue and discussion, though highly needed, much more difficult in practice. The question therefore is: are we achieving clearer perceptions of the nature of the problems, their origins and effects, and are the problems arising amenable to being addressed through policy, in the formulation of which scientists of various disciplinary backgrounds may play roles?

At the political level there have been a number of influential international reports and conferences. Major landmarks have been the United Nations Conference on the Environment, held in 1972 in Helsinki, which led i.a. to the setting up of the United Nations Environmental Programme. The Club of Rome sponsored *The Limits to Growth* (Meadows, et al. 1972) and other studies which stimulated wide-ranging debates. Recently, the original Meadows model has been updated and rerun (Meadows, et al. 1992). The International Union for the Conservation of Nature published its *World Conservation Strategy* (Gland, 1980). It was heavily criticized for lacking relevant policy perspectives. A much improved and updated statement appeared in 1991: *Caring for the Earth* (Gland, 1991). The sombre conclusions of the *Limits to Growth* book and of the *Global 2000 Report to the President of the United States* (Barney, 1980) inspired a much more positive 'counter attack': *The Resourceful Earth: A Response to Global 2000* (Simon and Kahn, 1984). *The Global Possible* (Repetto) appeared in 1985, and the World Commission on Environment and Development (WCED) produced *Our Common Future*, (*Brundtland Report*) in 1987. Both highlight the extreme inequality in access to and use of nature's resources in a global context, while taking the position that, in principle, natural resources are sufficient for human needs. But both reports are unclear about the levels of human needs that could be satisfied, and for how long. The United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro in 1992 (*The Earth Summit*), with important conclusions for *Agenda 21*, in respect of climate change and biodiversity conservation.

The significance of these studies and the ensuing debates is that they did not concern themselves with short term issues but with long term and strategic concerns. Though the attention-getting wide publicity usually died away rather soon, major initiatives were taken to develop better and fuller identification and analysis of the underlying issues regarding the definition and adequacy of natural resources and their management. Steps were also taken to commence the even more difficult process to try to change policies and practices. These public relations 'bomb shells' had considerable 'fall out' in undirected ways.

At the international level, it has become clear that environmental limits to growth can no longer be seen as a 'luxury problem' of the (over) developed countries in the North, of little relevance for the 'real' development needs of the underdeveloped or developing South, as was the dominant South position around 1972. Massive natural resource degradation in the North *and* South has been documented, while the most polluted cities and water streams are increasingly to be found in the developing countries (World Bank, 1992). At the global level, many problems will get worse as the combined developing countries account for a rising share of world product. This may imply that for some issues, such as the expected increase in 'Green House' gases, even very sharp decreases in emissions in the North, which seem politically and institutionally not yet feasible at present, will have only limited effects overall, compared to the major increase in Green House gases emanating from the South. This is so because the energy futures of the World Energy Council conclude (WEC, 1993) that in all scenarios for the next three decades, the share of primary energy used by the South will be larger than that in the North, while the fuel mix shows a continuing dominance of fossil fuels, a dominance expected to stretch well beyond the middle of the next century. Sources of primary energy, such as petroleum and coal, are major contributors to the 'Green House' gases.

One fortunate effect of the increased interest in the relations between development and the natural environment is that a statistical data base is being set up on natural resources stocks and use trends, which allow to develop indicators for monitoring environmental quality. Though most environmental data are still extremely weak, it is now at least possible to discuss some problems with the assistance of more relevant and less misleading data than 20 years ago.

Available statistics show that not all trends look equally bleak, and past trends cannot simply be extrapolated into the future. Some signs of trend breaks and possibly reversals are visible in the North, but in the South such sign are nearly absent, as is documented in such publications as the *State of the World* annuals of the WorldWatch Institute, the bi-annual publication *The World Resources Report* of the World Resources Institute and the World Bank's *World Development Report 1992*, devoted to Development and the Environment.

The emphasis in the public discussions is also changing: in the 1970s the major concerns were about the inadequacies of the world's supply of natural resources, or the effects of 'natural resource' cartels such as OPEC on international petroleum resources. That debate has faded away, and the current emphasis has shifted to possible limits on the assimilative capacities of the natural environment to absorb waste materials. Are limits to the 'sink functions' of the natural environment being reached? If so, this will have direct consequences for the life support systems on planet earth.

At the public policy level, the discussion has moved as well. In the 1970s, environmental concerns tended to be dealt with mostly at the micro-level, and took the form of widening the scope of analysis of major projects of infra structure development, through the more explicit requirement of Environmental Impact Statements. At present, discussions are at much wider levels and concern whole sectors of the economy, inter sectoral mixes as in industrial structures, and cover expanded spaces: from local and regional to national, international and a global context. Examples are the climate change

issue, or in the ongoing liberalisation of international trade over a broader range of productive sectors, such as agricultural trade, negotiated under GATT, with implications for i.a. the trade in harmful 'waste' materials.

This enlargement of scale has major implications for understanding some issues differently than before, require different analytical perspectives, and different analytical tools. It also immensely complicates issues of policy formulation, implementation, controls and sanctions mechanisms, as existing jurisdictions are inadequate and inter-jurisdictional disputes multiply exponentially by adding more levels and by widening the number of areas where actions are required to reflect environmental concerns.

At the practical institutional level, there is now also some 25 years of experience in some but not all countries at the national and sub-national levels especially in the North with coming to grip with regulatory approaches covering emissions and residuals of production processes to foster environmental quality objectives. Important lessons are being learned on the effectiveness and implications of alternative mechanisms to improve environmental quality.

In contrast, a large number of developing countries have hardly made a start with setting up institutions and policies for better environmental management, and they could well benefit from any lessons that may be learned from experiences elsewhere, in attempting to initiate and design their own policies and programmes.

1.2 Contrasting perspectives on sustainable development analysis

One ought to be pleased with the proliferation of publications dealing with aspects or issues in the interrelationships between population size and growth, natural resources and the possibility or prospects for achieving sustainable development. At its most general level the discussion deals with the prospects for mankind on planet earth, a topic on which anybody can and often does have views ranging from grave concern bordering on despair, to blissful avoidance of the issue on the assumption that life for the individual is short, and apocalyptic scenarios, if they take place at all, will (hopefully) happen 'beyond my time'.

However, even a cursory review of some of the recent contributions in the debates indicate that participants often tend to talk completely at cross purposes: views expressed are so far apart, their premises are so different and the language and/or jargon used differ so much as to make a dialogue nearly impossible. Time and again public fora where such important issues are debated end in chaos or frustration all around.

A key issue then is to seek ways and means to structure the subject matter in such a way as to enable a more constructive interdisciplinary discussion to take place. If these discussions were to lead to some degree of consensus there would be hope that a discussion of strategies and policies towards achieving sustainable development on a global scale may not be a futile undertaking. If no such consensus can be reached, the discussions might at least clarify where, why and how participants differ from each other.

Different criteria could be used to structure the subject matter of sustainable development at the interface of man and nature. Several such criteria will be presented below, and each one of them has advantages and disadvantages. They lead to different perspectives to analyze issues of sustainability. Three different approaches to structure relevant topics are presented below.

1.2.1 Alternative views on the relationship between man and nature.

Concerns about the environmental effects of economic growth and more concerted activities of natural scientists to formulate positions in respect of their views on man's relation to, and interaction with nature, has spawned a proliferation of views which span a wide spectrum on the theme of the relation between man and nature. They are often so far apart that they cannot be put in a common analytical framework. Instead, they may be more usefully compared, for the sake of clarity, as competing paradigms or world-views. The paradigms also reflect the evolution of viewpoints in recent decades, and provides an initial contextual background for the focus of the present paper.

Colby (1990) has distinguished five such world views, presented as paradigms, and has provided a set of dimensions to contrast the positions taken and/or the concerns which adherents to a paradigm are likely to hold and share. This scheme is reproduced below. The scheme presents the 'frontier economy' and the 'deep ecology' paradigms as polar opposites, with quite different values and ethos. Each paradigm has its own goals, objectives, philosophical attitudes and values, as well as its socio-political support structures. There are various forms of 'Green and Non-Green Politics'.

Frontier Economics

Adherents see nature as a resource in the service of mankind. It is frontier economics. The resources of nature are to be harnessed to satisfy human wants and needs, however defined. The relationship between human activity and nature under this paradigm is thus seen as unilaterally oriented. It is anthropocentric, and positions *Man over Nature*. From Nature's point of view, the relationship may be characterized as zero-sum, or negative; humans benefit at the expense of other species and natural ecosystems.

Natural resources can be exploited efficiently or wastefully, and to either serve the needs of the elite or those of the masses. But in all cases rising populations and aspirations for obtaining higher income levels will lead to accelerated exploitation of natural resources. Developmentalists, including most economists, work in such an anthropocentric and technocratic perspective.

The attitudes and policies of frontier economics are being widely propagated by the developed countries as 'exportables' in their international policies, and by development cooperation agencies, including the international financial institutions such as the IMF,

Figure 1 Basic distinctions between five paradigms of environmental management in development Colby, 1990, 8.

| Paradigm Dimension | Frontier Economics | Environmental Protection | Resource Management | Eco-Development | Deep Ecology |
|---|---|---|---|--|---|
| Dominant Imperative: | "Progress" as Infinite Economic Growth and Prosperity | "Tradeoffs," as in Ecology versus Economic Growth | "Sustainability" as necessary constraint for "Green Growth" | Co-developing Humans and Nature; Redefine "Security" | "Eco-topia": Anti-Growth "Constrained Harmony with Nature" |
| Human-Nature Relationship: | Very Strong Anthropocentric | Strong Anthropocentric | Modified Anthropocentric | Eco-centric ? | Biocentric |
| Dominant Threats: | Hunger, Poverty, Disease, "Natural Disasters" | Health Impacts of Pollution, Endangered Species | Resource Degradation; Poverty, Population growth | Ecological Uncertainty Global Change | Ecosystem Collapse "Unnatural" Disasters |
| Main Themes: | Open Access/Free Goods Exploitation of Infinite Natural Resources | Remedial/Delusive "Legalize Ecology" as Economic Externality | Global Efficiency "Economic Ecology" Interdependence | Generative Restructuring "Ecologize Social Systems" Sophisticated Symbiosis | Back to Nature "Biospecies Equality" Simple Symbiosis |
| Prevalent Property Regimes: | Privatization (Neoclass.) or Nationalization (Marx.) of all property | Privatization Dominant; Some Public Parks set aside | Global Commons Law (GCL) for Conservation of: Oceans, Atmosphere, Climate, Biodiversity? | GCL + Local Common & Private Property regimes for Intra/Inter-Generational Equity & Stewardship | Private, plus Common Property set aside for Preservation |
| Who Pays? | Property Owners (Public at Large; esp. Poor) | Taxpayers (Public at Large) | "Polluter Pays" (producers & consumers) (Poor) | "Pollution Prevention Pays" Income-Index Envir. Taxes | Avoid costs by foregoing development |
| Responsibility for Development & Management | Property Owners: Individuals or State | Fragmentation: Development decentralized Management centralized | Toward integration across multiple levels of gov't. (e.g., fed./state/focal) | Private/Public Institutional Innovations & Redefinition of Roles | Largely Decentralized but integrated design & mgmt. |
| Environmental Management Technologies and Strategies: | Industrial Agriculture: High Inputs of Energy, Biocide, & Water; Monocultures, Mechanized Production Fossil Energy Pollution Dispersal Unregulated Waste Disposal High Population Growth "Free Markets" | "End-of-the-Pipe" or "Business as Usual Plus a Treatment Plant" Clean-up. "Command and Control" Market Regulation: Some Prohibition or Limits, Repair, & Set-asides. Focus on Protection of Human Health, "Land Doctoring" Envir. Impact Statements | Impact Assessment & Risk Management, Pollution Reduction, Energy Efficiency, Renewable Resource/ Conservation Strategies, Restoration Ecology, Population Stabilization & Technology Enhanced Carrying Capacity, Some Structural Adjustment | Uncertainty (Resilience) Management, Industrial Ecology/Eco-Technologies. e.g: Renewable Energy, Waste/Resource Cycling for Throughput Scale Reduction, Agro-forestry, Low Input Agriculture, Extractive Forest Reserves Population Stabilization & Enhanced Capacity as RM | Stability Management Reduced Scale of Mkt Economy (inc. Trade) Low Technology Simple Material Needs Non-dominating Science Indigenous Tech. Systems "Intrinsic Values" Population Reduction |
| Analytics/ Modeling and Planning Methodologies: | Neoclassical OR Marxist Closed Economic Systems Reversible Equilibria, Production Limited by Man-made Factors, Natural Factors not accounted for. Net Present Value Maximization Cost-Benefit Analysis of tangible goods & services | Neoclassical Plus: Environmental Impact Assessment after Design; Optimum Pollution Levels Equation of Willingness to Pay & Compensation Principles | Neoclassical Plus: Include Natural Capital. True (Hicksian) Income Maximization in UN System Increased, Freer Trade Ecosystem & Social Health Monitoring; Linkages between Population, Poverty, & Environment | Ecological Economics: Biophysical-Economic Open Systems Dynamics; Socio-Technical & Ecosystem Process Design; Integration of Social, Economic, & Ecological Criteria for Technology: Trade & Capital flow regulation based on Community Goals & Mgmt; Land Tenure & Income Redistrib.; Geophytology? | Grassroots Bioregional Planning Multiple Cultural Systems Conservation of Cultural & Biological Diversity Autonomy |
| Fundamental Flaws: | Creative but Mechanistic; No awareness of reliance on ecological balance | Defined by F.E. in reaction to D.E.; Lacks vision of abundance | Downplays social factors Subly mechanistic; Doesn't handle uncertainty | May generate false security Magnitude of changes require new consciousness | Defined in reaction to F.E.; Organic but not Creative; How reduce population? |

Frontier: Economics (F.E.)

Environmental Protection (E.P.)

Resource Management (R.M.)

Eco-Development (E.D.)

Deep Ecology (D.E.)

the World Bank and the regional development banks. The prescriptions are received and imitated by developing countries and their leaders in the pursuit of their development strategies. The Frontier Economics approach was sometimes justified as a minor evil, 'necessary' during the pre- and early-industrial stages of development.

One major problem with this philosophy arises from an important difference in vulnerability to ecological degradation between temperate and tropical ecosystems, and the types of environmental problems they face (Gourou, 1955; Borgstrom, 1973; Watt, 1973). Resource depletion and ecological destruction in tropical lands is in many cases irreversible on a human time scale, unlike the pollution problems which dominated environmental concerns until recently in the developed countries. In the late 1980s, most developing nations have come to see that they are damaging their own future prospects by pursuing development strategies and policies that are unsustainable, though they often feel that they have no choice. Thus, vicious circles set in of poverty, marginalisation and ecological destruction.

Deep ecology

Deep ecology as a social movement is not to be confused with the science of ecology, which tries to understand how complex ecosystems function. Ecology in origin is a branch of biology, but has since widened and deepened its reach and has become more interdisciplinary, with physics, chemistry, geology and biology as the most basic disciplines. Currently, one speaks of the biogeophysical foundations of sustainability (Munasinghe and Shearer, 1995).

The deep ecology paradigm comes from one school of thought within the philosophical spectrum of Green Politics, which draws eclectically on various schools such as the modern science of systems ecology; wilderness preservationism; 19th century romanticism and transcendentalism, eastern philosophies and religions such as Taoism and Buddhism; various religions' concepts of ethics, justice and equity; eco-feminism; pacifism; Jeffersonian decentralised, participatory democracy; and some of the social equality aspects of socialism (which some have termed 'social ecology' (Colby, 1990: 13).

Deep ecologists approach the relationship between man and nature from a non-anthropocentric perspective. Instead, it sees man as just one of many species living in complex eco-systems. Their 'bio-centric' or 'harmonious' view of the relationship between man and nature, often means putting *Man under Nature*, the reverse of the frontier economics hierarchy.

The application of this philosophy would result in radical changes in social, legal and economic systems and definitions of development. It may mean to turn the whole world back to the pre-industrial stage. The operationalisation of deep ecology in strategy and policy remains unclear.

Environmental protection

The dominance of the frontier economic paradigm began to weaken from the early 1960s, especially after the 1962 publication of Rachel Carson's book *Silent Spring*, which called attention to the destructive effects of fertilizer and pesticides in agriculture on flora and fauna. At the wider public policy level in the United States, the President's (Truman) *Materials Policy Commission* - popularly known as the Paley Commission of 1952 - set up to inquire 'into all major aspects of the problem of assuring an adequate supply of production materials for our long range needs and to make recommendations for formulating a comprehensive policy on such materials' has been influential. It has i.a. led to the setting up of the think-tank *Resources for the Future*, which has been a source of many important studies on natural resources and resource policies since the late 1950s (Barnett and Morse, 1963, Chapter 2). Whatever the multiple roots, by the late 1960s problems of the adequacy of natural resources and of pollution arising from economic activities were a major concern in the industrialised world.

A polarized stand-off with the emerging deep ecology movement led to the perception that trade-offs might have to be entertained between Ecology *versus* Economic Growth.

Two policy developments of that period are worthy of note. Environmental impact statements (EIA) were advocated but institutionalized in only some countries and in some aid agencies (Nijkamp, 1979; Biswas and Geping, 1987; Bisset, 1987; Wathern, 1988; Kennedy, 1988; and Horberry, 1988). There was also a good deal of foot-dragging and paying lip-service only in many multilateral development agencies as was demonstrated in Stein and Johnson (1979). Nevertheless, Environment Impact Assessments are becoming an accepted instrument in project assessments in a widening range of uses and in more countries (Gilpin, 1995).

EIAs were often called for after most important and truly interesting issues and aspects of projects had been defined and project preparation was well advanced. As end-of-pipe add-on requirements, rather than as an up-front contextual exploration, such EIA requirements were often seen to be anti-developmental. The focus of the approach was negative, aiming at damage control and remedial actions, rather than focusing on ways to improve both development actions *and* ecological resilience. The remedial approach was also apparent in the Stockholm UN Conference on the Human Environment, and its institutional fall-out UNEP, which became an agency without power.

Probably the most important development in this phase was to 'legalize the environment as an economic externality' (Colby, 1990: 16). 'Command-and-Control' regulatory approaches are relied upon to set limits on pollution or other damages. Optimal levels of pollution were defined by short-term economic and political acceptability, rather than by ecosystem needs, and such standards were thus arbitrary. Pollution dispersal continued to be a common approach to amelioration, even if this led to larger problems down the road and in the future (such as the depletion of the ozone layer). Small parcels of common property were set aside as national parks and wilderness reserves. A more pervasive perception was the neoclassical belief in the privatisation of property as a principal solution to overuse of resources. Garrett Hardin's classic allegory of *The Tragedy of the Commons* (1968) was seen as the intellectual basis for this prescription.

However, Hardin confused 'open access' with 'common property' situations. It is therefore not only socially and culturally naive, it is also historically false (Bromley and Cernea, 1989; Van de Laar, 1990a).

Resource management

The political economy and the practical concerns of environmental management in developing countries are quite different from those of the industrial nations because resource depletion is often felt more severely than pollution effects, and it is the poor who are affected most. Hence, in some developing countries, such as in India, 'ecology movements' have risen from the lower classes (Bandyopadhyay, Jayanta and Vandana Shiva, 1988). Environmental problems in predominantly rural societies are perceived much more in terms of land use competition than in terms of pollution, though the latter are becoming quite significant in the fast growing large cities in the developing countries. Moreover, through such issues as 'acid rain' caused by urban-based industries, urban and rural environmental problems become interlinked.

Resource management is the central theme of reports such as the Brundtland Commission's *Our Common Future*, the WorldWatch Institute's annual *State of the World*, and the World Resources Institute's bi-annual *World Resources* reports.

The approach tries to link neoclassical economic theory with substantial changes in economic practices. It thereby tries to be more 'evolutionary' rather than 'revolutionary'. The basic idea is to try to internalise all types of capital and resource costs (biophysical, human, infrastructural, and monetary) in the decision making considerations of economic actors, and to reflect these in the calculations of national accounts, productivity and policies for development and investment planning. The management needed thus includes natural resources and extends to climate and the processes regulating it. Correcting incentive systems in order to 'harness market forces' for efficient environmental management is a major theme. The World Bank has become a major promoter of this view, and its policy correlates (Munasinghe, 1993; Munasinghe and Cruz, 1995).

The approach argues that increasing efficiency of resource use, through conservation, wise management, and policies that integrated economic and ecological principles, along with ever-relied-upon promises of technological advance, would prevent disaster and ensure that *The Global Possible* (Repetto, 1986) would be achieved.

Whereas Boulding (1966) argued the incompatibility of the principles of ecology and economy, resources management holds that somehow the two can be reconciled, and that something like the *Global Efficiency* path could be found and trodden.

Eco-development

This approach stands somewhere between resource management and the deep ecology movement. In the longer term, wider changes and more discontinuous shifts may need to be made than those contemplated by the resource management school.

It tries to find positive-sum solutions against the back-to-nature 'simple symbiosis' advocated by deep ecologists. It draws wider boundaries around the resource management system, and tries to move away from end-of-pipe remedies. This involves a move away from 'polluter pays' (OECD, 1975), towards 'pollution prevention pays' development strategies.

It thus tries to move closer to link the neoclassical model of the circular model to the environmentally closed model of Spaceship Earth. It would thus move on from *economizing ecology* to *ecologizing the economy*, or *whole social systems* (Colby, 1990: 27). Environmental economics might evolve into ecological economics. Ecological uncertainty needs to be incorporated into economic modelling and planning mechanisms. Merely risk management would be insufficient. The Resource Management strategy of the polluter-pays-principle, and methods for implementing it such as tradable pollution permits, do not incorporate ecological uncertainty and social equity issues well at all (See below, Section 2.5.3). Tradable emissions permits not only create a market for 'bads', they also create a new property regime, as in the 'right to pollute'. Once such new property rights have been created, they are very difficult to take away.

In this wider perspective of competing world views, the present paper will fit mostly in the area of resource management. It will try to analyze contributions from the history of economic thought regarding resource management, and to point at issues relevant to the formulation of environmental policies.

1.2.2 Defining Sustainability: What is to be sustained?

The concept of sustainability is central to many current natural resource debates. While the concept has substantial appeal, consensus on its meaning is lacking, especially concerning what combinations of resources or practices should be sustained. For many analysts the above classification by paradigm (as in 1.2.1) is too vague and general for comfort and it tends to provide too few handles to enable specific and policy relevant research to be undertaken. Hence attempts are made to come to grips with specific problems and issues in a more direct manner. The many meanings of sustainability can be addressed by posing four defining questions: what is sustained, why sustain it, how is sustainability measured, and what are the politics? Next, distinct types of sustainability are defined, each reflecting a different vision of which resources should be sustained. Gale and Cordray (1994) distinguish the following nine sustainability types: dominant product, dependent social systems, human benefit, global niche preservation, global product, ecosystem identity, self sufficiency, ecosystem insurance, ecosystem benefit. Putting the defining questions and the identified sustainability types on the axes, the resulting cells can be filled in as in the example below.

Figure 2 Sustainability types and four defining questions.
Gale and Cordray (1994): 314.

| Sustainability type | Four defining questions | | | |
|---------------------------|---|--|---|--|
| | What is sustained? | Why sustain it? | How is sustainability measured? | What are the politics? |
| Dominant product | Yield of high-valued products | Economic efficiency | Quantity produced | Maintain flow of narrow resource-specific resources versus broad, diverse resource production |
| Dependent social systems | Social systems (communities, families, occupations) | Lifestyle values | Social system persistence | Local, targeted resource-dependent social systems versus broadly distributed use or preservation |
| Human benefit | Diverse human benefits | Human rights to resource abundance | Range of ecosystem products and uses | Broadly distributed multiple uses versus ecocentrism or resource specialization |
| Global niche preservation | Globally unique ecological systems | Global human-ecosystem interdependence | Ecosystem health | "Spaceship earth" versus which niches to maintain |
| Global product | Globally important high-value products | Human need for products even if few areas produce them | Price and supply fit of local products into international market | International comparative advantage versus global exploitation and resource nationalism |
| Ecosystem identity | General types of ecosystems or resource uses | Commitment to general ecosystem diversity | Persistence of global ecosystem diversity | Worth of general ecological characteristics versus market-driven ecosystem conversion |
| Self sufficient | Ecosystem integrity | Commitment to ecosystem autonomy and naturalness | Ecosystem integrity without external input | Ecosystem rights and values versus human values and needs |
| Ecosystem insurance | Ecosystem diversity | Insure against ecological disaster and diversity loss | Vitality and amount of insured resources, resistance to ecological crises | General need for reserved areas versus questions of future need and technological optimism |
| Ecosystem benefit | Undisturbed ecosystems | Respect rights inherent in natural ecosystems | Ecosystem continuity, natural evolution | Restorative intervention or ecocentric autonomy versus human dominance and use |

In turn, the cells could be used to identify interest groups which may, or may not be able to organize themselves around any one of these issues, to engage in a dialogue with those interests occupying other cells, to try to resolve social conflicts arising. The outcomes may be stable or unstable over time, and there may be genuine accommodations of conflicting positions in carefully balanced trade-offs, or some types of interests may be structurally ignored or suppressed.

The framework sketched here, following Gale and Cordray (1994), should not be seen as final or exhaustive. No doubt, the number of rows and columns could be expanded. One additional defining question might well be included already here. It is not only important to ask what should be sustained but to also ask the question: for how long should what resource be maintained? This changes the context from what appears to be a static setting to a more dynamic setting. Neither population size and preferences nor technological change are likely to remain constant. On the contrary, both are, on the evidence of the last few centuries highly variable. Consequently, some hotly contested issues may evaporate over time, or new issues will come up which have not been anticipated. Moreover, adding the issue of time scales, forces one to recognize that different elements in the natural environment have life cycles on quite different scales. The abiotic element has a geological scale; the biotic elements, flora and fauna, have highly diverse time scales, considering for instance some trees that may be 500 or 1000 years old, and one-day flowers on the other, and animal species too have quite different life cycles. In contrast, the life expectancy of humans as individuals is not all that great and the range between the developed and the developing countries has narrowed in a period of only a few decades.

Asking about time frames is not only important because the key elements of the natural environment imply different time scales governing the evolution of its components, but it also could give indications about response times available to counteract through policy measures some trends in natural resource positions (Holling, 1995). Take the problem of climate change due to global warming: one set of questions addresses whether the phenomenon is likely to occur and the magnitude of the temperature change involved, about which scientific opinion is likely to remain divided for some time to come (GEC, *Special Issue* 1994). Another set of questions involves the consequences for global agriculture. The size of the 'shock', the rise in global surface temperature on agricultural production, is then compared to other shocks global agriculture has faced over the time frame over which the phenomenon of global warming is to emerge, and the number and intensity of shocks global agriculture faced in the past and which shocks have been accommodated reasonably well on the basis of available indicators of production (Food Policy, *Special Issue* 1994).

The above analytical framework may be helpful in laying out issues and viewpoints, but it provides no criteria or yardsticks to assess relative importance of the different interests, nor does it assess intertemporal trade-offs on the basis of a common denominator. Where multiple criteria analysis is being advocated, difficulties arise over the weights to be given to the different criteria, the more so as different actors involved are likely to give quite different weight to the criteria employed. As a framework of interest articulation the scheme may be useful in setting the shape and scope of multiple actor/interest bargaining with no predictable outcomes. At the general level solutions

may not be possible, though it should not be excluded that in a specific and relatively restricted geographic space, conflicts in land use competition can be accommodated in regional or spatial planning exercises. As regional-spatial planning has been practised for quite some time in different settings, something might have been learned about how to more effectively reconcile conflicting objectives in land use.

1.2.3 Disciplinary contributions: optimists and pessimists

Sustainability of development is, as should already be clear by now, a wide and overarchingly complex problem area. One way to address complex issues is to look at them from disciplinary perspectives, in an attempt to ascertain what contribution could, or have been made by the discipline. The disciplinary background shapes the premises of the analyst and the mode of analysis. Sustainable development is then an area of study or interest to be newly addressed.

A major problem of a disciplinary approach is its partial perspective. Under pressures of increasing differentiation within disciplines, and the difficulties of remaining current in one's chosen area of specialisation, one is forced to constantly narrow one's turf. A 'true' subject specialist knows ever more about increasingly less, with the limiting case of knowing 'all about nothing'. The question then arises whether and how specialists in different disciplines can effectively communicate and interact with each other to address the challenge of studying or achieving sustainable development.

One of the surprising and puzzling features of the current state of the sustainability debates is that among economists one often finds a high degree of optimism on the prospects for sustainable development. This optimism is surprising as even a cursory study of the history of economic thought, as will be shown in the present paper, tends to give more ground for a negative outlook on the part of economics.

Nevertheless, many current economists hold the view that there are no real scarcities in most natural resources, and if temporary scarcities emerge, through natural calamities, warfare or actions of powerful actors, problems arising will be only temporary. The dynamics of the economic systems will take care of them in a flexible and relatively short period of time. The response of the industrialised economies to the oil price shocks of the 1970s, enforced by the OPEC cartel, have boosted the confidence of the optimistic economics considerably.

On the other hand, among natural scientists discussing natural resources, the mood is mostly of 'doom and gloom'. They see a relentless process of mankind destroying the natural environment and the resources the earth can provide at accelerating rates. To them development and maintaining ecological systems are often held to be incompatible.

The curious phenomenon is thus that nowadays economists pronounce on natural resource scarcity (Solow, 1974, 1986; Rosenberg, 1973) while natural resources are not considered by many the professional specialization of economists. On the other hand, natural scientists pronounce on the needed changes in the behaviour of people, while the

study of how people behave, when faced with choosing among resources which have alternative uses, where economists claim some competence, is not considered the bailiwick of environmental scientists. From the perspective of analysis and policy prescriptions, one might be inclined to think that we have cases of rather serious professional and/or scientific trespassing, when subject specialists pronounce on issues where others think they have no professional competence as scientists. If this a fair description of reality, the prospects for effective dialogue to jointly work towards joint goals look bleak. A famous example of the former type of pronouncement is Beckerman (1974), shooting down the *Limits to Growth* report by Meadows, et al. of the Club of Rome, and a very influential publication in the management of natural resources field has been and continues to be Hardin's Tragedy of the Commons article (1968).

Put differently, consider the following key questions in any sustainable development debate:

- 1 Are current practices for transforming natural resources into flows of economic goods and services sustainable? If not, in what respects and by what margins is sustainability violated?
- 2 Can the larger flows of goods and services required to shrink the gap between rich and poor, or the still larger flows required to meet the needs of a doubled or tripled population be delivered sustainably by expanding current practices or by using improved practices that are already known? Or would sustaining larger flows require improvements over the best practices now known?

To environmental scientists, the answer to the first, analytical question, is clearly no, though the margins by which sustainability is exceeded by various types and combinations of human activity are very difficult to ascertain. It then follows, in answer to the second policy question, that for the future current practices could not possibly sustain even larger flows of goods and services, but whether best-known practices could do so requires further careful analysis.

According to Holdren, et al. (in Munasinghe and Shearer, 1995: 11), environmental scientists would be in nearly unanimous agreement on these answers, but they recognize that many members of other academic disciplines and numerous policy makers would dispute not only these answers but also the relevance of the questions.

Where the current mainstream economic approach and the environmentalist approach to natural resources management appear to differ so much, these differences cannot be ascribed in full to ambiguities in and disagreements about the meaning of sustainability, such as illustrated above in Figure 2 where nine different types of sustainability were identified. A more important source of disagreement are differing assumptions, perceptions, and knowledge about (a) the importance of environmental conditions and processes supporting human well-being, (b) their sensitivity to disruption, and (c) the character and amenability of society to remedy the anthropogenic impacts now disrupting and threatening those life support systems.

1.3 Purpose of the paper.

The present paper attempts to look more closely at the origins of these differences. Hence, it tries to sketch how economic theory, as an emerging science since the late 18th century, has been looking at the economic process and the evolving economic system. Important insights can be gained from a re-reading of the pluriform 'history of economic thought' on two issues: (i) what were the assumptions about the role of the natural environment, and (ii) what were the consequences of the analysis for the natural environment in the long run. These insights are to be seen against the times when and places where the theories were formulated. While some of these insights may have become obsolete in some societies - are overtaken in the course of their development - they may still have considerable reality value in other societies at different stages of development. As will be shown, many different views have been expressed and residual traces of these views (or schools of thought) contribute to what has emerged only in the 1960s and 1970s as a new field in economics: environmental economics.

This historical review might assist readers in coming to grips with structuring one's thinking about the manifold interrelationships between notions of Environment and Development. It also likes to give a flavour of the growth of insights relevant for what is now called Environmental Economics. Hence, the timing of individual contributions is of some interest for understanding how it all came together in the last three decades, e.g. since about 1960. Various central concepts which have emerged will be introduced as the discussion proceeds.

This paper is written from the perspective of economics, but is addressed to social scientists, non-economists, or to natural scientists interested in trying to understand the mode of analysis in economics. It might help clarify some of their thinking. There may seem to be need for this, as to the professional economist, the manner in which non-economists discuss economic theory is sometimes mind-boggling. To facilitate interdisciplinary communication, there is virtually no formal economics as is customary in contemporary presentations in the academic literature. Important notions are expressed in as simple terms as possible.

The task of economists with respect to natural resources and environmental policy is, following Dorfman (1985: 67-68), to provide a framework within which the data provided by experts in other fields can be viewed and the social implications drawn. Economists can only repeat, without quite understanding, what geologists, ecologists, public health experts and others say about physical and physiological facts. Their craft is to perceive how economies and people in general will respond to those facts.

The analysis of these responses, though predicated on second hand knowledge, is critically important. What is happening and what is going to happen to the natural resource base and the environment depends not only on the facts of nature but also on human responses to them. The efficacy of any policy that may be adopted depends as much on how it affects human behaviour as on how it is intended to influence natural phenomena. Judgments about the desirability of different policies are based on judgments about how they affect people's welfare. All these are matters that economists study, for economics is the study of the allocation of resources which have alternative

uses. How people react to problems related to natural resources or the environment, depends on what they know about the problem, what options are open to them, and what their motivations are.

Dorfman admits that the average economist does not know much about natural sciences, and in fact in the making of an economist as a professional there is little or no exposure to natural sciences, though there are major inroads of mathematics and abstract forms of reasoning in the discipline. It therefore seems appropriate to try to clarify some of the representations or understanding of natural phenomena by economists with information which is in the realm of natural sciences such as agriculture. To relate the nature of some concepts from the development of economic thought to the real world, at times, findings or evidence from actual historical developments are supplied which could not be available to the authors of a number of the concepts to be discussed. In that sense, I shall be trespassing in agriculture, some history and statistics.

Unfortunately, the review of economic doctrines from the perspective of natural resources scarcity has become longer than initially expected. There are three reasons for this. First, comments on an earlier draft of this paper revealed that at least part of the intended audience does not have a solid grasp of the history of economic growth in general. Second, a closer reading of relevant literature has shown that there is more in rereading this history than initially met my eye, and thirdly, in other and more recent (text) books on environmental economics, the historical treatment of theory is merely a backdrop to the main purpose of the book: which is to present a text on current environmental economics, or to develop one or more case studies where the tools of economic analysis are employed.

In view of the length of this paper, a separate paper deals with the presentation of the geobiophysical perspective on natural resources and the economic process¹. It is to be read as an adjunct to the present paper, and arising from this common introduction. It highlights the apparent core of the environmental critique of the economic system, and sketches operational consequences for shifting economic principles and economic theories, and for modifying internationally standardized statistical indicators which currently monitor development indicators among countries and over time, such as the National Accounts and Gross National Product. In consequence, the structure of economic models in current use need to change as well, if they are ever to integrate Economy with Ecology in their analysis.

The connections and the apparently problematic interaction between Economy and Ecology may be clarified with help of the following diagram, initially designed to define the newly emerging interdisciplinary discipline of Ecological Economics.

¹ *The Environmental Critique of the Economic Process, Management of Common Pool Natural Resources. Discussion Paper 19, forthcoming late 1995.*

Figure 3. *Relationship of domains of Ecological Economics and conventional economics and ecology, resource and environmental economics, and environmental impact analysis.*

| To From | Economic Sectors | Ecological Sectors | |
|-----------------------|--|--|---------------------------------------|
| Economic Sectors | I 'Conventional' Economics | II Environmental Economics and Environmental Impact Analysis | Waste materials and Heat |
| Ecological Sectors | III Resource Economics and Environmental Impact Analysis | IV 'Conventional' Ecology | |
| Solar | | Energy | ECOLOGIC AL |
| | | | ECONOMIC S |

Source: Costanza, et.al. 1991: 4

The basic world view of Conventional Economics is one in which individual human consumers are the central figures and actors. Their tastes and preferences are taken as given and are the dominant determining force. The resource base is viewed as essentially limitless due to technical progress and infinite substitutability among resources. Conventional economics studies interactions between economic sectors, which are interlinked in an Input-Output type flow system.

The basic world view of Conventional Ecology is of a limited resource base where humans are just another species. Those humans are, however, rarely studied and any human intervention in nature tends to be seen in a pejorative sense, as interfering with the Laws of Nature, thereby disrupting the natural environment and possibly threatening life-support systems on earth.

Ecological Economics, as a newly emerging trans-disciplinary domain takes a more holistic view with humans as one component in the overall system. Humans have a special place in the system because they are responsible for understanding their own role in the larger system and managing it for sustainability.

Resource Economics and Environmental Economics are basically areas of application in the interface of the economic and ecological system at the level of inputs (resource extraction) and outputs (emissions and residuals), seen as by-products of the economic processes in quadrant I : the overall economy.

The present paper will thus look at Quadrant I and the links between Quadrant I and II, and I and III. In the next paper we shall look at this diagram from the perspective of Quadrant IV to the three other quadrants in the above Figure. The four quadrants of the figure are interrelated in an Input-Output framework integrating economic sectors with the natural environment in the wider context of life support systems on earth: its geological core, its biotope and the atmosphere.

Evidence that Environmental Economics as a discipline is coming of age can be demonstrated by the growth of relevant literature. A good starting point to enter the increasingly diverse theoretical literature for views, contributions, significant names and source materials, would be the *Handbook of Natural Resource and Energy Economics* (Kneese and Sweeney, eds), of which Volumes I and II appeared in 1985, but Volume III only in 1993 (There are also some interesting changes in the actual composition of Volume III as compared to the 1985 planned version). In addition, early literature surveys on environmental economics have been published in the *Journal of Economic Literature*, in 1976 (Fisher and Peterson) and in the *Economic Journal* in 1977 (Petersen), and again in JEL in 1992 (Cropper and Oats). There are also emerging textbooks such as *Economics of Natural Resources and the Environment*, by Pearce and Turner (1990), with excellent references to further readings, and, more difficult, *The Theory of Environmental Policy*, by Baumol and Oates (2nd edition, 1988), or T.H. Tietenberg, *Environmental and Natural Resource Economics* (2nd edition 1988). These several authors are themselves pioneers in the emerging field and write from the perspective of their own life-long learning. A problem with these publications is that they are firmly embedded in the economics discipline. To non-economists, such as ecologists, and also many social scientists this is an alien world, and thus effective interaction is not insured.

Therefore, mixed audiences may be better served by more popularized text books such as Tietenberg's *Environmental Economics and Policy* (1994)². It addresses its economic analysis and applications to natural resource problems in the US. Turner, Pearce and Bateman (1994) is an excellent general and accessible introductory text as well. In the present paper an attempt is made to refer problems and issues to the context of developing countries and to North-South dimensions of issues where information is available, to make the presentation more suitable for the audiences envisaged.

It is hoped that the presentation of this paper³ will lay some groundwork to enable those developing an interest in this area to access the flood of publications emerging in recent years on issues of the sustainability of development more fruitfully. Juxta-posing

² In the Netherlands, a first comprehensive introductory book on environmental economics and attuned to environmental issues in the Netherlands, has recently been published: *Basisboek Milieu-economie*, Frank Dietz, Wim Hafkamp and Jan van der Straaten, eds. 1994 (Boom:Amsterdam, Meppel).

³ Several others are being planned: *On sustainability*, and *On the instrumentation of environmental policy*.

opposing modes of thought: to show differences and disparities as is done in the present several planned papers is seen to be a prerequisite for more effective interdisciplinary interaction in analytical and policy environments. In more specialised areas useful conferences and special readers are becoming available at an overwhelming rate. Once identified, they give good introductions to, or report on the state-of-their-art in a particular (sub)area. Much of the present search effort has gone precisely in trying to locate significant source materials and to make these materials more readily accessible. The extensive use of references will point the reader at significant publications through which further study and orientation will be facilitated. With the benefit of hindsight it would have been possible to compile a good set of the original readings themselves, rather than excerpting and compiling salient points from them as is done in the present paper. The argument against this alternative approach is that the resulting reader would become very thick and unwieldy, with reduced probability that it would be read⁴.

⁴ So far some 500 selected 'quality' references have been identified and collected, with an emphasis on analytical issues in a wide spectrum.

2 ECONOMIC THEORY AND THE NATURAL ENVIRONMENT

2.1 Introduction

There is a persistent view among natural scientists, and in some areas in the social sciences, that economics as a discipline is a rather monolithic set of ideas, approaches and techniques. It is, indeed, true that most people who call themselves economists by profession, and those employed in educational establishments to educate new generations of practising economists, at the present time work in the neo-classical paradigm, the current 'mainstream'. But this is only one of many existing paradigms in economics. Awareness that economics is a large and much divided house internally, where conflicting paradigms exist and find adherents to the present time is desirable. Conflicts rage within and between schools. Therefore, Cole, Cameron and Edwards (1983) have made an attempt to systematically analyze 'Why economists disagree', using flow diagrams to clarify and summarize their analysis. Some familiarity with a number of ideas advanced in the history of economic thought would be illuminating. Convenient textbooks are the brief volumes by Barber (1967, 1984 edition) or Gray (1931, 1956 edition), the current classical text is by Blaug (1968, 1977 print) or, though in a different vein, Haney (1911, 1964 edition). A criterion being that these books have been reprinted and/or seen new editions spanning decades, and this is taken as proof that the economics profession has considered them as authoritative works, though the approach taken by these authors is somewhat different.

But these textbooks by themselves are not the object of the present exercise, rather the focus is to select those lines of reasoning which are important in understanding the development of economic doctrines in as far as they relate to natural resources, and on policy relevant insights to understand alternative approaches to natural resource management.

Pearce and Turner (1990: 5) provide an illuminating descriptive scheme locating different 'schools of economic thought' which have contributed to the emergence of environmental economics in recent times.

It is a convenient vehicle to introduce a range of concepts formulated in specific historical settings, but of continuing importance for the environment and development debate at the present time, and including the developing countries. It is not necessary in the present context to follow closely what different authors said as in a *Dogmengeschichte*. Rather, the idea is to sketch the mode of thought and to bring out key insights contributed by different intellectual traditions in the history of economics, relevant to natural resources role and use and policy.

2.1 Classical economics

2.2.1 Adam Smith (1723-90)

Classical political economy stressed the power of the market to stimulate both growth and innovation but remained essentially pessimistic about long-term growth prospects. The growth economy was thought to be merely a temporary phase between two stable equilibrium positions, with the final position representing a barren subsistence level existence - the stationary state. (Pearce & Turner, 1990, 6-12).

In his *Wealth of Nations* (1776) Adam Smith is not concerned with *wealth* as a stock concept, but rather in ways and means to increase the flow of goods and services available to society. The emphasis was put on the division of labour as the instrument to increase output; its advantages springing from increased dexterity, from economy of time, and from the encouragement it gives to inventions (Smith, 1976, Book 1, Chap 1). But the principle of the division of labour necessitates exchange in markets. When individuals are left free to pursue their own interests, Smith argued, the individual and also the aggregate outcome would be best. When individuals could start from relatively equitable initial conditions, and with easy entry and exit options, this would ensure that they would face market parties of roughly equal strength, and nobody would be able to exercise monopoly power. The 'invisible hand' of the market mechanism would then give optimal results for the individual and society at large. The role of government could therefore remain limited to that of 'night-watchman', maintaining law and order, take care of national defense and provide education to help equalize initial inequality in knowledge.

Smith reacted against the prevailing economic order with widespread mercantilist practices by the state. He painted a future-oriented picture for a particular and more desirable *institutional setting* for organizing society at large, in contrast to the pre-existing era of the all too 'visible hand' stemming from mercantilism (See the introduction of Seligman to Smith, 1954).

Mercantilism is to be seen as the economic side of 'state making', as an adjunct of evolving political thought. Machiavelli, in the 15th century, postulated that his times called for a strong prince (state being equivalent to principalities), and wrote his book, *The Prince*, as an analysis of what must be done to create the strong state - conscience being hushed and all scruples ignored. Machiavelli thus became the unscrupulous despot's guide to power. In addition, Jean Bodin, writing in the 16th century, presented to the world the idea of *sovereignty*, arguing in essence that in each state there is a

supreme power, subject to no other power within the state itself. Both are attractive notions to ambitious and aspiring political operators: past and present.

Mercantilism became the economic means to the political end of making a strong state. As in this pursuit the King lived beyond the means from his own resources, taxes had to be levied on the populace. However, a rural and barter economy has limited options to raise revenue compared to a money economy. The discovery of abundant precious metals in the Americas fostered the monetization process of the economies in Europe. Hence, the King focused attention on the overseas mining sector and on bullion, seen as the most flexible source of wealth to be brought into the country. Where no domestic gold and silver mines existed, it was the only option to acquire the economic means of power. More in general, economic policies were geared to create an excess of exports over imports with the 'balance of trade gap' to be covered by the import of bullion. Whatever the merit of this policy to the King, who had to directly control international trade and the flow of bullion into his own treasury, and indirectly through subsequent spending effects in the country as a whole, such an economic policy objective could not logically be applied across many aspiring kingdom states.

The hierarchy of sectors and occupations was thus clearly determined. Least important was agriculture, though it fed people and might replace food imports. More important were industry and manufactures where a definitive excess could be created for the needs of other countries. Most important was international trade. While in the Middle Ages the acceptability of a merchant in the sight of the Almighty God had been doubted, under mercantilism the merchant had come into his own in the service of the King (Gray, 1956: 73-80).

Such was the mercantilist programme and point of view; equally significant was the machinery whereby that programme was to be carried into effect. For in all their schemes the mercantilists looked to a benevolently paternal government, assumed wise enough to interfere everywhere. Mercantilism was a policy of ubiquitous and perpetual governmental activity, indicating an obvious kinship between mercantilism and State Socialism (ibid: 77-8). But, as the King's appetite increases, overseas sources of bullion dry up, or are lost to other kingdom and state makers. Paternal government benevolence may easily become oppressive and exploitative, as indeed happened in many instances.

Smith's advocacy of a different institutional order for society, and his analysis that it could work, was thus a clear reaction against the excesses of economic mercantilism and political state making. He demonstrated that markets could replace much of government interventionist practices.

Parallel to Smith, physiocrats in France developed their views and emphasized quite different sources of a country's wealth, in opposition to mercantilist perceptions. Quesnay, who, according to Gray (1956: 97) has strong claims to be regarded as the real founder of Political Economy, argued emphatically:

Agriculture and commerce are constantly regarded as the two sources of our wealth. Commerce, like industry, is merely a branch of agriculture. These two states exist only by virtue of agriculture. It is agriculture which furnishes the material of industry and commerce and which pays both; but these two branches give back their

gain to agriculture, which renews the wealth which is spent and consumed each year (Grains, cited in Gray, 1956: 102).

Quesnay subsequently elaborated his views in the famous *Tableau Économique*, showing numerically how commerce and industry depended upon agriculture, as a precursor of an Input-Output table in a closed economy. This *Tableau* and the conceptual problems associated with it need not concern us here.

The origin of mercantilism might be placed in Italy where city states were well developed already in the Middle Ages and well before that, such as Rome or Venice. The practice of state making then inevitably had an 'urban bias', the more so where soil conditions and thus agriculture were poor. The analysis of the physiocrats appealed to the landed rural aristocracy in France where soil conditions were relatively good and agriculture more promising. There, state making from a landed base, through increasing agricultural production, was more feasible.

There would hardly be a need for the broad, however brief, sketch given above were it not that it touches upon a good many themes and issues which have been so prominent in the area of development strategies for developing countries in the last four decades. For instance, major concerns in development policy have been: processes of state formation after obtaining political independence from colonialism, and of resource mobilisation for the state and for state-led development, especially in Africa but also in former British India; a focus on the modern sector through industrialisation and the initial neglect of agriculture in most developing countries in early Five Year Plans, but now being slowly corrected; governments initially being seen as benign and development oriented, but increasingly becoming exploitative and overbearing usurpers of power, turning to military dictatorships and/or anti-developmental 'kleptocracies'. And the subsequent profound reactions. Such as: state interventions giving way under pressures towards allowing greater roles for market forces; questioning the role of the state in discussions about 'good governance' and 'civil society'; a belated recognition of the primary need to get agriculture moving in predominantly rural societies in LDCs, and a de-emphasis of industry. The comparison may be stretched to the point of foreign aid flows to governments replacing the import of bullion in mercantilist times in facilitating 'state making'.

Awesome is the magnitude of these shifts in perceptions and visions in such a short time span, and mind boggling the speed with which international financial institutions such as the World Bank have been giving policy advice to governments in developing countries: aligning with mercantilist state formation political aspirations first, and transforming to neoclassical economic assumption and practices within a period of less than five years around 1980. A further interesting aspect is the development and requirement of applying project appraisal techniques which use the 'net foreign exchange to government' as the decision criterion, as if resources to the government are superior to resources in private hands (Little and Mirrlees, 1974; Squire and Van der Tak, 1975; Irvin, 1978).

But let us turn more narrowly to the availability and use of natural resources. Smith and the Physiocrats were of the opinion that there were no restrictions on the availability of natural resources (Barbier, 1989: 5). Nature was assumed to be bountiful and generous.

This belief was based more on the spirit of optimism prevailing in the 18th century than upon a concrete analysis of the natural resources themselves.

There is one point on the asserted virtues of the division of labour principle that needs to be stressed here. Smith illustrates his principle with the example of the pin factory (Smith, Book I, Chapter I). But England was hardly an industrial country at that time, and large scale enterprises, in the sense of employing many workers, were few and far between. He recognised that the scope to apply the division of labour in agriculture was considerable less than in industry, especially in small scale, artisanal industry (Van der Straaten, 1990, Chapter 4). Hence, there may be more scope for industrial development than for agricultural growth.

2.2.2 David Ricardo (1772-1823)

It was precisely the problems for England to make its agriculture more productive which forced a sharpening of the analytical apparatus by economists of the classical tradition: this led to a rather pessimistic outlook for long term economic growth. A central role in this was the introduction of what became the generalized *Law of Diminishing Returns*, stating that the application of increased quantities of a variable factor of production (labour) in combination with a fixed resource (land), leads to progressively diminishing marginal returns. This concept is associated mostly with Ricardo, in his *Principles of Political Economy and Taxation* (1817) (see Blaug, 1968, Chapter 4; Gray, 1956, Chapter VI). However, there is a variant associated with Malthus, in his *Essay on the Principle of Population* (1798).

Modern economic views concerning the influence of natural resources on economic growth are variations on the scarcity doctrine developed by Malthus and Ricardo. There were two basic versions, according to Barnett and Morse (1963, Chapter 3). These theories have traditionally been classified as either 'pessimistic Malthusian' models that suggest a long-term absolute natural-resource scarcity constraints or 'optimistic Ricardian' models that do not assume any absolute limits but only admit that resources decline in quality and are therefore relatively scarce (Barbier, 1989, Chapter 1).

Malthusian scarcity is assumed to treat natural resources as being homogenous in quality, whereas Ricardian scarcity portrays them as varying in quality. In the absence of technological change, both scarcity effects eventually constrain economic activity, but with the important difference that under Malthusian scarcity diminishing returns do not set in until the absolute limit of the available stock of natural resources is reached. In contrast, 'Ricardian diminishing returns take effect from the outset, thus requiring no specification concerning the time horizon and no assumption of an absolute limit to the availability of resources' (Barnett and Morse, 1963, 58-60). That is, Malthus 'found resource scarcity inherent in the finiteness of the globe', whereas Ricardo 'focused upon the differential fertility of the individual parcels of land; assuming that the better lands would be used first, he found declining quality to be the cause of increasing resource scarcity' (ibid).

The Malthusian notion of constant marginal cost of labour applied to homogenous land leading to constant output in the absence of technological change, would seem to fly in the face of biophysical facts of agricultural production. Selective cropping to meet human consumption requirements, and repeated for a number of years, is likely to lead to declining soil fertility and thus lower yields. It would thus seem that Ricardian scarcity analysis is more realistic than the Malthusian approach. Acceptance of the Ricardian perspective of diminishing labour returns from land, leads to a view of nature not as bountiful, as Smith and the Physiocrats assumed, but as a resource requiring progressively more 'sweat and toil', and which only niggardly releases its production potential for satisfying human needs.

2.2.3 Thomas Malthus (1766-1834)

Malthus focused his analysis on the role of population growth; with absolute scarcity of land and under Ricardian diminishing returns per unit of land, a growing population would face declining food availability per capita (Blaug, 1968, Chapter 3; Haney, 1964, Chapter XII). Population dynamics overwhelms in the long run any progress which could be made to increase agricultural productivity.

Malthus 'theory' consisted in essence of three propositions: (1) man's biological capacity to reproduce exceeds his physical capacity to increase the food supply, (2) either the preventive checks to lower the birth rate through moral restraint or vice, or the positive checks of raising deaths through vice or misery, are always in operation, and (3) the ultimate check to reproductive capacity lies in limitations on the food supply. Malthus' framework is however not a theory explaining the interactions between population and agricultural resources. The first proposition is axiomatic, and the second and third are its deductive corollaries.

The phenomenon of decreasing returns to land and the biological tendency to procreate are not analytically linked, they are juxta-posed. Moral restraint in procreation was desirable as it would bring down the rate of population growth and would thereby prolong the period whereby arithmetic progression in food availability would keep pace with the geometric progression of population numbers. The two growth rates would then diverge only in the long run with population growth outstripping food supplies.

The empirical basis for Malthus' analysis was weak, for he shared the general belief by contemporaries that the population of England had increased little, if at all, since the revolution of 1680. In the second edition of the *Essay*, in 1803, he took notice of the census of 1801 but barely examined its findings, and he showed no awareness that he was living in a time of population growth without precedent in European history. His argument was never meant simply to reflect the prevailing situation in Great Britain but it was couched instead in universal terms (Blaug, 1968, 69).

But actual changes in agricultural production and in population growth have been dramatic as we now know. Dean and Cole estimated that agricultural production in the UK in the first half of the 18th century increased with 11% and in the second half with 13%. In contrast, population increased by 11% and 51% respectively. Consequently, the

grain price increased between 1795 and 1805 by 178% (cited in Van der Straaten, 1990, 36).

A combination of diminishing returns and population dynamics can easily lead to doomsday scenarios for the future. The destruction of 'nature' and habitats for animals is then seen as inevitable, as massive and accelerating conversions to agricultural lands are needed to feed a growing population. This type of reasoning has found frequent and vocal adherents, not only in the 19th century in Europe, but especially in the 20th century in connection with the future of the developing countries. For instance, equations whereby food projections are estimated from linear trends in agricultural production and geometric population estimates are independently estimated, are central to projection models such as those of the *Limits to Growth* scenarios (Meadows, et al. 1972) of the Club of Rome.

From an analytic perspective relevant to the priority to be given to the preservation of natural resources/habitats, there may be little incentive for human ingenuity to become oriented to develop technology to increase land productivity on existing agricultural lands, as long as the option exists to appropriate large tracts of 'unoccupied' or not-cultivated communal lands and natural or waste lands at low cost. In England, a law of 1235 enabled landlords to appropriate and develop such lands through tenancies. Particularly in the 18th and in the early 19th century large areas of 'natural waste lands' were transformed for commercial agricultural production, in a process known as the *Enclosure Movement*. Only when this option was foreclosed did technological change in agriculture itself take off (van der Straaten, *ibid.*).

2.2.4 John Stuart Mill (1806-1873)

John Stuart Mill's *Principles of Political Economy with some of their application to Social Philosophy* dominated the economics profession during the second half of the 19th century. It became their bible and the dominating introductory economics text book used in British and American universities until the end of the 19th century (Blaug, 1968, 180). Mill regarded his writing in economics, which formed only a part of his larger intellectual enterprise, as primarily an exercise in synthesizing the findings of the classical tradition. But he also made a number of revisions (Barber, 1984, Chapter 4, Haney, 1964, Chapter XXIII, Blaug, 1968 Chapter 6).

Confining ourselves to the relationship between natural resources and population, he saw economic progress in terms of a race between technical change and diminishing returns in agriculture to accommodate a growing population.

He advocated the necessity of a 'Stationary State', in line with the outcome of the ideas of Malthus and Ricardo. But, unlike his predecessors, Mill acknowledged more explicitly the important counteracting influences of technological 'improvements' in postponing the inevitable emergence of the stationary state.

Mill extended the classical concept of natural-resource scarcity to non-renewable mineral resources. Although he argued that mining is 'more susceptible of mechanical

improvements than agricultural production' and that exhausted mines could be replaced by the discovery of new ones, equal or superior in richness', he nevertheless considered mining to yield diminishing returns and increased cost in the long run. Furthermore, he considered the problem of exhaustible-resource scarcity to be a constraint independent of the Malthusian population problem (Barbier, 1989, 12-13).

To Mill, it was axiomatic that, as the increase in wealth is not boundless, so, beyond the progressive state, there must lie the stationary state when the stream of human industry shall 'finally spread itself out in an apparently stagnant sea' (Gray, 1956, 285). But he added different arguments in its favour. Firstly, he stressed distributional aspects of income and wealth across the globe. Adding to the wealth of the rich would add little utility, as long as there was no improvement in the conditions of the poor. In a stationary state there is less need for aggressive behaviour amongst people in a battle for access and control over natural resources. A low birth rate would make it easier to reach a stationary state in combination with a reasonable income distribution (Van der Straaten, 1990, 39-40).

Mill is also credited with being the first classical economist to consider the impact of natural-resource scarcity on what nowadays would be called the various 'amenity services' provided by nature to humankind. These services provide alternative uses of natural resources (e.g. land) for agriculture and for residential areas. Sites of remarkable beauty are generally limited in supply, and therefore, if in great demand, are at a scarcity value. In his words:

Solitude, in the sense of being often alone, is essential to any depth of meditation or of character; and solitude in the presence of natural beauty and grandeur, is the cradle of thoughts of aspirations which are not only good for the individual, but which society could ill do without. Nor is there much satisfaction in contemplating the world with nothing left to the spontaneous activity of nature' (cited in Barbier, 1989, 13).

Mill appears to be suggesting that certain services provided by nature are threatened by the use of the environment for economic growth. Moreover, the scarcity of such essential services may have a detrimental impact on human welfare long before diminishing returns impose an absolute constraint on economic activity. It should also be noted that Mill does not suggest that the imminent scarcity of these environmental services will be reflected in market prices; instead he concludes that preservation of these vital services may motivate society to consider the stationary state as a desirable outcome 'long before necessity compels them to it' (Barbier, 1989, 14).

The conservation of 'remarkable sites of beauty in natural resources has been a major objective of the Conservation Movement at the turn of the 20th century in the United States, as part of the *Progressive* political reform programme and the social movement underlying it. It manifested itself i.a. in fostering the creation of National Parks and bringing vast tracts of land under the national forest service. Though the movement faded into the background later it reemerged again in the 1950s and 1960s. (Barnett and Morse, 1963, Chapter 4).

Mill's analysis of natural-resource scarcity implies a weakening of the Malthusian formulations concerning scarcity and time horizons (Barnett and Morse, 1963, 64-71). His analysis provides an important bridge between classical and more contemporary views, but an explicit analysis of the role of technology, and of technological options is not present.

2.3 Classical concerns and contemporary discussions

The grand concerns of the classical economists continue to have significance at the present times, and especially in respect of the developing countries. However, the only vaguely articulated and understood formulations of the late 18th and 19th century can now be restated and brought somewhat up to date, on the basis of present knowledge. Several of these 'updates' will be discussed below.

2.3.1 Contemporary views on population growth, agricultural land and technological change

In the classical economic tradition much attention is given to population growth, diminishing returns and limits on available land resources, but no clear views could emerge on general evolutionary patterns of land use in response to population pressures. Such processes are by their nature slow and require considerable time to take effect. 'Myopic' authors, having to base themselves on casual empiricism, could not develop such views. Also the role and types of technological change in this context remain vague. Consequently, simplistic assumptions lead often to mechanistic or somewhat abstract reasoning. This is unsatisfactory. At present, better descriptions are available and theories are being developed due to more and systematic historical research. Some relevant ideas are presented below to bring the analysis more up to date. It may possibly offer scenarios for future trends in the context of some, though not necessarily all developing countries.

Population increase has two different effects on systems of production: one is of diminishing returns in combination with population growth (Boserup, 1983: 186-7). But this situation provides motivation for the introduction of more intensive systems of production, and these changes may or may not raise the productivity of land and labour depending upon local circumstances. The other effect of population increase is to make it possible to build and finance collective investments in physical and human infrastructure of various types, especially investment in water regulation, energy supply and transportation. Because a larger population can afford more infrastructure, it can make use of technologies which would be inapplicable or uneconomical for a smaller one. The positive effects of this will often outweigh any negative effects of a higher man-land ratio on food supply and development.

The historical record, however, has been highly varied. There have been many increasing populations with sufficient food supply and rapid development, and many stagnant populations with sufficient food supply and no development. But there have also been cases of increasing food supply and no development, and increasing populations with

insufficient food supply, widespread malnutrition among the poor, and rapid development. Boserup (1983) sketches a number of examples of these diverging trends from history and ancient cultures.

Moreover, the complexities of interactions are enormous, for societies can adapt to increasing numbers by means other than the intensification of agriculture and the introduction of technological changes. They could increase total food supply by changing the diet from food which uses land extensively, for instance meat of large animals kept on natural pastures, to pork, poultry and cereals. Or they could replace such land-intensive crops as cereals with tubers or roots that have higher food-value yields per acre. Another possibility could be to use the increasing military strength of a growing population to conquer land from neighbours, or impose food imports from them as a tribute. Food could also be obtained in exchange for other products. Finally, growing populations could adapt population size to food supply instead of adapting food supply to population, either by inducing a part of the population to emigrate to another area, or by birth prevention or infanticide. Clearly, the effects on development would be very different according to which of these means of adaptation were used, and only careful historical studies which relate population growth to land use and patterns of technological change would bring to light the manifold variations in patterns emerging.

Further, issues and possible solutions are not merely a matter of agronomy, technology or political power. Since the late 19th century it has been realised that there is a 'geography of diets'. Sorre (1962: 459), for instance, points at widely different food consumption patterns in different cultural settings, even under similar climatic conditions. Religions impose periods of purification accompanied by fasting or abstinence. These might be, in part, rationalizations for seasonal food shortages. Religious beliefs may also neglect important possibilities for increased food production, which the physical environment would allow.

One internationally generalizable statistical feature of diet is that with rising incomes within and between countries, the share of animal products tends to increase. A growing proportion of plant materials is then not used directly for human consumption, but is used as animal feed to be converted into animal products for human consumption later. Energy conversion rates differ greatly and a generalised trend towards animal products will put considerable pressures on agricultural resources, in addition to those of population increases. (Borgstrom, 1973, Chapter 5). Socially, such a conversion of agricultural land towards livestock products may lead to a deterioration of the income position of the poor.

Specific analysis of the complex relationships between land, population and technology is greatly assisted by the 'stylized facts' approach presented by Pingali and Binswanger (1988), using an approach which links the population dynamics perspective of Boserup, with evolving detailed farming-systems in specific climatological and soil settings, typified by the work of Ruthenberg (1980). Such analysis may act as a bridge between the general and abstract analysis of economic theory and the geophysical perspective of natural scientists.

In general, the farmer's means of coping with increasing population densities and/or increased demands for agricultural output has been an expansion in the area under cultivation, through a reduction in fallow periods, or through the cultivation of virgin land. With the exhaustion of the land, intensive cultivation of permanent fields became the norm. Permanent cultivation systems are characterized by land investments for terracing, drainage and irrigation, intensive manuring systems, and a change from hand cultivation to use of animal draught power. All of Europe and East Asia and most of South Asia, according to Pingali and Binswanger, had made this transition to permanent cultivation of land before this century, while most of Sub-Saharan Africa is still under fallow systems today.

They then compare SSA with Asia to illustrate the process of agricultural intensification and the associated changes in agricultural technology. They argue that farmer-generated technical change is capable of sustaining slow steadily growing populations with modest increases in agricultural output. It appears, however to be incapable of supporting rapidly rising agricultural populations and/or rapidly rising non-agricultural demand for food. The then necessary transition to science- and industry-based inputs is costly, especially in terms of establishing an institutional structure and an industrial base that is capable of generating and supplying these technologies (ibid. 52). In consequence, when such support structures are not emerging natural resource degradation is inevitable.

From the point of view of natural resources and maintaining biodiversity the determinants of the toposequence, e.g. the order in which specific parcels of the land surface (slope sections) within (micro) climatic zones are brought under cultivation, is of special interest. This sequence is presented as a function of power requirements for land preparation, response to intensification investments and output, and erodibility (ibid: 57).

Land productivity can be improved by more intensive cropping systems, better seed selection and crop substitution, whereby better yielding varieties replace low yielding ones. However, this process inevitably leads to genetic erosion in the long run and thus to loss of biodiversity. It also could lead to instability in production, as a trend towards mono-cropping makes agriculture more susceptible to pests and diseases.

To the extent that land productivity in already established agriculture can be continuously improved, pressures to convert more 'natural lands' into agricultural lands would diminish or could be postponed. Thus, the areas left under 'natural' conditions would remain larger, and natural habitats and biodiversity would remain better preserved.

Unfortunately, the areas of high biodiversity, the so-called Vavilov zones, are all in the developing countries. Not surprisingly, these are the areas where most of the International Agricultural Research Institutions are located, and where the transition to permanent cropping systems faces its greatest challenges.

Loss of biodiversity implies exposing populations to survival risks. The classic example is the 'potato famine' in Ireland in the 1840s. The consequences of this 'natural hazard' for the Irish population were, however, considerably worsened by the prevailing socio-

political structure dominated by the British, which limited coping mechanism for the Irish, and inhibited external relieve efforts. The result was massive outmigration of the population. For more contemporary such environmental crop failures, and some of the current issues and controversies over *in situ* and *ex situ* biodiversity conservation issues see Van de Laar (1987).

2.3.2 Role of industry and natural resources

Smith, Ricardo and Mill did not analyze industry in any specific sense, though the productivity effects of the division of labour principle was illustrated with the famous example of the pin manufacture (Smith, 1954, Book I, Chapter I).

The role of industry for agriculture is ambivalent. On the one hand, newly emerging industries require new and more diversified natural resources to provide necessary inputs. On the other hand, the discovery of chemical fertilisers from the 1850s made it possible to add materials from outside the agricultural sector to replenish soil nutrients. Before industrial fertilisers were widely used, transporting human 'night soil' from urban areas to nearby agricultural land has been historically significant to maintain soil fertility in agriculture.

The process of supplying industrial inorganic fertilisers to agriculture facilitates maintaining soil productivity for longer periods, thus assisting the transition from fallow systems to permanent field agriculture. For this interaction to occur, however, the exchange economy must be well established.

Moreover, adoption rates may be low when chemical fertilizers are not profitable for farmers to use. This will be the case when variability in weather or soils is great, or when fertilizer prices are too high relative to agricultural output prices for poor farmers to use. In general, these factors prevail in the semi-arid areas of Africa and Asia. Hence, the process of land degradation cannot be stopped in large areas at the present time, and by presently known means.

As to the future of industry itself, there was considerable reason for concern in England in mid-19th century among those more interested in concrete rather than abstract and speculative analysis. For instance, a contemporary of Mill, William Stanley Jevons, studied the prospects for raw materials for industry. In his book *The Coal Question: An Inquiry Concerning the Progress of the Nation and the Probable Exhaustion of Our Coal-Mines* (1865) he observed the physical limits of coal deposits in England, and predicted the end of the industrial revolution there (Barbier, 1989: 14-16). Renewable resources like timber also brought worries as wood became scarce (Rosenberg, 1973: 112). It was thought that the Industrial Revolution tended to run out of fuel! These concerns, too, antedate contemporary debates about deforestation and the future of wood energy in the developing countries of Africa and Asia (van de Laar, 1991).

2.3.3 Technological change as hope for the future

A belief in continuous technical change in agriculture and in industry thus became necessary for modern economists to justify some optimism about the possibility of long-term progress and to counter the classical economists in their analysis and prognosis. Otherwise, all roads would seem to lead to disaster, and the messengers, e.g. economic theorists, earned the reputation as propagating a 'dismal science'.

If technology is seen as a way out of doom, the discussion inevitably has to shift to such issues as whether and how technological change can be stimulated, generated, directed and used in socially desirable directions. These are issues of science and of science policy, to which economics has little to contribute. Historical research may show that technological progress has been made in some socio-cultural setting and periods, but this hardly provides a basis for projecting the future with any degree of confidence. Moreover, this type of research often does not give clear indications of causality and sequencing. The historical record has been too varied and the simultaneity of many major problems occurring in many different countries make the study of isolated cases even less valid as generalizable predictions for the future. As long as problems are local or regional, coping mechanisms through external relief or population migration are available. But such options tend to disappear when generalised problems have to be faced simultaneously in many areas.

Within economic theory, as currently practised generally, the concept of technological change has no substantive meaning. It is invoked in theoretical discourses as an argument to draw different lines in diagrams. In applied economics, technological change is mostly a statistical residual, as in production function estimates. This residual is then interpreted as either embodied technical change in physical investment, or ascribed to improvements in human capital. This latter notion became popular in the 1960s but its popularity proved short-lived, under persistent and rising structural unemployment trends. Because the size of this statistical residual is large compared to the measured quantity indicators of investments and labour inputs, the analyst can go in quite different directions in his further theoretical analysis and policy prescriptions.

Inventions are the product of human ingenuity, and occur stochastically. However, whether inventions are being put into practice is a question to which economic analysis can contribute to some extent. To this end, economists distinguish between 'inventions' (discoveries), and 'innovations' or applications in production processes. Modern economists tend to approach the generation of inventions from the point of view of incentives to the inventor. Inventions themselves may also be stimulated through public support for research. Inventions are then seen in the public domain as 'pure public goods'. However, innovations often take place in the private sector, at the individual level and within enterprises. Innovations are then analyzed in a framework of cost-benefit analysis under uncertainty.

The study of diffusion models in innovations is important to analyze technical change and the dynamics of the economic system in general. It can also be useful from the point of view of environmental policy such as in pollution control policies, where it could yield insights in the acceptability of policy measures proposed, on the speed of their adoption

and on the degree to which public support for the initial development of pollution control technologies may be needed. For a recent critical survey of innovation models in pollution control, see Kemp (1995, Chapter 2).

2.4 Karl Marx (1818-1883), and the Marxian tradition

The views of Marx on natural resources are of only limited interest, for they add few new insights. The standard reading of Marx is to assume that the one thing he had in common with the neo-classical school emerging in the late 19th and the early 20th centuries (see below), was little regard for the role of natural resources in the economic process. As formulated by Georgescu-Roegen: 'Marx's dogma that everything nature offers us is *gratis*' stems from his 'well-known tenet that nothing can have value if it is not due to human labour', from which it follows that 'things supplied by nature *gratis* and the services of capital proper have no value.' (cited in Barbier, 1989: 19).

But the Marxian tradition is introduced here for two ideas, which have become increasingly relevant in modern times. They are also crucially important to understand and analyze the possibility of, and the future of environmental policy design and implementation. The Marxian tradition, loosely defined, stresses the class character of social conflicts under capitalism, and questions the postulated but not analyzed by Smith, benign role of the state, in relation to the market mechanism. The significance of these points is that it leads to a treatment of the 'state bureaucracy' as endogenous to the economic process.

Role of the State

Under the Ricardian system, owners of land would enjoy economic rents when less productive land was taken into production. This analysis assumed that labour income obtainable at the lesser productive margins of new lands would be generalised across all lands due to labour competing with itself. The way to acquire economic and thereby also political power is thus to try to obtain preferential access to land resources, because it provided the opportunity to receive 'unearned' rent income. Historically, this process of 'rent-seeking' could be reanalysed in feudal societies, where only land owners had the resources to enjoy life and waste resources indiscriminately. Though some of them also built what in those days must have been seen as 'white elephants' such as palaces and churches, which only later can be appreciated by history as major cultural monuments, the heritage of mankind.

In emerging industry, competitive capitalists would seek labour-saving innovations to increase short-run labour productivity and total surplus value. For labour was seen to receive only its maintenance (subsistence), while employers reaped the benefits from additional labour time spent by workers in capitalist enterprises (labour surplus). This 'exploitation of labour' pushes up the rate of profit and capital accumulation. Competition among capitalists and the search to maintain profits would thus provide the dynamics of industrial capitalism. If there were limitations to innovate, the rate of profit

would decline and the system would be non-sustainable because it would lose its dynamism.

Where ownership of resources provides important sources of power, either to the land lord and renter under conditions of growing population and a closing land frontier, or to the capitalists, growing in numbers and influence during the 19th century, by their power to organise the production process in industry, it cannot be assumed that the state bureaucracy is a neutral entity and outside the economic process. The state itself is seen, in Marxism, to represent dominant economic interests and fosters their interests and power: feudalist monarchs were the state in the historic past. The state under capitalism was defined as merely the 'organising committee of the bourgeoisie' in the *Communist Manifesto*.

Marxism stresses that different social groups in society had and have differential or no real access to the state. Appeals to 'the state' to correct 'excesses' of capitalism may fall on deaf ears when the state itself represents the same dominant class interests which cause these excesses, and does not develop a role as a 'countervailing power'. At issue is therefore the characterization of the state in relation to the economic process and the factors shaping the extent of its autonomy to 'distance itself' from narrow class interests in shaping policies in the general interest. The power of the state and its 'room for manoeuvre' changes with evolving capitalism in time and place.

This conceptualisation of the State as class is quite different from the vision of Adam Smith of a minimalist, law and order state, which was postulated to exist outside the fray of the economic process, and which was to assume a posture as 'guardian of the public good' in society.

In contemporary societies, especially in non-industrial, less developed countries, land ownership continues to be the key source of economic and political power in rural areas, though this power is contested at the national and international levels as non-rural bases of economic power begin to emerge. Many countries have brought unused and natural lands within the realm of the state: as Crown lands or through nationalisation after they gained independence. While the expressed intent may have been to develop them prudently and wisely for the common good, reality is often different. Abuse of power by the 'trustees' of state land and reconversion of public land to private use through land grabbing by public officials and politicians is widespread in many countries, especially in Africa at present. On the other hand, active state support through the provision of economic infrastructure and somewhat repressive labour policies have been factors in explaining the phenomenal successes of the new industrial countries (NICs) in East Asia especially in the last half century.

Marxism looks upon the capitalist entrepreneur in terms of his control over the instruments for exploiting labour. In contrast, Joseph Schumpeter (1947) sees the entrepreneur as the provider of dynamism, enabling capitalist expansion over time, to the benefit of both workers and capitalists. State activities can either support or stifle entrepreneurial roles in agriculture and industry, with important effects on development paths.

Leaving Marxist terminology of exploitation, the conceptualising of the state as endogenous to the economic process presents a problem area for economic analysis. Rent-seeking behaviour can be seen as a general phenomenon in economic life. In the theory of economic policy, it used to be confined to address issues of monopoly power exercised in the market. But the area where it has been attracting most interest in the last decades is in relation to the behaviour of governments. The rent-seeking perspective provides a powerful basis for an economic analysis of the State and bureaucratic activities generally (Colander, 1984). To illustrate: strongly expanding government bureaucracies have set up increasingly complex systems of regulations aiming at market ordering through permits and licenses, in the expectation of some, often poorly defined, 'higher state or public interest' goals. This process implies the creation of degrees of monopoly for those acquiring these 'pieces of paper', for it excludes others from undertaking the activity concerned. Hence, aspiring entrepreneurs are willing to pay bribes to circumvent the rules in proportion to the gains to be expected from the envisaged activities themselves. Alternatively, all types of interest groups and professional organisations are only too willing to 'assist' governments in the design of all types of regulations, but such as to admit or protect their own members. Well-known examples are medical doctors, lawyers in court and other professional groups. They aim to protect their 'investment in education' in the market place through collective action and connive with the state for initiating regulatory practices.

The rent-seeking perspective asks the valid question: what is the net-benefit of government regulations of all types, and what is their cumulative effect on the economic process? In attempting to shed light on this question in specific contexts, the tools of economic analysis, as developed in the neo-classical revolution (see below) of the early 20th century, can be quite useful.

Impact on the natural environment

What would be Marxist perceptions of the environmental consequences of capitalism? Over the long run of capitalist expansion new technologies would impose a heavy cost burden on the environment as both the toxicity and durability of waste discharges increases. In the words of Engels:

Let us not...flatter ourselves overmuch on account of our human conquest over nature. For each such conquest takes its revenge on us. (Cited in Markham, 1994, xi).

These environmental damages would become 'class costs' because of their uneven incidence. Pollution generates damages which includes human morbidity and mortality (Pearce and Turner, 1990, 8-9).

However, it should not be thought that pollution is only to be associated with emerging capitalism and the industrial revolution from the late 18th century. It is not such a recent phenomenon. It is not difficult to uncover stories about horrible environmental conditions in medieval and even relatively modern times. The deplorable history of pollution in the city of London is especially well documented. In the 14th century butchers had been assigned a spot at Sea Coal Lane near Fleet Prison. Queen Elizabeth I kept out of London because she found herself annoyed with the smoke of sea coal and

other stinks, and in the 19th century the Thames presented severe water pollution problems. The Kings of France did not often reside in Paris, but preferred more pleasant surroundings such as in Orleans. It is of course true that industrialisation intensified pollution considerably. By the late 19th century, with the development of coal mining, followed by steel and steel finishing plus chemical industries, conditions in the Ruhr region of Germany had become desperately bad. Subsidence in the mining areas soon created depressions that were filled with the waste of industries and municipalities, causing massive aesthetic and health damage in the region (Kneese, 1977: 24-25; also Markham, 1994, Chapters 1-2).

The class character of pollution impacts can be visualised as follows. Initially, industrial development in towns leads to spatial segregation. Almost invariably the better-off move to more pleasant parts of town or out of town: up-wind *versus* down-wind of smoke stacks as in London's West End *versus* East End, or to up-land *versus* low-land locations as for instance in Bandung in Indonesia. Over time, pollution would take on regional and national dimensions as industrialisation tends to concentrate in regions. It then becomes increasingly difficult, also for the rich and the middle classes, to escape the environmental cost of pollution. They have to travel abroad to unpolluted land for residence or vacation, thereby encroaching the 'sites of exceptional beauty' so appreciated by Mill.

At present, the relevant discussions widens to the international level as the imposition of environmental constraints on industry in developed countries are alleged to stimulate the international division of labour in that polluting industries move out to 'pollution heavens'. These are located mostly in the South, where environmental regulations are non-existing or not enforced. This international relocation of industry for environmental reasons is then seen as a different phase in the dynamics of international capitalism, following on the heels of the transfer, by initially mostly US companies, of production plants from the USA to the Far East in the 1960s and 1970s to take advantage of absolute difference in labour costs, and a structural lowering of international transport costs.

In modern Marxism, changes in the environments in the North as well as in the South need to be understood in terms of the international division of labour, and this process is facilitated by the transnational corporation (TNC). Against these TNCs regulatory powers of the state are increasingly seen to be ineffective. Dominant capitalism, as ideology, has been waging effective war against state regulation in the areas of trade restrictions and the promotion of the international mobility of labour and capital. A weakened state cannot initiate and enforce pro-environment rules.

It can be readily seen that these lines of analysis and critiques from a Marxian perspective provide important insights in some of the dynamic properties of the capitalist system as a whole, also in the contemporary setting. A whole range of study topics suggest themselves to test whether the suspected phenomena occur. If they do, whether they are quantitatively significant, and if not, why not (see further the institutionalists' concerns and critiques of economic theory, in sections 2.6 and 2.7).

Marx and the Marxists are concerned with 'grand theory', trying to create a system that embraced all the social sciences including history. It is an heroic attempt to project a systematic general account of 'the economic laws of motion' of capitalism. The twentieth century has witnessed a strong revolt against great philosophical systems which purport to explain nature and society in all their aspects (Blaug, 1968, 227). Yet, the future of society on a global scale in its pursuit of development and its needs to use global natural resources, inevitably rekindle interest on these large questions and grand theorizing. It raises a range of issues which could be addressed in specific historical research, perhaps more fruitfully than in yet another round of obtuse and often abstract terminology.

Natural resources conservation under socialism

Marxism is relatively silent on what the application of socialism in a post-revolutionary era would imply for the environment. The basic initial notion was that progress itself was to be defined in terms of material and technical advance, made possible by the exploitation, 'humanising' of nature via science and state-led development (Pearce & Turner, 1990:8-9).

The socialist experiments of the 20th century in the Soviet Union and Eastern Europe seem to have shown, however, that the record of socialism has certainly failed to show a superior environmental performance compared to that of evolving capitalism. Pressures to 'catch up' with the West in material production, insensitivity to consumer welfare by bureaucratic decision making structures shielded from external criticism, and directing technological change in a limited range of production processes, has led to long term neglect to begin to deal with environmental effects of socialists investment strategies through a refocusing of technological policies. The evidence of environmental decay and the problems which the socialist experiments have created for abatement of air, water and soil pollution in the contemporary era, are daily coming to light. The problems are particularly acute in environmentally heavily impacted sectors of industry such as in the energy sector.

Various developing countries in Africa and Asia have also experimented with socialist-oriented policies and often during shorter periods of time. Though environmental degradation cannot be separated from the effects of poverty and underdevelopment generally, the impression is that such socialist experiments have not been a blessing for the natural environment in the countries concerned.

2.5 Neoclassical economics

2.5.1 Introduction

Neoclassical economic analysis developed in different quarters. Its emergence received strong impacts of the *Austrian School*, and found its Anglo-Saxon pioneer and giant in **Alfred Marshall (1842-1924)**. His *Principles of Economics* was originally published in 1890 and went through eight editions in his lifetime, with the last one, the definitive Marshall appearing in 1920. It became the leading textbook in economics for decades.

The neoclassical contribution to economic analysis developed from the 1870s and reigned in full force up to around 1950 (Blaug, 1968, Chapters 8-12; Haney, 1964, Chapter XXII; Barber, 1984, Chapter 6). Since then cracks are appearing which are leading at present to reconsideration of premises and areas of applicability, not least because of the reemerging issues of the impact of the economic process on the natural environment. But these realisations have been slow in emerging, as will be shown below.

Interest in the large questions of the nature of economic progress disappeared from the centre of attention in neoclassical theory and practice. But these large questions are central to contemporary debates about economic development and environmental sustainability on a global scale. In classical economics the 'economic problem' was seen in essence as a contrast between non-augmentable land and augmentable labour, with capital subsumed under the latter as stored-up wealth, the product of past labour inputs. The function of economic analysis was to reveal the effects of changes in the quantity and quality of the labour force upon the rate of growth of aggregate output. The accent was on capital accumulation and economic growth in the context of a private enterprise economy. Free competition was thought to be desirable because it tended to expand the area of the market by bringing about an improved division of labour.

In the 'new economics' the economic problem was redefined as: given a certain population with various needs and powers of production in terms of land and man-made capital goods, what should be the optimal mode of employing labour which will maximize the utility of the products. With population now exogenously given, the emphasis was on the allocation of the factors of production to optimize utilities to consumers. This approach was to revolutionize economic reasoning. The dominant role of the concept of substitution at the margin in the 'new economics' also accounts for the sudden appearance of explicitly mathematical reasoning (Blaug, 1968, 300-01). The spread of the mathematical mode in the presentation of economic analysis has been sometimes important to detect flaws in logic, and is often necessary to enable statistical analysis of theoretical propositions. On the other hand, it has not stimulated interdisciplinary interaction with those versed in verbal discourse.

From the point of view of the neo-classical economists the problem deserving study was the functioning of the market system and its role as an allocator of resources. Clearly, a re-thinking of this issue was timely as the economic structure had altered significantly. The size and role of industry had substantially increased during the 19th century, and industrial concentrations had grown in size and capacity to wield unchecked economic power. Trade unions, though still in their infancy, were beginning to claim a voice in wage setting. Neo-classical economists absorbed the late 19th century faith in progress and in the benevolence of its consequences. Progress appeared to resolve social tensions rather than to aggravate them. Optimism began to re-emerge, after it had been suppressed since Malthus (Barber, 1984, 164).

The major analytical contribution of the neoclassical school is the introduction of the methodology of marginal analysis, i.e. the study of interactions and substitutions between incremental changes in economic variables in the margin. The significance of marginal-utility theory was that it provided the archetype of the general problem of allocating given means with maximum effect (Blaug, 1968, 299). This method made it possible to

simultaneously analyze supply and demand effects in commodity and input factor markets, and to study market structures in different sectors of the economy. It helps explain what is happening in these sectors, and the insights developed paved the way for economics and economists to enter business or to engage in policy work.

Economists became instrumentalists, as the tools being developed were used for the analysis of concrete phenomena in the functioning of actual market processes. At the same time it made economic analysis less philosophical, and grounded in natural law or moral sentiments and ethics as in the earlier period. Adam Smith was appointed professor of Logic and Moral Philosophy, and John Stuart Mill was skilled in Latin, Greek, logic, law and history, and wrote on history, liberty, representative government, utilitarianism and on the subjection of women. He also has been an official in the East India Company and a Parliamentarian. To him economics was a 'side line'.

Neoclassical economic analysis has also abandoned the labour theory of value adhered to by the classical economists, who sought to explain the value of commodities by the relative amounts of incorporated labour, or of the search for the 'just price', as a 'cost of production' price in the Middle Ages (Haney, 1964, 99). It also rejected earlier physiocratic notions of 18th century France (François Quesnay, 1694-1774), which emphasized nature (agriculture and mining) as the only 'source of all value'. Instead, neoclassical economics defines value as a scarcity indicator, a relational concept between supply and demand, rather than as an intrinsic attribute of a commodity (as embodied labour). 'Value' is the price, in monetary terms, resulting from the confrontation of supply and demand in market transactions.

Defined in this way, the concept of value is clear and it can be measured by observing the operation of the market. It can be applied to agriculture, to industry and to services of all kind, and therefore can be used across the total spectrum of economic activities in the evolving economy.

It has, however, far-reaching social, practical and political consequences, which non-economists find difficult to accept. An important consequence of defining value as scarcity concerns the valuation of labour in production, and thereby individual welfare. A labourer's work in producing a product for which there is no willing buyer in the market is a waste, valued zero. If the product finds a market the same physical labour has 'value', because it is sold in the market. Another example: should an airline pilot flying a little Piper Cup with only 1 passenger, receive the same wage as a pilot on a modern airplane with hundreds of passengers, but flying most of the time on autopilot? Moreover, neither pilot has had any involvement in the design and construction of the airplanes concerned. For a trade union, issues of equal-pay-for-equal-work, and of organisation on a plant basis, an industry basis with strong and weak, large and small firms, or organising across industries to gain more aggregate power in negotiations with employers' organisations and in politics, have been vital issues from their very origin.

Value concepts and natural resources

The notion of 'value', its determinants and measurement, has again become an important source of controversy and conflicts in discussing issues of natural resources and the 'value' of the natural environment. In contemporary debates environmentalists often hold notions of the 'intrinsic values' of nature and natural resources. Nature has 'existence value'. But the meaning of 'existence value' is difficult to define. Moreover, not all of nature can be presumed to have equal existence value, and this raises difficult questions of identifying the determinants of the existence values of different natural resources; and of finding ways to rank them. A further problem is the valuation of the existence of natural resources as compared to, for instance, the use value of natural resources in the economic process.

In the current attempted dialogue between economists on the one hand and environmentalists and natural scientists on the other, the following taxonomy of concepts of 'value' are distinguished in relation to the social aspects of geobiophysical sustainability analysis:

Fig. 5: Components of Total Economic Value

| Total Economic Value | | | | |
|--|---|--|---|---|
| Use Value | | Non-Use Value | | |
| Direct use value | Indirect use value | Option Value | Bequest Value | Existence Value |
| Output that can be consumed directly | Functional benefits | Future direct and indirect use values | Value of leaving use and non-use values for offspring | Value from knowledge of continued existence |
| * Food * Biomass * Recreation | * Ecological functions * Flood control | * Biodiversity * Conserved habitats | * Habitats * Irreversible changes | * Habitats * Endangered species |
| >>> Decreasing 'tangibility' of value to individuals >>> | | | | |

Source: Munasinghe and McNeely (1995): 36.

Among environmentalists a taxonomy of views is slowly emerging regarding sustainability of the natural environment. First, the 'Input-Output' view assumes that the internal dynamics of the ecosystem are more or less in a 'steady state', in the sense that they are not degrading over time. The primary focus is on all these ecosystem inputs and outputs and whether they are sustainable. The related 'state' definition requires simply that a sustainable ecosystem be one in which an ecosystem state can be maintained indefinitely.

The 'capital' or 'stock' view requires the maintenance of natural capital or stock at or above current levels and, thus, that the products of the ecosystem be used at a rate

within that ecosystem's capacity for renewal. Sustainability is thereby ensured by 'living off the income' rather than off the ecological 'capital'. This view requires the perpetuation of the character and natural processes of the ecosystem and indefinite maintenance of its integrity.

Third, there is the 'potential throughput' view, emphasizing the use of resources within the capacity of those resources to renew themselves. Sustainability is then defined on the basis of maintenance of potential, so that ecosystems can provide the same quantity and quality of goods and services as in the past. Potential is emphasized rather than stocks, biomass, or energy levels. To maintain this potential, which amounts to future options, there are two areas of concern: the degradation of the physical productive capabilities of the land and water, and the loss of genetic diversity. This potential throughput view might mean sacrificing 90 percent of the stocks of that species so that in the future a society could rebuild the habitat for that species (Munasinghe and Shearer, 1995, Introduction).

As a first step in coming to grips with environmental sustainability from a biophysical perspective, indicators for ecosystems need to be developed. But this is hardly enough for policy. Indicators of stress in ecosystems will need to be developed as well, especially in respect of identifying thresholds, or discontinuities in stress indicators, which might govern non-reversibility. To get from ecosystem status to stress points, additional indicators will be needed on the rate of environmental impacts of anthropogenic interventions. Environmentalists tend to develop physical indicators for different ecosystems or land utilization types. But such indicators cannot deal with influences across ecosystem spaces, such as air and water quality variables. Moreover, all these indicators could be in quantitative or in qualitative terms.

The signalling value of these various indicators will, of course, differ depending upon which of the three views on the natural environment is adhered to: maintaining Input-Output relations; Stocks and Flows, or Potential Throughput maximization (See Opschoor and Reijnders, 1991 for further discussion of issues involved).

The difficult issues of valuation across indicators would have to be addressed as a next step. For many environmentalists and natural scientists these are difficult issues as their scientific training is not geared to analyze natural resources and processes in this way. But unless these issues are being dealt with amongst environmentalists, a discussion with other claimants on the use of the natural environment can hardly emerge.

2.5.2 Neoclassical economics in outline

It may be appropriate to discuss the neo-classical economics paradigm in some detail and in relation to environmental matters, for the method of analysis and its prominence in the economists' contribution to the contemporary environmental debate is clearly in evidence.

The neo-classical view of the market was supposed to be neutral and value free. The basic aim had been to define a set of 'economic laws' which govern economic activity (in

much the same way physicists had done following Newton's discoveries). Rational individuals were seen in terms of seeking to satisfy substitutable wants (or preferences) and this pursuit of individual self-interest was also believed to be improving societal welfare. Individual rational action was thus socially justified and legitimized, as per Adam Smith. Within the 'hard core' of the neoclassical system was a particular view of human nature - the rational and egotistic person. People are assumed to have a set of wants, and the preference structure of indifference among these wants is 'revealed' by the actual choices they make. Trade-offs among wants are made on the basis of the expected net-utility they yield. Efficiency - a preference of more over less under given budget constraints - and consistency of choice⁵ reflect rational behaviour for consumers.

Revealed preferences in the market provide important signals to producers to adjust production decisions. In periods of strong demand, supplies may initially fall short leading to upward pressures on prices. This leads to increasing profits which induce existing producers to produce more, or new producers to enter the market. When there is weak demand relative to supply, producers are left initially with unwanted stocks of products, and subsequently they either reduce production levels to market demands or reduce prices to stimulate a wider market demand amongst lower income strata to dispose of already produced commodities. Inefficient producers drop out and market equilibrium is restored. Further, changes in production decisions due to shifts in consumer demands translate themselves to the markets for factors of production. It manifests itself in recruiting patterns of labour and skills, and in attracting new sources of finance when demand is strong, and leads to unemployment and capital losses when demand slackens.

Employment and capital resources are released in contracting industries, but they are assumed to be re-employed in expanding industries. Neoclassical analysis holds strong beliefs concerning the speed and efficiency of these resource switching operations which are assumed to be associated with low costs. Especially important are assumptions about the mobility of labour in job searches and flexibility in wage rates to clear markets for production inputs. Thus, equilibrium is attained or restored in all individual input and output markets with only minor transitory frictions during the adjustment processes.

Neoclassical economics deals mostly with allocative efficiency at the margin of partial decision making and within the framework of individual choice options. This implies that larger issues, such as the initial distribution of available resources, or the distribution of income and wealth, knowledge, information and educational attainment and access remains outside the analysis.

The social desirability of the outcome of market processes is usually expressed in terms of the so-called *Pareto criterion*. A Pareto-optimum situation is defined as one in which it is impossible to make any individual better off without making someone else worse off, where 'better off' means 'more preferred' and 'worse off' means 'less preferred'. Every

⁵ If A is preferred over B, and B over C, then A is preferred over C.

competitive market equilibrium is a Pareto optimum and every Pareto optimum is a competitive equilibrium, as long as a set of very restrictive conditions are being met.

The issue of comparing utility amongst individuals has been controversial among economists for a long time. It has important implications in arriving at optimal welfare in society, or judging existing societal welfare. Within welfare economics there are two main streams. Those who believe that interpersonal welfare comparisons are possible tend to use interpersonal expected utility gains to justify all types of redistributive policies: to change the initial distribution of assets of market parties, or try to correct unequal outcomes of the market process through progressive taxation. On the other hand, there are those who believe that interpersonal utility comparisons are not possible or permissible for economics as science, and that all the normative and distributional objectives and income transfer measures are thus non-scientific.

Views on the desirability of redistributive government policies can and are passionately defended, but economists then argue that these are political preferences, which economic science accepts as given. When redistributive policies are proposed or implemented, economics, as science, can only try to analyze its consequences for the outcome of the economic process, how it changes incentive structures, stimulates shifts in sector output composition and in income distribution. In addition, it studies how the impacts of such policies can be evaded and resulting additional initial burdens (such as those of taxation) are being shifted to other parties.

According to the so-called first fundamental theorem of welfare economics, market allocation of resources will be Pareto optimal when: (i) there are no missing markets, (ii) all producers and consumers behave competitively, and (iii) an equilibrium exists (Newbery, 1989). Market failure thus occurs when there are too few markets, non-competitive behaviour, and/or problems of non-existing equilibria. While the problems of non-competitive markets have long been realised and analyzed in economic theory and in-economic policy, as in the regulation of natural or other monopolies or the analysis of oligopolistic market situations, the problems and consequences of 'missing markets' has received far less attention until relatively recently. But the phenomenon of missing markets, as will be shown below, are fundamental and widespread in environmental matters.

The problems of missing markets are analyzed in mainstream economic theory under the heading of 'externalities'. That analysis is mostly associated with the work of **Arthur Cecil Pigou (1877-1959)** who succeeded Marshall in Cambridge in 1909. The treatment was developed in the 1920s by Pigou, following Marshall who had earlier introduced the notion of external costs and benefits, e.g. external to the market economy.

Initially, these externalities were generally interpreted as relatively minor deviations, compared to the vast majority of transactions in the economic system which could be analyzed in the context of market processes. For instance, in his influential paper *Two Concepts of External Economies* (1954), Tibor Scitovsky, after having described cases which deal with technological externalities affecting consumers and producers respectively, notes that the first seem exceptional, because most instances of it can be and usually are eliminated by zoning ordinances and industrial regulations concerned

with public health and safety; the latter case is said to be unimportant simply because examples of it seem to be few and exceptional. More surprisingly, in view of his major role in environmental economics later on in his life, is Baumol's position. In his *Welfare Economics and the Theory of the State* (1967), he did see externalities as a rather pervasive feature of the economy, but tended to discuss external diseconomies like 'smoke nuisance' entirely in terms of particular examples (both cited in Ayres and Kneese, 1969: 282). Further, Kneese (1977, 24) notes that the most popular text-book on Micro-economics (by Henderson and Quandt) in the United States at the time of his writing, 'contains no more than a few paragraphs on anything but the classical market model'.

In his interpretative essay on the post-World War II literature on externalities, Mishan (1971: 1) states that externalities (i.e. the divergence between 'private net product' and 'social net product') today provide the standard exception to the equation of optimality with universal perfect competition. An external effect arises whenever the value of a production function, or a consumption function, depends directly on the activity of others. The essential feature of the concept of an external effect is that the effect produced is not a deliberate creation but an *unintended* or incidental by-product of some otherwise legitimate activity. This feature influences the economist's and the public's attitude towards externalities and, consequently, also influences remedial policies.

General policy solutions to the externality problem are the following. They are presented here to indicate their varied range. Any serious analysis of environmental policy has to analyze the relative costs and benefits in economic, administrative and political terms of choosing and applying these instruments in practice⁶.

* Outright prohibition, which the economist is prone to think of as naive and too costly, as it may be impossible to eliminate all pollutant emissions. Outright prohibitions are often advocated in regulatory policies for reasons of public health and safety. It may imply closing down otherwise productive (valued in the market) activities with loss of incomes, welfare and employment.

* The tax/subsidy solution. This is the classic solution favoured by most economic theorists, for it aims to 'internalize' the external effects in production and consumption decisions in market-based processes. As was noted in Section 1.2.1 the World Bank has embraced this approach in its policies to improve natural resource management in developing countries. Also within the OECD concerted action is undertaken to stimulate the use of economic instruments to improve environmental performance in member countries. In weighing cost of pollution and benefits of pollution abatement, something like an 'optimum level of pollution' would be obtained. While the logic of the approach is clear and consistent within the context of Pareto optimality, the approach has considerable information cost to estimate environmental cost and benefit functions in practice (see Section 2.5.3.2).

⁶ A paper on the Instrumentation of Environmental Policies is being planned for the near future, which will include an evaluation of experiences to date with applying different instruments.

* Regulation, this has similar information costs and, in addition, enforcement costs. These problems tend to grow exponentially when many production and consumption activities are to be regulated, and where these activities interact with each other. Moreover, initial regulated partial standards, set on a case-by-case basis, may not be tenable at aggregate levels (many small, permissible emissions add up to large scale pollution), or when there is negative and cumulative interaction among pollutants, as in secondary reactions affecting air quality or water sources. Setting standards may have conservation (technology freezing) effects on industrial growth, or may become superfluous due to technological change leading to the disappearance of the negative externality.

* Voluntary agreements among parties affected, of value when transaction costs are low or nil as between two neighbours solving a dispute. One or both parties negotiate and pay each other off, to settle the dispute about a negative externality. In industry the approach may be useful when there are few suppliers in the market.

* Preventive devices. Of these Mishan says that the professional economist is more likely to interest himself in optimal output solutions than in the opportunities for installing preventive devices (ibid: 14-16). Finding preventive devices are primarily technological matters, and, as noted earlier, technology itself is a subject about which economic analysis has little to contribute. It is, however, at least conceivable that in the long run pollution *prevention* strategies, through forcing technological change, are economically more effective than pollution *control* policies. Pollution is then prevented at source in 'closed production systems' rather than in combating diffused impacts post-production, e.g. seeking 'end-of-pipe' solutions.

2.5.3 Neoclassical economics and the environment

2.5.3.1 *Market failure: from exceptions to the general norm*

The Pigouvian analytical framework is rooted in the neoclassical economics of markets, and it constitutes the point of departure for economists addressing issues affecting the natural environment. Unfortunately, in environmental matters 'missing markets' are pervasive and not the minor aberrations as the mainstream neoclassical tradition would like to see it, and hence, the contribution of market analysis, the *forte* of neoclassical economics, faces major problems where markets in environmental goods do not exist and, moreover, are difficult to create or assume.

Perhaps the easiest way to show the limitations of the applicability of the neo-classical paradigm is to first describe market failure in respect of the natural environment (Goodland and Ledec, 1987).

Environmental externalities and market failures can be classified according to the cause of missing or malfunctioning markets (Kox, 1994:15-17):

* 'Open access' externalities. A precondition for the existence of markets is that ownership relations are sufficiently defined. Market transactions exchange entitlements to a variety of resources. Widely spread private property rights would enable competitive markets to be developed. In many natural resource situations property rights are seen to be insufficiently specified or inadequately enforced. This then leads to problems in many forest lands, grazing areas or fishing ground and persistent conflicts over the distribution of irrigation water. Many such natural resources have been treated by economics as 'free goods'. Environmental problems of land, water and air pollution result from the fact that entitlement systems to clean air, unpolluted water and non-toxic soils have, until recently, not been recognized. Such rights are only slowly beginning to be enforced with the polluters. Traditionally, producers had an implicit right to pollute, seen as an unavoidable by-product of production, industrialisation and modernization generally. These implicit pollution rights are no longer socially acceptable, and hence, pollution is to be curtailed for a variety of reasons.

* Inter-generational externalities. Even where property rights are fully specified, current users may impair the production and consumption possibilities of future generations. Whether this is a problem for renewable resources depends upon whether each generation of current users has taken adequate action to ensure that sufficient renewable resources remain available for future users. If current users are of the view that future users cannot be trusted in this respect, they have an incentive to strongly discount the future, for why would current users sacrifice current use options if the expectation is that future generations will waste the fruits of current efforts anyway? There is a different issue in the case of non-renewable natural resources, but whether their depletion would present a problem depends on whether future generations would still have to depend, in their production and consumption activities, on what the current generation would see as non-renewable resources. It is conceivable that in future alternative resources may have become available which would be effective substitutes for some non-renewable natural resources identified as such at the present.

For instance, glass fibres replacing copper wires in electric cables, or miniaturization of technology integrating many links in modern integrated chips. Recent developments in Dutch horticulture under glass may serve to illustrate a different trend; the production process has become 'disembodied' from the traditionally necessary underlying soils. Production has literally been lifted off the ground in a 'closed' production system. It implies that horticulture is also becoming independent of the quality of the soil. It remains true that the key impetus for technology to be developed in this new direction has been stimulated by the imposition of restrictions on horticulture for its heavy use of chemicals affecting soils and possibly ground water quality in the past. But whether alternative technologies exist or can be developed cannot be taken for granted in all situations and cases. For instance, many developing countries simply do not have, or have access to the necessary technology.

In general, the market process only takes account of current decision choices, and there is thus a strong possibility that not sufficient 'strategic long-term decisions' are being made for the future. The market process is thus myopic in its outlook. This is rationalized by stating that, as the future is by definition unknowable, it tends to be ignored or under-valued in current decision-making. Moreover, policies intended to

overcome market failure may sometimes be designed such as to be counter-productive in their intended future-oriented pro-environment effects: they would then not lengthen the time horizon of decisions of current users, but shorten it, as has been demonstrated for forestry policies (Mahar 1989; Binswanger, 1989; Repetto, 1988).

* 'Public good' market failure. Many environmental resources, such as clean water and pure air have a public goods character. Public goods are goods which, once created, cannot be denied in use to others. Therefore, private agents cannot exclude others from the fruits of their effort, and they have therefore limited incentives to provide environmental improvements such as in restraining the emission of air pollutants or reducing dirtying the waters. Private parties cannot recover their costs from those who would also benefit from these services, and the market therefore cannot provide public goods even though their social desirability is beyond doubt.

* Externalities caused by incomplete or asymmetric information. Incomplete information restrains rationality in decision making. It is akin to decision making when sailing in the mist compared to sailing under clean skies. The recognition of the need for, and the time frame to take anticipatory or corrective actions is sharply reduced, with possibly fatal consequences. Pareto optimality requires perfect foresight for all decision makers in relevant markets. Asymmetric information violates the optimality of market process outcomes, because it introduces various forms of monopolistic behaviour in the market process. The well-informed can mislead the un-informed. Knowledge is then not a public good but a private good. These problems often play a role in issues of the creation and disposition of hazardous waste materials, in the mining sector or in the chemical industry. Many such cases have been documented, for instance for the *International Water Tribunal*, held in Amsterdam in 1992.

* Externalities due to uneven market access. These occur when private agents are very unequally endowed with market access capacities: these capacities vary enormously by income levels, educational attainment, and, as is increasingly recognised, by gender. Inequality due to unequal access to the 'market for compensation of ecological damage' is the normal case when local communities are confronted with transnational companies or state-owned enterprises. Unequal access is then on such issues as economies of scale in pollution abatement, the costs of litigation in case of pollution damage, inadequate juridical organisation of damaged parties, costs of information gathering, lack of monitoring skills, or other entry barriers (Kox, 1994: 17). In other words there are heavy transaction costs involved in providing all parties with equal power and opportunity to influence and confront each other in the market. 'Level playing fields' often do not exist and are difficult to ensure.

From these perspectives it should be clear that Marshall's 'external costs' are not freakish random events which, for some reason sometimes happen. They are a systematic part of the economic development process in economies where common property resources, such as valuable natural resources, including major nature monuments, clean air, clean waters and unspoiled nature, have become, and are increasingly scarce.

It is fair to say that until quite recently, the relation between environment and economics did not receive much attention in the neoclassical economics literature and in the literature on developing countries generally. The anthology of 100 *Great Economists since Keynes*, by Blaug (1985), includes only four who are clearly interested in environmental matters (W.J. Baumol, K.E. Boulding, N. Georgescu-Roegen, H. Hotelling) and for all of them it has been a sometimes passing interest developed later in life, and after having contributed in quite different areas.

There was little cross-fertilization between environmental and natural resource economics, and development economics. When Dasgupta and Mäler (1991) reviewed a number of well-known textbooks (late 1980s editions), they hardly found any reference to the issue of natural resources; no real improvement since the findings of Kneese some 15 years earlier and noted above. Only since about 1990 have publications and contributions to issues of sustainability as related to natural resource policies become a growth industry of their own. The editors of the Dutch *Economist* note:

Perhaps it is no exaggeration to assert that the possibility of global warming and natural resource depletion have propelled the issue of the environment to the top of the economics discipline. As an abstract, if real, factor, the environment now occupies a place equal in importance to capital and labour. Almost overnight a whole new branch of the discipline, called environmental economics, has sprung up with several subdisciplines (1995: 107).

2.5.3.2 *Correcting market failure: government vs private ordering.*

Whenever there is a demonstrable 'market failure', economists in the neoclassical tradition admit that there is a case for intervention in the public interest, and in a role which is to ease the inevitable conflict between private rationality and the collective public interest. But given this need, there are two ways of dealing with the issue of such externalities: (i) taxation and subsidies to be administered by government, or (ii) bargaining among parties affected *without* the need for government to intervene. These two approaches are associated with the names of Pigou and Coase.

Government taxation

Pigou, in the 1920s, found a rationale and advocated a method of taxation and subsidies to deal with 'external effects' in the absence of markets, as was noted above. In the modern theory of welfare as applied to pollution, polluting agents need to be confronted with a 'price' equal to the marginal external cost of their polluting activities. This will induce them to internalize at the margin the full social costs of their pursuits. Such a price incentive to modify behaviour can then take the form of the 'Pigouvian tax', a levy on the polluting agent equal to marginal social damage, or of a subsidy for pollution avoided.

It was recognized early by theorists that a subsidy per unit of emissions reduction could establish the same incentive for abatement activities as a tax of the same magnitude per unit of waste discharges. However, there are important asymmetries between these two policy instruments in respect of the profitability of production in a polluting industry: subsidies increase profits, while taxes decrease them. The policy instruments thus have

quite different implications for the long-run entry-exit decisions of firms. The subsidy approach will shift the industry supply curve to the right, and will result in a larger number of firms and higher industry output, while the Pigouvian tax will shift the supply curve to the left with a subsequent contraction in the size of the industry. It is even conceivable that a subsidy could result in an increase in the total amount of pollution. Thus, the subsidy approach is to be rejected for policy applications. To obtain the correct number of firms in the long run, it is essential that firms not only pay the cost of their marginal damages of their emissions, but also the total cost of their emissions.

Conventional diagrammatic presentations of microeconomic theory can be used to illustrate the mode of analysis (see Fig 6 (a, b)). In a micro-context, the imposition of the Pigouvian tax on a producer is an example of the *polluter-pays-principle* (OECD, 1975), though the initial burden is, in effect, shifted between producers and consumers depending upon market conditions.

Fig 6 (a) The Pigouvian tax levied at source.

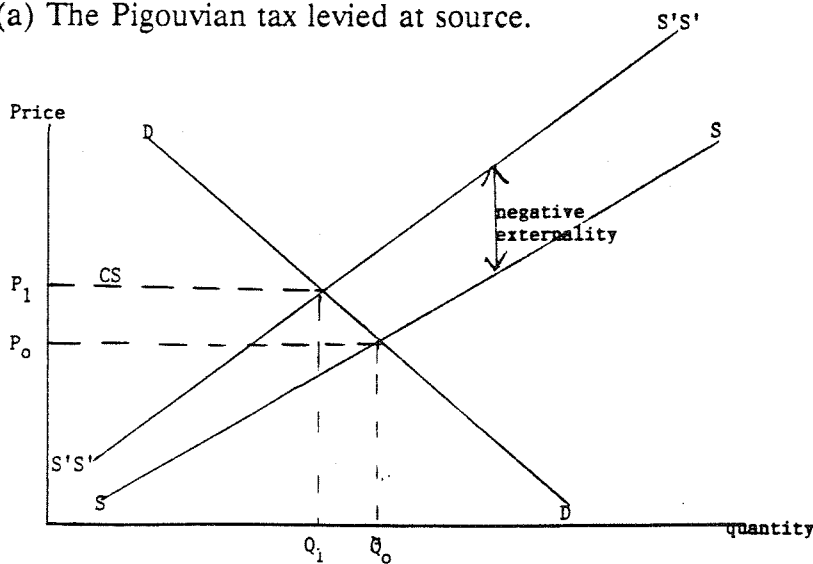
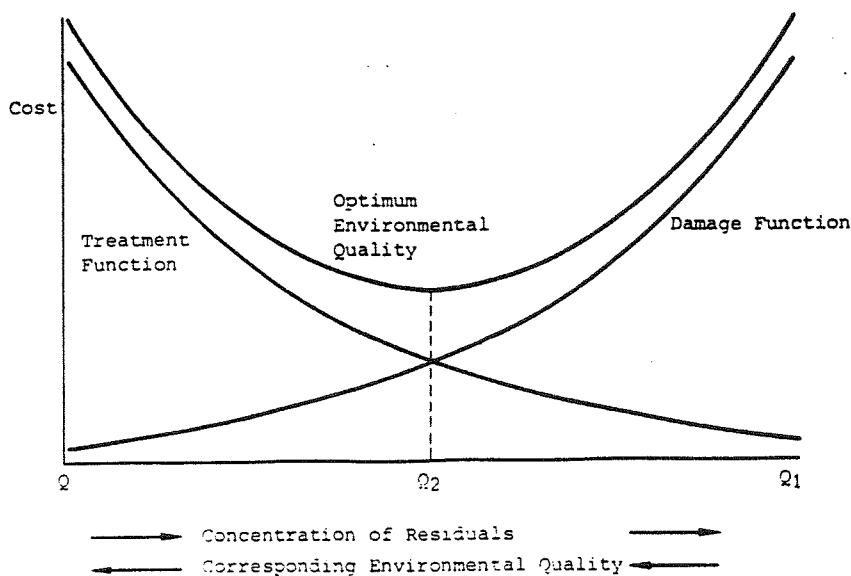


Fig 6 (b) Optimal environmental quality



Let DD be the demand curve for a commodity, and SS the private marginal supply cost curve. The negative externality is charged as a levy to a producer, which causes his effective supply price curve to shift upwards to S'S'. The distance between the two curves indicate that negative externalities increase with the volume of production. This causes the production of the harmful production to contract from Q_0 to Q_1 and the price to increase from P_0 to P_1 . To maintain production levels the producer has two options: to reduce harmful emissions through technological change, and thus reduce the levy to be paid, with favourable environmental effects. Alternatively, he can try to lower his (other) cost of production, but leave pollution unaffected. This will then mean that pollution is not reduced and production volume does not contract, but stays at Q_0 .

The effectiveness of the levy to reduce the negative externality depends on the slope of the underlying individual supply and demand curves. When the demand curve is relatively flat, a levy will have a major effect in contracting the volume of the harmful activity, but when the demand curve is steep only a limited amount of pollution reduction will be obtained, and at a high relative price increase for the firm's output. In the latter case the tax may not be very effective if the pollution control objective is seen to be important. A further problematic issue is to determine the level of the tax, whereby aggregate revenues should equal aggregate social cost. But when market parties (producers and consumers) adjust their behaviour under the impact of the tax, *ex ante* revenue expectations may not correspond to *ex post* realisations. Through iteration the tax rates may be adjusted over time to reach the desired effect: control pollution.

When moving from this partial analysis to the aggregate case the analysis changes, and the polluter pays principle (PPP) needs further amendment (see Fig 6 (b)).

When the objective is to reduce aggregate pollution levels, an analysis is to be made first of the cost effectiveness of pollution control measures. With given supply and demand curves of multiple polluting activities, this analysis focuses on the effectiveness of investing in treatment there where it has the greatest effect on aggregate pollution reduction. The shape of the Treatment (or Abatement) curve indicates that, when moving from right to left, sizeable reductions in pollutants can be made at relatively low cost. But these costs increase sharply when the aim is to eliminate the last remaining concentrations of pollutants.

Conversely, the Environmental Damage function slopes upwards going from left to right. Low concentrations of pollutants may be absorbed by the regulatory capacity of nature without harm. When concentrations increase some damage results, which geometrically increases when concentrations increase further. A sharp upward turn in environmental damage may be due to environmental regulatory capacities ('thresholds') being exceeded, thereby affecting its capacity to continue to absorb earlier, lower levels of pollutants. The 'machine of nature' does no longer work faster but breaks down. In addition, a rise in the concentration of un-absorbed pollutants by nature will begin to show major effects on human health, leading to rising social damage and thus cost.

A stable equilibrium is reached at the intersection of the damage and treatment functions. To the right of Q_2 , damage exceeds cost of treatment and thus it is worthwhile

to invest more in treatment. To the left of Q_2 treatment cost exceeds damage caused, and this does not make investment in pollution abatement worthwhile from an economic perspective.

This line of reasoning is beginning to be applied in designs for the formulation of some environmental policies. For instance, it underlies the study of *The Global Greenhouse Regime. Who Pays* (Hayes and Smith, 1993), which provides much of the economic staff work to inform negotiations called for under the *United Nations Framework Convention on Climate Change*, agreed and opened for signature at the May 1992 *Earth Summit* held in Rio de Janeiro, Brazil.

This approach to address environmental policy problems appears analytically simple and, to some, is even convincing. The problems with this economic approach to pollution are less in the conceptualization than in the application of the above principles. Estimating treatment functions involves detailed knowledge of pollution emissions across a wide range of production activities in the economic systems and of the (sub)sector specific cost abatement functions. For each of the pollution causing activities, the structure of the market needs to be analyzed as well to ascertain whether pollution levies will have major pollution reduction effects, as was demonstrated in the simple partial case of Fig 6 (a). Also, a large sector with low levels of pollution per unit of output is in a different position than a small sector with high pollution intensity per unit of output. Sectors vary in pollution intensity as well as in 'employment intensities', hence the incidence of the employment effects of pollution abatements may be highly uneven. Firms and/or sectors will also have different profitability and this affects their ability to cope with the burden of the levy to adjust through future-oriented investment in desired response directions.

Equally problematic are the estimates of damage functions, in particular where damages may be related to concentration densities which are rather quickly dispersed over space. Emissions which would have major harmful impact in the vicinity of the pollution source may be relatively harmless at some distance. Tracing damage to specific sources is then also difficult and imposing a levy may be contested as unjustified.

Because of these types of problems in the treatment and in the damage side, it is quite possible that environmental policy, formulated along the economic logic outlined here, is seen to be discriminatory and thereby unfair. This will make acceptance of standards and compliance issues more problematic. The design of environmental policies, incorporating economic optimization principles will have to face up to these issues of information cost, administration and compliance, as well as the legal aspects of alleged or perceived inequity in government policy. In general, economists tend to ignore problems of policy design and implementation, as is demonstrated by Tietenberg (1994) in the context of globally tradeable carbon emission entitlements.

Private ordering

Market failure provides a rationale for government intervention through Pigouvian taxation, also in the mainstream of neoclassical economic analysis. This intervention, however, has been attacked as unnecessary because an alternative to government

intervention is alleged to be available. One precondition for the alternative approach to be applicable is the full specification of property rights. This latter idea has been forcefully propounded as relevant for the analysis of many environmental problems by the work of J.H. Dales (1968). Opponents of government taxation base themselves on a Coasian framework of analysis involving bargaining among interested parties. This new framework is presented as a substitute for government interference which is negatively painted as meddlesome, too complicated and inefficient, and often causing more new problems than it is called upon to resolve.

Ronald Coase has argued (1960) that, in the absence of transactions costs and strategic behaviour, distortions associated with externalities will be resolved through voluntary bargains struck among the interested parties. No further inducements (such as Pigouvian taxes) are needed to achieve an efficient outcome for the economic process.

Such a bargaining framework is valid in small groups as amongst neighbours of roughly equal strength and power, or in small village settings (The original Coasian analysis was based on a conflict between corn and livestock farmers). Government interference would then be too heavy-handed. The approach is, however, not useful for major pollution issues since most cases involve large numbers of polluters and of potential or actual victims. The likelihood of a negotiated settlement through bargaining is then remote, as transaction costs are prohibitive and issues of unequal access to information apply (Cropper and Oats, 1992: 678-80).

Whether bargaining amongst affected parties, even when few in numbers, will have beneficiary outcomes in environmental terms is uncertain. This depends i.a. on how property rights, the basis for the bargaining as activities infringing upon them, are structured in relation to its effects on transaction cost involved and for litigation.

Consider the following set of alternative rules of entitlement:

Fig 7: Alternative Rules of Entitlement.

| | |
|--|--|
| Rule I (property rule) | A <u>may not interfere</u> with B without B's consent; B is protected by a property rule. |
| Rule II (liability rule) | A <u>may interfere</u> with B but must compensate; B is protected by a liability rule. |
| Rule III (property rule) | A <u>may interfere</u> with B and can only be stopped if B buys off A; A is protected by a property rule. |
| Rule IV (liability rule) | B <u>may stop</u> A from interfering but must compensate A; A is protected by a liability rule. |
| Rule V (inalienability rule) | A <u>may not interfere</u> under any circumstances, and the stopping does not imply compensation; B is protected by inalienability. |

Source: Calabresi and Melamed (1972)

The incidence of transaction costs is central to natural resource management, and to the incentives which parties in a collective action situation face. The tendencies for interference (to try to strike a bargain) differ between the two types of entitlement, and this changes the expected outcome of such private transactions. The distinction between property rules and liability rules has implications for litigation, because it shifts the burden of proof for any negative effects or injury. Where interactions between parties in the economic process and the natural environment are surrounded by vast margins of ignorance and uncertainty, unequal access to knowledge or financial resources may determine the outcome in specific cases.

2.5.3.3 *Is government influence beneficial?*

Among those who recognize that there is a case for public intervention in safeguarding environmental objectives, there are two lines of thought. On the one hand, there are those who expect beneficial effects from public intervention to supplement the market mechanism. They then call upon government to intervene extensively in the environmental and natural resource section of the economic system where there are many missing or poorly or malfunctioning markets. On the other hand, there are those who seriously question whether public intervention has the capacity or the willingness to act beneficially. It brings back perspectives sketched earlier in the discussion of the Marxian tradition on the role of the state, but now more specifically directed to the role of the government bureaucracy in its environmental policy role.

Those wishing to demonstrate the *incapacity* of governments to act beneficially, point out that public policy in a democratic and pluralist society is the outcome of numerous compromises among many competing factions of the alleged public interest. The public policy process has even been defined as the 'art of muddling through' (Lindblom, 1977). The resulting design and implementation of interventionist policies then inevitably bear the imprint of numerous compromises, and thus its implementation and enforcement often have many unintended and sometimes even counter productive effects (Olson, 1965; Buchanan and Tullock, 1975). This incapacity to act efficiently is one of the weaknesses in liberal democratic societies, for each interest group to be negatively affected by newly proposed environmental interventions tries to exert its influence in the political process in the usual sequence of pressure group behaviour: first, deny that there is a problem; second, contest it being harmful; third, argue that although harmful combating it has major employment and output effects; fourth, influence the shape of remedial measures such as to undermine their expected effectiveness or efficiency; and finally sabotage the intent of the regulations through use of loopholes in the regulation designs or searching imaginative new means to counter intended environmental policy objectives.

Those who want to demonstrate the *unwillingness* of government to intervene to safeguard the natural environment, point at the nature of political regimes in many countries where one finds frequently military regimes or governments dominated by narrow economic interest groups, who often act in collusion to jointly pillage and squander natural resources in their society. Government intervention then leads to accelerated natural resource exploitation and degeneration. Such a framework is argued

to represent reality in many developing countries, where democratic principles are poorly developed and government institutions are often weak to implement impartially and efficiently any set of policies, including policies relating to the natural environment. These types of issues are relevant in current debates on the nature of governance, and on defining 'good governance'.

Combining economic analysis and insights from public policy analysis one reaches the following tentative conclusion: the shortcomings of the market process to allocate resources efficiently in the presence of environmental externalities provides arguments for government intervention, but the manner in which public intervention takes place may result in government policy failure. The end-result would then be compounded failure.

2.5.3.4 *Conclusion: neoclassical economics and the environment.*

In 1971, Mishan foresaw that the apparent consensus among economists, which treated externalities as a minor issue which did not distract from Pareto optimality analysis, had come to an end. In his view, the economic features of environmental spill-overs, other than the observed fact that they appeared to increase rapidly with economic growth, are:

- * that their impact on the welfare of members of the public can be substantial;
- * regarded as external diseconomies, they pose a problem not so much as between firms or industries, but as between, on the one hand, the producers and/or the users of spill-over creating goods, and, on the other, the public at large.

As a consequence, welfare effects could, in Mishan's view, no longer be treated as negligible. Transaction costs are likely to be inordinately large, and a potential Pareto improvement is no longer uniquely determined (ibid: 18).

The strength of the neoclassical approach in economics is its ability to effectively deal with market processes in analytic terms, and thus in a decentralized policy environment where vast numbers of individual actors make their day-to-day decisions affecting the economic process and its outcome. Its weakness is that it cannot deal effectively with situations where no markets exist, and which cannot be easily created.

Where no markets exist, environmental assets tend not to be valued as 'economic scarcity' indicators cannot come about. Environmental assets then are considered 'free goods', to be used indiscriminately and inefficiently, as there is no reason to 'economize' on their utilization. These resources represent 'un-priced scarcities' (Goudzwaard, 1971). The outcome of market processes is then that environmental resources will be wasted until they become 'scarce' in the economist's sense, being 'valued in market use'. Only then is there a chance that markets can be created. But not necessarily so, as it will remain difficult to determine who shall be the entitlement holders on the remaining natural resources and at what 'price' they may be disposed off for satisfying human needs. Considerable volumes of natural resources may well need to have been used up before their 'scarcity' begins to be felt. A rising price is an indication of scarcity and it provides incentives 'to do something' by searching for alternatives to further use of the

natural resource. However, if then action is taken to respond to these new realities it is not inconceivable that the structure of society and its institutions is such as to make it extraordinary difficult to conceptualize alternative futures and to redesign technological progress in entirely different directions. Thus, the signalling function of the market may not be strong enough for a long time, until scarcity in previously 'free' goods has become ubiquitous. Effective action might be possible in situations of partial scarcities by switching to the increased use of alternative natural resources, but problems multiply if scarcity indications appear simultaneously in a range of important natural resource categories. The search for remedial action may then come too late to redesign society and the nature and direction of technological progress in new directions.

At the present time, the economics profession tries hard to involve itself in the analysis of environmental problems and in the design of environmental policies. The major contribution of neoclassical economics to environmental analysis is derived from what has been considered for a long time a very minor and peripheral chapter in the body of received economic doctrine: the analysis of 'externalities', to be accommodated by Pigouvian taxes to internalize external effects of production and consumption. Given this origin, and the minor role which this topic attracts in standard economic text books, it can hardly be surprising that the impact of economic principles on the formulation and execution of environmental policies has been rather limited to date.

For instance, Fisher and Peterson conclude (1976: 26) that 'given the potentially very useful analytical techniques that we have developed to aid environmental decision-makers, it is unfortunate that policies, on pollution control for example, are being set without much input from economists'. Kneese states (1977: 15) 'national environmental legislation in the United States seems to me to be particularly misguided'. The Clean Air Act (1970) and the Clean Water Act (1972), *explicitly* prohibited the weighing of benefits against costs in the setting of environmental standards.

But others, also economists, feel that the profession argues a weak case. Dorfman (1985: 80) notes that benefit-cost analysis is a banner to some people and a red flag to others. The use of benefit-cost analyses is a subject of controversy, and the results are regarded with scepticism. This low-esteem is well-merited, for few analyses can command respect or confidence. As a result, most have come to be paper exercises undertaken for the record, while actual decisions are made without the guidance accorded by careful analysis of their consequences. He then proceeds with discussing a half-dozen of the leading problems. The Dorfman view should be well-founded as the international quarterly *Environmental Impact Assessment Review* is published at MIT in Boston where Dorfman teaches.

Standardization of cost-benefit methodologies could be one way to increase the policy relevance and usefulness of the economic contribution in policy discussions, but progress is painfully slow. For instance, in 1995 a systematic comparison of C/B methodologies employed in five very large scale infrastructural works under discussion in the Netherlands showed widely different practices (Boneschansker, Van Noort, 1995). This is not helpful in deciding the desirability of individual investments, nor assists in choosing amongst alternatives where possible. C/B is still a tool that apparently can and is employed to suit any individual investigator's preferences.

Cropper and Oates (1992: 676) feel that now seems to be a time 'when there is a real opportunity for environmental economists to make some valuable contributions in the policy arena, if they are willing to move from 'purist' solutions to a realistic consideration of the design and implementation of policy measures'. They bolster their judgement by stating that thus far 'we were operating on relatively low and flat segments of marginal abatement cost curves. But things have changed. Rapidly increasing marginal abatement cost often set in with a vengeance' (ibid: 730). But in the Portney (1992) volume which contains a detailed assessment of nearly 20 years of US environmental policy, the question is posed: Will environmental law evolve to include a more prominent role for economic consideration? Writing from the perspective of 1989 the answer would appear to be no. There are several reasons. 'First, economists have not done a convincing job of explaining why a balancing-type to environmental policy is advantageous. In addition, most law makers prefer not to acknowledge openly that environmental protection must be traded off against economic considerations in the same way that human health, housing, national defense, education, and other important national objectives are balanced in federal budget policy each year. Since they know that these trade offs will be made implicitly at the Environmental Protection Agency even if the laws state otherwise, they see little to be lost by writing zero-risk laws' (ibid: 282). Worse, the changing political climate in the USA now threatens to dismantle the EPA and its powers to issue environmental regulations, under the guise of budget cuts (*De Volkskrant*, September 16, 1995).

2.6 Other approaches

There are several other approaches in economics relevant to natural resources analysis and policy. They have often not (yet?) clearly spelled out their main premises for relevant theory (see Figure 4, in Section 2.1). They are ignored for instance in the *Dogmengeschichte* of Blaug (1968) or Gray (1956), but not in Haney (1964). It is also difficult to classify individual authors. Their current impact on the main body of modern neo-classical economic analysis appears limited. Yet, in their criticism against historically established ideas in economic theorizing, they have been more effective. Some important new insights suggest themselves, as will be shown below. But also multiple sources of actual or potential confusion emerge. Another reason to devote some space to these approaches is that insights from these approaches seem rather popular with several modern environmentalists who theorize on the relationship between society and nature and natural resources.

2.6.1 The humanistic paradigm

The humanistic paradigm originates in concepts of universal ethics, universal human rights and international solidarity across the globe. It, therefore, tends to have strong moralistic and utopian overtones, which however create problems at the level of concrete analysis and practicable policy action. The paradigm arises from concerns about the combined effects of the lack of technical progress assumptions of the classical school, and of the greedy attitude ascribed to rational man in the pursuit to optimize individual welfare and thereby also collective welfare of the neoclassical school in economics. The

manner in which natural resources in a global setting are being squandered appears to them unsustainable and a more sober life style in the developed countries is seen as a necessary precondition to enable the population in the less developed countries to satisfy their basic human needs. Adherents recognize the need for re-education in the developed societies to more sober material life styles, while at the same time working towards an uplift of people in the developing countries such that they can acquire a higher material lifestyle to better cover their basic human needs.

Overdevelopment in the rich countries leads, in this view, to the destruction of nature and natural resources, and so does underdevelopment in the poor countries for lack of development alternatives open to them! More sober life styles in the DCs may, but need not automatically lead to reduced use of natural resources. Moreover, if it does, this does not mean that these 'saved resources' then automatically are at the disposal of the LDCs to exploit as quickly as they can, in pursuit of their desired and to be encouraged economic uplift: enabling a steep ascent on the development ladder. Conversely, encouraging development of the LDCs, - as if that was a judgement for Northerners to make - may reduce natural resource destruction for poverty reasons, but may at the same time accelerate natural resource destruction via the very success of development strategies to be pursued. Notions of distributive justice, steady-state economies, or no-growth scenarios are advocated for the developed countries, but usually one refrains from any analysis of the consequences of such scenarios for the growth prospects of developing countries in an increasingly interdependent world. An important current contributor to the analytic issues involved in steady-state-economics for environmental reasons is Herman Daly (1992) who treats the general case. This is, however, not the same as putting the analysis in a North/South setting, which seems the more realistic and relevant case for discussion at the global level.

It is often unclear whether no-growth scenarios in the DCs would contribute to a growing willingness and ability of the developed countries to contribute to the intended uplift of the people in developing countries. If trade expansion options for LDCs are to be foregone under low-growth scenarios in the DCs, other mechanisms will have to be designed to enable transfer of skills, capital goods and other elements needed for growth in the developing countries to come about. Some authors therefore argue in favour of LDC autarky or strong self-reliance, and to seek fully internally generated development for developing countries.

With skewed income distributions in developed countries the above approach is also open to criticisms that perhaps the well to do could refrain from more consumption, but the poor in the rich societies may not agree, for they face perceived large relative income gaps which they may prefer to see closed first through more own growth. Moreover, with income distributions in developing countries often being even more skewed than in developed countries, greater precision is required on who should reduce consumption in the rich countries and for whom in the developing countries. The political feasibility of claims made under this approach would be more credible if society were more egalitarian. But that may well require revolutionary change which is completely unpredictable in its consequences. With the current collapse in international socialism on a global scale, the calls for new revolutions may not be well received. The socialist experience has no longer a function as role model, worth emulating by others.

Specifically, who would mobilize for such a revolution and on what basis could it acquire sufficient political support? Moreover, what would be the specific policy reform agenda and programme? And how would the outside world react to revolutionary attempts in isolated, single-country settings: encourage, tolerate, ignore or obstruct implementation through the powers which current international links give to outside forces?

Adherents of this paradigm tend to reject the 'rational economic person' model, prevailing in the origin of the neoclassical approach: the 'private utility optimizer' of the *Austrian School*. Instead, they adopt a behavioural psychology approach. They emphasize a hierarchy of needs, and argue that consumer tastes are not independent and externally determined but can be modified by cultural norms. Education, and awareness raising activities of interdependencies between international development, population growth and resource use are seen to be important to influence public opinion in favour of different lifestyles. But whether growing awareness by itself leads to different behaviour is unclear, and depends, i.a. on whether alternative options are available.

Some of the old criticism of the *homo economicus* assumptions of the neoclassical model is misdirected at present. Neoclassical theory has evolved considerably since the beginning of the 20th century. The neoclassical method of marginal analysis is not restricted to analyzing greedy consumers pursuing ever larger volumes of material goods to satisfy their hedonistic needs. Rationality for one may be irrationality for someone else, as is inherent in subjectivity. Some humans may have strong urges to surround themselves with purchases, while others may prefer frugality. Impulsive purchases are often made, and they determine effective market transactions as 'revealed preferences'. Buyers may regret their purchases, or are less than satisfied afterwards. But for the economic process this is hindsight. Such negative experience may, or may not, lead to implications for the next time around when a decision to engage in a market transaction has to be made.

Rationality, as consistency of decision making over time is not needed either for the modern neoclassical approach to remain analytically useable. Consumers can and do change their mind frequently and this makes them fickle and unpredictable in their market demand behaviour. This volatile behaviour does, of course, present problems for producers, who may not have anticipated correctly sudden changes in consumer preferences, and therefore have difficulty in adjusting supplies accordingly and rapidly. Producers have no perfect foresight. They may also lack flexibility due to leads and lags in final and intermediate production stages.

The neoclassical approach also does not deny that tastes and preferences can be influenced in various ways: through advertising, and various techniques for product positioning in actual or to be developed niche markets. Such practices are sometimes successful, but they also often fail. The method of analysis and, in fact, reality shows that widely different tastes and need patterns can be accommodated and fruitfully analyzed, as in market segmentation. To some there is not enough choice in the market, while to others there is too much choice leading to waste in production. Not too long ago all Chinese were expected to wear Mao-suits, but at present they try to distinguish themselves in dress styles. The market will determine where the limits to availability of supplies relative to consumer choices are and, by implication, who wins and who loses.

Neither is the criticism valid that allegedly greedy material consumers do not care, and cannot be made to care about the natural environment. In the narrow definition of the 'welfare function' mostly material consumption standards featured, the satisfaction of which was to be optimized by commodity production. But analytically this old 'welfare' function can, and has been widened in more modern analysis into a 'wellbeing' function, which includes a wider range of elements. In addition to direct material consumption levels and quantity *versus* quality choices in commodity consumption, one has included other elements in the 'utility function', the total value of which is to be optimized.

Consider the agenda for collective bargaining contracts between employers and employees' organisations. This includes, for instance, work *versus* leisure time, current income increases *versus* deferred income rights in pension schemes, income increases *versus* job security, or a safe work environment *versus* an unsafe environment. An appreciation of environmental values such as flora, fauna, recreation facilities, and a clean unpolluted natural environment could be developed and become important. Their implications are then being included in the wider individual and collective 'well being' function. The role and function of environmental education could well be to increase people's awareness and appreciation of the natural environment, and thereby hope to influence human behaviour. In effect, environmentalists would then need to engage in advocacy and advertising activities which the same people often decry as wasteful when done by interest groups in commodity markets. To the extent that these efforts are successful, it may result in mass-tourism or severe rationing of access to national parks or nature reserves, with inevitably mixed consequences for the possibility to maintain these places and the environmental values they symbolize.

The range of 'wellbeing' elements to be included in a welfare function, and also the relative weights to be given to each of these elements may well differ between individuals, between societies in different parts of the world and at different levels of economic development, as well as over time. The point remains that each individual and each society has to make current choices, and the sum total of these individual and societal decisions determine how aggregate preferences are expressed and generate signals as to the direction in which society moves.

This widening of the 'wellbeing' function has the effect of softening the egotistical material perception of economic man; an alternative way of looking at this process is to speak of extended rationality, which might even be stretched to include genuinely altruistic elements. Whatever elements are to be included in the preference function it does not do away with the necessity to make choices among the elements, for the individual and for society at large, through its economic institutions.

It is not even necessary that all these choices are to be expressed in money terms, though a surprisingly large number of choice options can be supplied with some 'price tag' to indicate what the consequences are if one chooses more of one and less of another element in the final choices that are made. Over the last 20 years a lot of effort, and considerable ingenuity has been brought to bear to calculate values for miscellaneous environmental functions. These need not be elaborated here. There is an extensive literature; for instance, Folmer and Van Ierland, 1987; Markandya, 1992; Van Pelt, 1993, would assist a reader interested in these techniques).

Environmentalists, too, increasingly recognize that they will have to concern themselves with developing criteria and norms for ranking natural resources, and find decision criteria from the perspective of biogeophysical sciences, as was noted in 2.5.1. This will enable them to engage in a dialogue with society in its pursuit of valid development oriented objectives. (Some) Natural scientists, like (some) economists in an earlier phase, have to change from analysis to become more instrumentalists. For the future of environment and development involves issues of policy choices and policy options, to the identification of which natural sciences will have to contribute. In this way, the approaches of economics and the natural sciences could perhaps be put in a joint framework for decision-making on natural resource use questions (Munasinghe and McNeely, 1995).

A distinction has to be made between the analytical aspects of the neoclassical method of economics and normative values pronounced by environmentalists who often strongly feel that people should attach much higher weights to environmental indicators in the patterns of decisions they ought to take. At the level of suggested policy such views tend to find expression in rather absolutist and authoritarian views, often argued on the basis of their interpretation of 'ethics'. In this, they often express a preference for strong regulation and prohibitions of activities deemed environmentally harmful. Such positions have done, and sometimes continue to do great harm to establishing any dialogue⁷. To the economic analyst the task will then still be to try to analyze the implications and consequences of such command-and-control measures. These implications may lead to an assessment whether drastically different pro-environment choices in society are politically and socially viable.

2.6.2 Institutional economics

In some respects the humanistic paradigm shades over into the concerns of institutional economics, especially in respect of policy views. Institutional economics is a phenomenon of the 20th century. The movement originated in the United States in *academia*, but became politically influential in Roosevelt's *New Deal* in the early 1930s. Its origin and development is associated with authors such as Thorstein Veblen (1857-1929), W.C. Mitchell (1874-1948) and John R. Commons (1862-1945), the founder of the Wisconsin school of institutional economics. See, for instance, his: *Institutional Economics* (1934). The emergence of the institutionalists can be traced in reaction to the abstract and theoretical reasoning in the writings of the classical economists.

While authors classified as institutionalists differ among themselves, areas of agreement relate to the following beliefs:

- * Group behaviour, not price, should be the central theme of economics.
- * Human behaviour is constantly changing, and economic generalizations should be relative to time and place.

⁷ In preparing the *Report on the Netherlands Bilateral Program of Development Cooperation and the Environment* (ISSAS, Van Raay and Van de Laar et al. 1979), the group was 'guided' by an ecologist who claimed veto power for the ecologist. His influence on the report was minimal in the end.

- * Custom, habit, and law are emphasized as modes of organizing economic life.
- * Important motives which influence individuals cannot be measured.
- * Maladjustments in economic life are not to be regarded as departures from a 'normal' equilibrium, but are themselves normal, - at least under existing institutions (Haney, 1964: 719-20).

Institutionalists thus reject attempts to formulate general laws deduced from human motives, and the general equilibrium approach developed in Marshall's *Principles*, formalised in the mathematical approach of Léon Walras (1834-1910), in his *Éléments d'économie politique pure* (Elements of Pure Economics) first published in 1874. On the positive side, they suggest 'economic generalizations' to be based upon uniformities in 'institutions' (habits, customs and legal systems). They regard human motives as 'instinctive' and criticize economists who assume rational self-interest as a dominant motive. The institutions and behaviour are regarded as phases of an evolutionary process, but the changes in the two are considered as non-synchronous. Accordingly, they tend to see a need to eliminate maladjustments and clashes of interest, and therefore advocate social control over institutions (Haney, 1964: 720).

Some institutionalists are content to analyze and describe economic life, pointing out maladjustments which they may see. Others want to develop a theory of a holistic evolutionary science. Yet others carry their findings into suggestions for action, and centre Institutionalism around what they refer to as 'the problem of control' (ibid). Institutionalists may thus be either *sociological* or *legal*, with the latter allowing more scope for reason, for they accept the task of appraisal and of setting social goals. They would like to force social evolution, and this view influenced pro-active government policies under the New Deal in the US under Roosevelt. In this vein, K. Polanyi, in *The Great Transformation* (1944) even suggested that individual freedom is an illusion. He attacks the capitalist market system and defends interventionism. Paradoxically, the basic assumption is that man tends to resist change! (Haney, 1964, 722).

Some of these policy-related ideas are embraced by modern environmentalists who would like to see themselves as unacknowledged mini-gods. The reasoning is as follows: mankind is dependent upon the biosphere, and they, as experts in ecology, are the 'natural guardians' of the basis of life on earth. Therefore, they must have higher power in establishing control over social institutions than mere developmentalists. Authoritarian 'social forcing' is then justified by a higher goal. Most others would call this insufferable arrogance, another recipe for dictatorship.

There is considerable resemblance between the American Institutionalists of the 1914-1946 period, and German Historicists of the 1843-1872 period such as: Wilhelm Roscher, Bruno Hildebrand, Karl Knies, and Gustav Schmoller. Both groups emphasize, change and evolution of some sort. Both vigorously attack the Classical economics on the ground of its dogmatic deductions from abstract and unreal assumptions, and especially its 'mechanical' individualism, and self-interest motivation. Both seek realistic descriptions of human behaviour. The Austrian School attacked the Historical School, the Institutionalists attacked the Austrian (Haney, 1964, 722).

Detailed factual studies deal with the manner in which societies evolve in the course of development and how they thereby also change their economic institutions. The analytical approach is inductive rather than deductive. Starting point is the observation that societies, at least in North-West Europe, were not doomed to misery due to decreasing returns in agriculture in the face of population growth, as in the classical paradigm. Nor did capitalism collapse as per Marxist expectations. Instead, they observed that capitalist societies from the mid-19th century have proved themselves capable to adapt themselves, in part through changing their institutions.

Contemporary concerns relevant for environmental policy.

The study of the evolution of contemporary capitalism is not only of great interest in itself, but it is also important to recognize possible implications for natural resource utilization and to judge the prospects for the possibility of framing effective environmental policy. What are some of the possible implications for environmental policy formulation in the contemporary phase of international capitalist development?

The development of the capitalist system has been a rich and fruitful field of study, and it has shown that the spread of international capitalism took different forms and paths in different countries and under different circumstances (Moore, 1967). Also, the systems adapted themselves in the 20th century under the impact of catastrophic events such as two world wars and the Great Depression. In some respects, however, they moved in the same direction. For instance, in many countries gradually a welfare state was build up, as a set of expanding national institutional responses to correct for excesses or breakdowns of capitalism and to provide collective safety nets to the economically weak. These arrangements were built on notions of group cohesion and solidarity and were mediated through the state taking a larger slice of the economic cake in taxation, and in being instrumental in the development of income distribution via elaborate systems of transfer payments. Characteristic of many of these arrangements is that they are open-ended: they give entitlements without clear information on how many will need to make use of the facilities, and thus their budgetary costs are unknown and somewhat unpredictable. Moreover, the call on these facilities is inversely related to the rate of economic growth. Under generalized rapid economic growth and near-full-employment, characteristic for the 1950s and 1960s, few people needed assistance. When growth wanes, the number of claimants grows in inverse proportion, while the financial basis through taxation of the welfare facilities erodes: budget deficits become endemic to the economic system.

These developments towards the welfare state could however only take place in highly nationalistic states, as only within the confines of the nation state could social cohesion and group solidarity be mobilised in support of these far-reaching measures. Thus, while capitalism expanded beyond national boundaries, the building of the welfare state became only possible within the confines of the modern nation state as it had been forged into existence over a period of in most cases several centuries.

Major concerns for institutionalists since the late 1960s are, however, whether these nation-based systems constituting the modern welfare states are sustainable in an

increasingly internationally integrated world, characterized by generalised free trade and capital flows. Developed societies face a slowing down of economic growth, due to reaching maturity (becoming post-industrial) or are suffering from competition from the newly industrialising countries, especially in South-East Asia. This threatens employment and income levels, and the 'acquired rights' under the welfare state.

One explanation for the recent slow economic growth is seen in the ossification of the institutions of capitalism, which allegedly puts too many constraints on the entrepreneurial function to be exercised freely. Hence, the call for measures which stress liberalization, deregulation, the curtailment of trade unions and attempts to disband cartels of producers. All these efforts are directed to 'boost dynamism' in the older capitalist economies, to face up to the 'new competition' on a global scale foreseen for the 21st century.

These insights gained analytic prominence in the 1960s and acquired political clout in the anglo-saxon world as Reaganomics and Thatcherism in the late 1970s and 1980s. The movement is spreading wider in the 1990s, as this economic policy outlook is also actively pushed by international financial institutions such as the International Monetary Fund and the World Bank towards developing countries.

Consequent to this widening trend towards deregulation and liberalisation of trade and capital flows, doubts are expressed whether the nation state can continue to effectively intervene in the economic process. Traditional government policy instruments, such as international trade taxes, have been given up by national governments and non-tariff barriers are under close scrutiny. An economic policy framework which tries to create 'level playing fields' for different categories of economic actors prohibits, for instance, discriminatory administrative actions by nationality, and also state-subsidization of national industries within the European Community and increasingly under GATT. Monetary policy has become ineffective under internationally freed capital movements, and exchange rate adjustments have little to do any more with international trade, as the volumes of financial transactions in capital markets and on a daily basis are much larger than the annual volume of world trade. Differences in international taxation levels threatens state revenues, through fiscal constructions which rout taxable financial flows via relative tax-havens.

These developments in the international economic system have implications for environmental policy formulation and natural resource management, areas of increasing public concern, and the subject of this paper. It is argued that environmental regulation by national authorities would not only be ineffective, but it would also go against the generalised trend towards mondialization and internationalisation of economic activities. To polluting actors, the scope for evasion and non-compliance increases with internationalisation, and the reach of national environmental policy instruments decreases. Resource extracting, through mining or the opening up of virgin resources, would increasingly move towards those countries, often the developing countries, where constraints on actors are weakest. Environmental policy regulations may then be argued by those affected as non-tariff barriers to free trade, prohibited under GATT's international trade rules.

This relative impotence of environmental policy instruments is then interpreted in the same way as the internationalisation of capitalism in a setting of liberalised trade and capital markets has made monetary and fiscal policy at the national level increasingly ineffective. The powers of the nation states for independent action are increasingly circumscribed, independent of the national political system and the role of parliament.

At the theoretical level, 'evolutionary economics' does not seem to have taken off. As critics of classical economics early institutionalists have done, in Haney's view (1964: 728), excellent work. They reinforced valid criticism of Classical economics and have brought them home to Neo-Classicism. They have demonstrated the importance of irrational motives, as affecting supply and demand schedules. They have emphasized the role of institutions and down-played that of the market. However, they ignore or slight reflective choice and much of sentiment. It is no more true that 'man' is a mere creature of habit than that he is a hedonistic calculating machine.

A convenient introduction to these intellectual traditions in their contemporary setting is Geoffrey M. Hodgson, Warren J. Samuels and Marc R. Tool, eds. *The Elgar Companion to Institutional and Evolutionary Economics*, 2 Volumes. 1994. (Edward Elgar/Gower: Aldershot), and, for the American branch, the *Journal of Economic Issues*.

Historicists and Institutionalists have also much in common with social historians. They have an interest in describing and analyzing what happens in society in the hope of better understanding why and how these observed changes take place. Their work is often rich on description but weak on theory. It is by the nature of its approach retrospective, but through lack of theory it does not provide indications of what the future may bring, and thus on how to frame more environmentally conscious and/or corrective policies.

Of considerable interest in the contemporary setting are detailed longitudinal rather than cross-sectional analyses of how societies in the developing countries evolve in their economic institutions and, from an environmental point of view, in adjusting or reacting to their natural environment and their natural resource position. While the impact of the colonial heritage on developing countries' institutions has been well studied, detailed studies of how specific societies in developing countries succeed, or do not succeed to achieve growth by modifying their natural environment are still relatively scarce (see also 2.3.1).

Some important recent studies along these lines are Lele and Stone (1989), which covers six Sub-Saharan African countries at the national level, an approach which is unsatisfactory because developments in different eco-systems are blurred through aggregation to the national level. Turner, Hyden and Kates (1993), is better in this respect: covering 10 areas with high population density in Africa, and Tiffin, Mortimore and Gichuki (1994), a study of change in Machakos District in Kenya between 1930 and 1990 is a very detailed and rich source. Interesting as these studies are, they provide few if any useable guidelines for the future as the determinants of change in specific terms do not become clear. They fit the standard institutionalist approach: being rich in information but weak in theory, and thus policy.

To assume or postulate a simple parallelism for developing countries with the evolution and development of the developed countries is too simple, as the two worlds do not exist independent of each other but shape and constrain each others' development options in multiple, and poorly understood ways. This brings us to further problems and issues in the internationalisation aspects of population growth, development and natural resource use, and the role of the state.

2.7 International trade, international migration and the natural environment

2.7.1 Introduction

From an economic growth perspective and related to the natural environment, two mechanisms have been very important historically to forestal doom. Implicit in the early economic models of the classical economists was the notion of a 'closed economy', e.g. confined in geographic space. In an 'open economy', extending beyond national boundaries, new options to cope with problems of local/regional overpopulation in the face of declining land productivity present themselves: international trade and international migration.

But pursuing these options inevitably introduces issues of actual and potential conflicts between internationalist as against nationalist goals, strategies and policies, and this provides an opportunity to introduce yet additional lines of criticism of the way the classical economists, and many of their neo-classical followers, look at the economic process.

Within an individual country, a singular political and institutional setting exists to govern the behaviour of its inhabitants, including civil rights, forms of political representation, legal systems and government authority structures. Laws are nationally determined, applied and enforced, and this provides a known and reliable institutional setting governing norms for contracts in exchange relations. The application of the principle of the division of labour in pursuit of a growing economy is then relatively simple within such a uniform institutional setting.

In modern economic parlance, the 'transaction costs' are then low: this facilitates exchange and, thereby, promotes development. When this stable institutional setting breaks down, as is the current experience of the disintegration of the former Soviet empire, pervasive institutional uncertainty results in sharply rising transaction costs and this stifles the spread of market forces in the economy. In turn, this will lengthen the transitory period of uncertainty and of adjusting from one type of social ordering to something else, yet to be widely agreed upon and accordingly established and enforced. It typifies a situation where not only the game itself (the pursuit of economic development) changes, but where the 'rules of the game' are suddenly changing as well. For a while, there may be no discernible rules at all, and a vacuum or chaos exists. 'Lawlessness' then governs or shapes (parts of) the economic process, and cost-benefit considerations to engage in market-based transactions are fraught with a high degree of uncertainty.

Conversely, where the process of nation building has not yet proceeded far enough for national institutional and contractual settings to have been established and enforced, as is the case in much of Sub-Saharan Africa, the market process is slow to take roots, precisely due to the limited status, acceptance and enforcement of basic elements relating to the laws of contracts. Market parties adjust and limit trade among family, friends or within known ethnic groups, where similar norms are valid and shared. Outside trading, integrated on a national scale, is impeded because of contractual uncertainties and risks: contracts may not be honoured and/or cannot be enforced.

Mainstream economic theorizing cannot deal with such situations, and the relevance as well as the advisability of pretending to give economic policy reform 'advice' in such a fluid institutional setting, such as by the International Monetary Fund or the World Bank, becomes highly questionable. Instability in the institutional setting is the essence of major structural shifts, and in this context the analysis of small changes in partial markets, and under *ceteris paribus* assumptions is then not very helpful: all relevant contextual conditions are being changed.

Enlarging the area of applicability of the division of labour principle is therefore likely to face discontinuities when moving from one jurisdiction to another. Movement from one legal and institutional setting to another implies conflicts when 'the laws of the land' are differently defined, regulated and enforced. Whether the development of the economy is hampered or stimulated by conflicts arising from the need to straddle different jurisdictions cannot be ascertained, without further analysis. Different concepts of the rationale of the state have spawned different lines of criticism of how economic theory looks at the economic process.

The role of the nation state as an economic and political entity in relation to the economic process is not limited to establishing and maintaining a minimal legal order as was considered desirable in the classical tradition. This view makes the state a mere conglomeration of individuals. The individualistic approach of the classical and neo-classical economists tends to give little attention to the role of *public capital* and wealth, as opposed to individual riches. In fact, several of the earliest critics of the classics (e.g. Lauderdale, Rae, Sismondi) accepted individualism and materialism in part but recognized a lack of harmony between public and private interests (Haney, 1964, 913; Gray, 1956: 192, 220). The provision of public goods in economic and social infrastructure was seen to be important, and such goods could not be provided by the market process. The government thus had to intervene (tax) the private economy to enable it to supply these goods. Maintaining law and order is not enough for a functioning state. Social and economic infrastructure has to be provided as well, to facilitate communication and exchange.

The early *nationalist critique* of the classical economics tradition is most characteristically German (Friedrich List, Adam Mueller) but found also support in the USA. It attacked the validity of the cosmopolitanism of the classical theory. Adherents stressed the importance of the state and of national borders as limiting the application of economic laws (Haney, 1964 914; Gray, 1956, 218). To them a central point was the Aristotelian doctrine that man is inconceivable outside the State. The state was seen not as an

artificial creation, but as an expression of the supreme human need, the sum-total of civil life itself. The state also provides a continuity through time.

In economic terms, this doctrine could be and was invoked in using state power to pursue national economic development goals, and to ward off foreign competition. *Laissez-faire* should not be relied upon as the *state is always in the centre of things*. It also meant national sovereignty over natural resources, and the application of national law over the conflicts arising over 'international' contacts within the state jurisdiction. This is objected to by foreign nationals, who fear that 'nationalist' courts may be biased against them. Sovereignty over natural resources requires a balancing act between rights and duties at the national level and at the international level as well in an increasingly interdependent world (Schrijver, 1995). The economic integration process can only proceed *pari passu* with the development of a reliable and predictable institutional order governing contracts. Where cultures and business norms differ contracting partners have considerable difficulty interpreting actions of the opponent: there are different styles of doing business. Any modern international businessman will testify to the differences in doing business in, say, the UK, France, Italy, Japan, or China, not to speak of Africa or Latin America.

Friedrich List, at mid-19th century, saw that England was emerging as the workshop of the world, intent on nipping continental manufacturers in the bud; was it safe for other countries to be content with a position of subordination, accepting this 'insular supremacy'? (Gray, 1956, 232).

This perspective on the economic process, from an 'underdog' position, typically has been used in late industrialising countries to argue the necessity to pursue protectionist policies, to enable the establishment of a 'national foothold' against foreign intrusion and/or domination. It justified putting restrictions on overseas transactions and in providing government support for local 'infant' industries being set up. This has been done in Germany in the late 19th century and such practices have also featured prominently in government roles in the newly emerging, and already emerged, *East Asian Tigers*. It has been a strong tenet in African development as well, as shown in various countries seeing the need after obtaining political independence to nationalise, or otherwise gain control over what were seen as 'the commanding heights' of their economy.

From the perspective of these lines of criticism on economic theorizing of the classical and neo-classical school let us now look at some aspects of the globalization and internationalisation of the economy, and from a natural resources perspective.

2.7.2 International trade

Pressures on land resources can be relieved through international trade and geographical expansion. When 'new' land resources are available elsewhere, and in empty or thinly populated areas, there is scope to produce additional agricultural commodities for the home country, provided transportation cost are not prohibitive.

In England, *Corn Laws* existed already in the 18th century aiming to protect domestic agriculture against foreign imports, which were permitted only in case of famine high prices. Hence a nationalistic institutional setting (a 'closed economy') existed which limited analysis of agriculture to within England only. In that context Ricardo's *Law of Diminishing Returns* in agriculture was applicable. The repeal of the *Corn Laws* in 1846 did away with this protection accorded to domestic agriculture. It allowed economic analysis to be applied on a wider geographical scale. Analysis of comparative advantage had shown that it was cheaper for England to import food in exchange for its industrial products, rather than to muddle through with protective policies for domestic agriculture whose productivity apparently could not easily be expanded.

Ricardo's writings helped to make free trade a popular objective of British policy. Unwittingly, he provided the theoretical justification for the long-range solution to the growth problem which Britain actually adopted in the 19th century: she became the workshop of the world, and bought most of her food abroad (Blaug, 1968, 140). Of England it has since often been said that 'the rich live off the poor, and the poor live off imports'.

Colonialism and imperialism, as a scramble for control over landesque resources, provided the means to establish a wider institutional setting under which this international division of labour could be organised: the new colonies became the suppliers of food and raw materials for industry and the production of those commodities was actively encouraged. The advanced and industrialising countries, especially England, provided a widening range of industrial commodities to these new markets. International shipping rates had to be rigged: charging low rates on incoming bulk agricultural and industrial raw materials and high rates on the industrial counterflow. To maintain dominance over the overseas markets, the emergence of industry in the colonies had to be discouraged and existing industrial production was discriminated and even destroyed. In addition, 'free trade' was to be free within one's one sphere of influence, but intrusion of other, later industrialising European countries aspiring to imperialism, had to be resisted. Hence, the emergence of the nationalist, underdog perspective is to be seen as a reaction against this mercantilistic economic policy practice of the industrially more advanced countries, as pointed at above.

The institutional structure established by colonial overseas expansion remained largely intact also after decolonization, and so did the distribution of production between the two categories of countries: industrial and non-industrial. Spheres of influence were maintained or actively pursued with different means. For instance, Japan is a country with limited own natural resources in agriculture and in the energy field. It has established in the 20th century its own sphere of influence in South East Asia first by military means under the guise of decolonizing Asia from European domination, and after the Second World War and its reconstruction by its sheer economic power and vast industrial capacity. It buys raw materials and sells industrial commodities internationally.

From an environmental point of view, the significance of the agricultural sector in the national economy of the developed countries cannot be derived only from national statistics. There is a tendency to argue that in the developed countries the significance of the agricultural sector is small, and hence its burden on the natural environment. It

is then pointed out that agriculture accounts for a small and declining share in Gross Domestic Product and employment. However, such figures greatly understate the contributions of agriculture, if direct agriculture-related activities are not taken into account such as food processing, manufacturing, transport, trade and retailing, and eating establishments. For instance, in the United States, direct employment in agricultural production is only some 14 percent of total agriculture related employment.

Of special interest are the imports of agricultural commodities into the industrialised countries. Massive imports of agricultural commodities, as became policy for England in the second half of the 19th century, imply claims on agricultural lands and on other natural resources, such as mining and industrial raw materials elsewhere to sustain production and income levels in the importing country. The 'ghost acres' from overseas land claims have to be added to the national statistics on land use. Trade in agricultural products implies first and foremost, a trading in soil nutrients affecting land fertility. Especially when the extraction of natural resources takes place without due regard for the maintenance of soil fertility in the supplying countries, such international trade amounts to a unilateral transfer of natural resources from the developing to the developed countries. It is exploitation in a natural resource sense.

The contemporary significance of the phenomenon of the 'ghost acres' may be illustrated as follows. In 1992, the Netherlands was the third largest agricultural exporter in the world, after the United States and France, with a market share of 10 percent of world agricultural exports. For the Netherlands to produce that much, it had to import massive amounts of agricultural raw materials, representing 15 million hectares of agricultural lands elsewhere: key imports are tapioca from Thailand, soy beans from the USA, Brazil and Argentina and palm oil from Malaysia. The Netherlands thereby lays claims on 1.2 hectares of agricultural land per inhabitant, more than double the 0.55 hectare average per inhabitant for Western Europe. Moreover, such figures have to be compared to the per capita agricultural land available for the rural population in the developing countries themselves to meet own food and other requirements. The livestock products in the Netherlands are again largely exported from the Netherlands, often at subsidised rates under the Common Agricultural Policy of the European Union. What remains in the Netherlands is a massive amount of manure which cannot be disposed off and which leads increasingly to environmental problems such as eutrophication of soils in the Netherlands, and more specifically in the intensive pig-farming areas (IUCN, 1994; Dietz, 1992). A further consequence is the recent introduction of maize, for this crop, more than any other, can withstand large volumes of manure.

2.7.3 International migration

Population pressures have historically been relieved in two ways: international migration, and the demographic transition. Out-migration, due to land productivity shortfalls, lack of alternative income opportunities and usually compounded by discriminatory existing socio-political structures, has been numerically significant in the 19th century for the population size of such countries as Ireland, Italy or Sweden. As recent as in the late 1940s and 1950s, the Netherlands government policy, too, supported out-migration to

Canada, Australia and New Zealand, fearing it would not be possible to provide an adequate standard of living for the rapidly growing population in the Netherlands. This policy may be contrasted with France, which, at least since the 1920s has been more concerned with being underpopulated. France has been in the forefront of adopting measures to stimulate the national birth rate, though with only limited success.

The completion of a successful demographic transition in the developed countries in the late 19th and 20th century refers to the transition of population dynamics from a high birth rate and high death rate situation to one characterised by low birth rates and low death rates. In both situations more or less stationary, or even declining populations have resulted, and this is obviously important if the world is seen as a finite entity, as is done by most environmental scientists.

The contemporary issue is whether most developing countries can and will make a similar transition, and the time span which this will take. When death rates fall while birth rates stay high, population growth is very rapid until birth rates begin to come down. The longer that process takes, the longer the phase of very rapid population growth will continue. Even when birth rates come down rapidly, there would still be continued rapid population growth for some time because the cohort of the population in the reproductive age groups will have become relatively large, compared to the situation before the demographic transition started (World Bank, 1984)

Land and population dynamics have historically been possible in a context of expanding economic frontiers. However, with the land frontier closing in many parts of the world, that option is being foreclosed for the future. If out-migration is seen as one pressure-relieving mechanism when economic development resources do not keep pace with population growth under prevailing levels of technological development, it will be mostly from the South to the North and not the other way round as in the 19th century. This process of South to North migration is well under way at present, despite being discouraged by most countries, either in the aggregate or selectively, such as favouring only people with certain skills. In many countries in the North, major socio-cultural and economic adjustments need to be made to recognize the nature and implications of multicultural societies, which result in the wake of this international migration.

Issues of concern to institutional economists are to look at the evolving capitalist system, also in the perspective of international trade and international migration. Attention has shifted from analyzing the roles of the state (see section 2.6.2) to changes in the organisation of production and the emergence and spread of the multinational or transnational corporation on a global scale and in a global environment. These corporations, by definition, have outgrown the national scale. They organize and direct their operations from a global perspective, and adjust approaches to, and location of business activities in a manner which takes them in many ways beyond the reach of national governments' policies.

This process of globalisation of production in an increasingly liberalised setting is to be encouraged by some or seen as inevitable by others. However, this process, in turn, is also seen as a threat to nationalistic aspirations and to the welfare state, which, as

argued, could only come into being on the basis of a strong government in a nationalist setting.

Global issues arise when regional power blocks form and organize the world economy in such a way that burden shifting falls on the weakest group of countries. Often those will be the developing countries. They supply raw materials, but are denied access to the North for their industrial exports. They may become dumping grounds for waste materials and attract polluting industries. They do not have the institutional capacity to resist, nor the human manpower resources to conceptualize and implement alternative futures for themselves.

The processes of globalisation and integration limit the power of national governments to shape the economic process. Increasingly they are relinquishing traditional instruments of government policy. Liberalisation of trade and capital flows is bound to lead to further shifts in international production, with many of its negative consequences being passed on to the least mobile of the factors of production, which is labour. Forces of dynamism are being unleashed with quite unknown consequences and effects.

These processes increasingly constrain governments in designing environmental policies. More than ever before, the effects of and reactions to any set of proposed policies will have to be evaluated in the light of likely reactions of national and international market parties. Possible reactions may include possible relocation to 'pollution havens', to evade environmental regulations. This latter threat should, however, not be overrated as there are many considerations involved in (re)locating enterprises or plants, and some types of environmental policy may turn from initially negative assessments into positive factors. This will be the case after environmental clean ups have reduced pollution abatement costs for existing enterprises as well as for new-comers, or when the development of new, pro-environment technologies provide new competitive advantages to enterprises involved.

3 Concluding observations.

This review of major economic doctrines deemed relevant for the analysis of natural resources has demonstrated that economists have identified a few ideas of lasting importance for the analysis of natural resource use which also may have policy relevance towards the future.

The *Law of Diminishing Returns* is one such concept. In respect of natural resources it indicates that increasing efforts are needed to extract more useful economic services from nature, but this very requirements is seen to provide incentives to search for alternatives and substitutes for the natural resources in apparent short supply. Natural resources may become relatively scarce, but are mostly not seen to be scarce in an absolute sense.

The solution for natural resource scarcities is seen in technical process to take place in response to scarcity, but whether and under what social conditions technical progress

takes place, and in what specific directions and forms, are issues about which economists have no views.

The definition of value as a scarcity indicator in market processes is useful only where markets exist and function well, as in competitive situations. However, where markets do not exist, and cannot easily be established market analysis breaks down. Unfortunately, issues of missing markets are crucial and missing markets are ubiquitous in environmental matters. It has taken the economics profession a long time to realize this. In the end, 'externalities' are now being recognized and the instrument of the Pigouvian corrective tax, as an 'end-of-pipe instrument' is recommended to deal with externalities.

Economists have often inadequate appreciation of the roles of the state, especially in those roles shaping the complex institutional context under which the division of labour is stimulated and market-based transaction can thrive. Much more extensive analysis is required in respect of a wide range of public goods, their existence, functions and effects.

The tool of marginal analysis, the strength of neoclassical economic analysis, is conditioned on 'other things remaining equal'. However, institutional discontinuities are a fact of life. They are associated with the collapse of the former Soviet Union, and in many African countries under the impact of processes of structural adjustment policies.

In the contemporary world economics has difficulty in addressing and/or reconciling conflicting perspectives: specifically, contrasting the cosmopolitan perspective of individual choice with national perspectives and the fulfilment of national social, cultural and economic roles of communities there where other forms of governments and to express group identities do not exist or are weakened by deliberate policy actions and economic trends and processes. Yet, group cohesion, a sense of belonging to a wider social group, is important to assure minimal levels of solidarity and to provide social safety nets for labour, where alternative institutions of governance do not exist.

The notion of opportunity costs, e.g. considering options forgone in alternative directions of actions, and of a thinking along cost-benefit lines is useful, despite all types of technical snags, to press home the need for making choices, also in environmental matters. It may also be useful in establishing a dialogue with scientists dealing with the geobiophysical foundations of sustainability.

Finally, we may return to our figure 3 in section 1.3. We have attempted in this paper to identify a range of concepts from the pluralistic history of economic thought which have a bearing on what is currently the rapidly subsiding discipline of Environmental Economics. In a next paper, we shall attempt to summarize the major elements in the environmental critique of the economic process as seen by economics. It will provide an alternative perspective on the economic process and will point at a range of implications for the manner in which economic progress is defined and measured. In turn, these insights are providing new challenges for economics to rethink its premises and define new areas of priority research.

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