



**Gulf Research Centre Cambridge**

**K n o w l e d g e f o r A l l**



**Realigning Ecological Needs and  
Economic Growth to Formulate  
Environmental Policy for the Gulf States**

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## Realigning Ecological Needs and Economic Growth to Formulate Environmental Policy for the Gulf States

Azhan Hasan and Hezlina Mohd Hashim

### Introduction

The environment may be described as “all the elements in an organism’s surroundings that can influence its behavior, reproduction or survival” which also include resources, habitat, and population.<sup>1</sup> Many countries – for example, the Gulf Cooperation Council (GCC) countries – are overly exploiting their natural resources in their effort to provide for pressing current needs and this will heighten the risk of potentially sacrificing the natural resource inheritance of future generations.<sup>2</sup>

The economic system and the ecological system influence each other in many ways. We utilize natural resources from the ecological system by means of labor and capital to produce and consume goods and services<sup>3</sup> as is shown in Figure 1. Many environmental problems arise because of emissions that are outputs from the production process, the waste treatment process, as well as the storage of waste. High concentration of emissions in water, soil and air can later lead to the damage of ecosystems, materials, buildings and human health.

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1. See Ehrlich and Roughgarden 1987, 6.

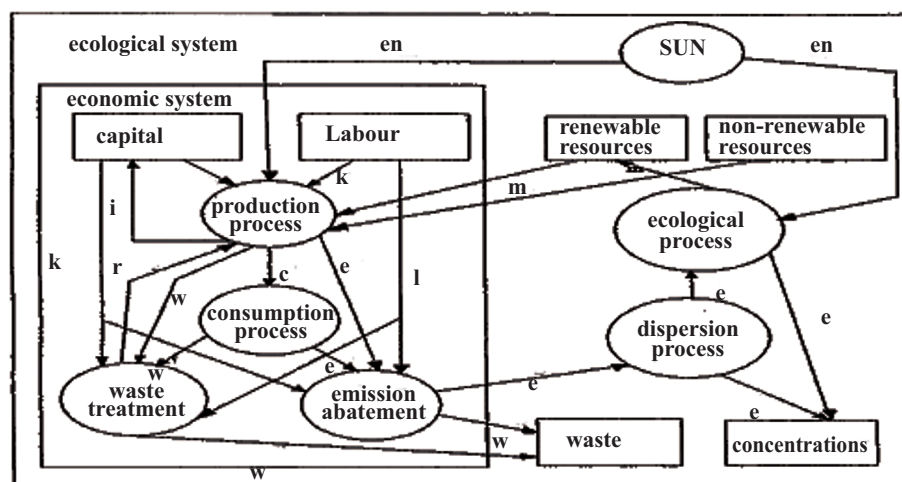
2. See Bryner 1997, 271-72.

3. See, for example, Ayres and Kneese 1969, Herfindahl and Kneese 1974, Nijkamp 1976, Odum 1975 and Siebert 1987 for economic-environmental interaction.

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A multidisciplinary approach can contribute to the formulation of policy measures to preserve or sustainably use natural resources.<sup>4</sup> A number of frameworks and models are proposed interlinking ecology and economic analysis (Figure 1) by offering information about the hierarchy of dynamic ecological processes.<sup>5</sup> Modeling the use of biodiversity requires that the dynamics of species richness is taken into account explicitly through integrated modeling in the context of ecologically sustainable economic development of a region.

**Figure 1: Materials balance and stock-flow approach for some main interactions between the ecological system and the economic system**



Note: Circles indicate processes; squares indicate stocks; and arrows indicate flows.

- |                    |                      |
|--------------------|----------------------|
| k capital services | c consumption        |
| l labour services  | i investment         |
| en energy          | r recycled materials |
| m materials        | e emissions          |
|                    | w waste              |

Source: Opschoor and Pearce 1991: 6.

It is necessary to analyze and understand the forces that will determine environmental change as well as to choose a set of environmental policies that will move us toward a sustainable future. This in turn needs a better understanding of social institutions, ecological and economic processes. A full valuation of all goods and services that natural resources provide is necessary. The resulting values should provide a basis for policies aimed at internalizing externalities in the use and exploitation of natural resources. Integrated models can help in the analysis

4. Turner et al. 1998.

5. See also Van der Bergh 1997.

of complex interactions and implementation of policy packages in ecological-economic systems.<sup>6</sup>

### The Need for (Political) Decision-making

An analysis of the economic decision-making process makes it clear that environmental legislation is necessary and the governments should look for instruments of environmental protection. The government may come out with a democratic mechanism by which environmental legislation could be implemented and environmental standards could be provided in its attempts to correct the market mechanism. It is important to keep in mind that environmental quality is not the only goal of economy policy. According to Tinbergen, other generally accepted targets of macroeconomic policy are an acceptable living standard, full employment, a stable price level, a stable exchange rate and equilibrium on the current account.<sup>7</sup> All these parameters should be carefully analyzed in formulating environmental policy. Consequently, there is a need for information on the impact of different environmental policy alternatives, as formulating environmental policy might have consequences for macroeconomic target variables.

The purpose of a policy framework is to assist decision-makers in the formulation and implementation of consistent policies, strategies, programs and projects that will enable the move towards the common goals of sustainable development.<sup>8</sup> The anticipatory approach will have to adjust to the conventional instruments of socio-economic policies and programs. Such adjustments are based on models that can predict the environmental effects of socio-economic policies and programs and contain control (policy) variables by permitting the avoidance or reduction of anticipated effects. Meanwhile, the environmental impacts have to be assessed and clean-up action carried out by existing or newly-created environmental institutions and protection activities in the reactive approach. Additional costs and benefits are generated in both cases of environmental action which impacts long-term economic growth, short or medium-term change in national income, employment and inflation.<sup>9</sup>

6. Panayotou and Ashton 1995.

7. See Tinbergen 1956.

8. WCED 1987:310

9. See Pearce, Markandya and Babier 1990:7 et. seq. The arguments favoring anticipating policies rest upon the assumptions of rising costs from accumulating environmental impacts; foreseeable with different degree of uncertainty, prohibitive environmental effects or possible violations of social norms/standards such as intergenerational equity. For reactive policies, it is seemed to be in order in case of clean-up of past environmental degradation; high discounting of the future

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The effectiveness, efficiency and equality of policy measures should be assessed.<sup>10</sup> Pronk and Haq in 1992 said that:

“There is no choice between economic growth and environmental protection. It is an imperative. This issue is not how much economic growth but what kind of growth. Zero growth can be as detrimental to the environment as rapid growth. It is not the rate of growth that allows us to gauge the effect on the environment. It is the composition of the GDP – the product mix as well as the types of production processes – that alone can tell us whether the overall impact on the environment is positive or negative. For developing countries, the choice is not to sustain poverty but to overcome this poverty through growth.”<sup>11</sup>

### Ecological Modernization as a Basis for Environmental Policies

An antagonistic relationship existed between economic development and environmental protection for a long time. The concept of sustainable development presented in the Brundtland Report in 1987 led to a vision of the simultaneous and mutually reinforcing pursuit of economic growth, environmental improvement as well as global and social equity together with an emphasis on global distribution.<sup>12</sup> During the 1990s, sustainable development became the predominant feature of the environmental discourse, underlying global, supranational, national, regional and local environmental policy strategies, company environmental management, and the work of many environmental groups alike.

Ecological modernization proposes that policies for economic development and environmental protection can be combined and the synergistic effects of this will create a positive-sum game between economy and ecology. It also promotes the application of stringent environmental policy as a positive influence on economic efficiency and technological innovation.<sup>13</sup> In addition, ecological modernization theory states that contemporary economic practices are firmly rooted in modernity and are related to modern scientific-technological and state

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by individual or collective decision-makers and anticipation of technological breakthroughs for dealing with environmental impacts in the future, possibly prompted by anticipating research.

10. See Pronk and Haq 1992. The first question to answer for effectiveness is which effects are to be assessed. Cost effectiveness as an efficiency of a policy measure is the ratio between costs and effectiveness.

11. See Basic Policy Message 2, *The Hague Report* (Pronk and Haq 1992 :10).

12. Dryzek 1987.

13. See Gouldson and Murphy 1997, 74.

institutions. In recognizing this fact, this theory emphasizes the possibilities of a process of re-embedding economic practices with respect to their ecological dimension, within the institutions of modernity. This process should result in the institutionalization of ecology in the social practices of production and consumption, thus causing the redirection of economic practices into more ecologically sound ones.<sup>14</sup>

There are various important aspects in analyzing the theory of ecological modernization in relation to the process of environmental policy making. First, ecological modernization favors a style of environmental policy making within which nation-state intervention moves away from a hierarchical command and control policy style and towards a more decentralized policy style, consensual negotiations, partial self-regulation (with legal boundaries), and the use of market mechanism and instruments.<sup>15</sup> Second, the changing state-market relations result in an increasing activation of economic agents and mechanisms for environmental reform. Producers, consumers and suppliers mainly appear as actors for environmental reform by using economic arguments and mechanisms in order to articulate environmental goals. Third, trans-nationalization and globalization change the dynamics of environmental reforms. The nation-state is no longer the only level of analyzing and influencing environmental policy making. Supranational bodies, such as GCC, influence national policy, through their policy orientations and transformations.<sup>16</sup>

According to O'Neil, "ecological modernization offers an innovative method for understanding national environmental policy as embedded in changing international context."<sup>17</sup> Weale extended the O'Neil thought on ecological modernization by citing it as "a precondition for future sustainable growth" so that the economy is not burdened by environmental protection program. All these arguments were summed up by Hayer when he said that ecological modernization "recognizes the environmental crisis as evidence of a fundamental omission in the workings of the institutions of the modern society."<sup>18</sup> Mol believed that the ecological modernization theory puts forth a radical reform program through the institutions of modern society, such as the market, state, science and technology, which will be radically transformed in coping with the environmental crisis.

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14. See Mol 1995 and 1996.

15. Berger 1999; Mol 1999.

16. Mol 2000.

17. Neil 1998: 3.

18. See Weale as cited in O'Neill 1998, 14; Hayer 1995:3.

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Ecological modernization is seen as one way of achieving economic recovery without sacrificing higher standards in the immediate environment.<sup>19</sup> It proposes to internalize externalities, designing clearer and more sustainable goods which meet clear environmental standards. Besides that, it also suggests that economic restructuring can be modified to incorporate environmental ends by providing a convergence between productive capital and the environmental goals of society.

### The Linkage between Economics and Ecology in the Formulation of Environmental Policy

The World Commission on Environment and Development (WCED) Report in 1987 found that interdependencies exist, on the one hand, between socio-economic and environmental conditions, processes and activities and, on the other, between environment and development. To quote an excerpt from this report on economic-ecological interdependence:

“We have in the past been concerned about the impacts of economic growth upon the environment. We are now forced to concern ourselves with the impact of the ecological stress – degradation of soils, water regimes, atmosphere and forests – upon our economic prospects. We have in the recent past been forced to face up to a sharp increase in economic interdependence among nations. We are now forced to accustom ourselves to an accelerating ecological interdependence among nations.”<sup>20</sup>

Economics deals generally with transactions in scarce resources for purposes of production and consumption. The economic exchange system comprises production, consumption and accumulation activities which create flows of goods and services (including labor) between the system components. The environmental system consists of natural, man-made and social components as illustrated by Bartelmus<sup>21</sup> (see Figure 2).

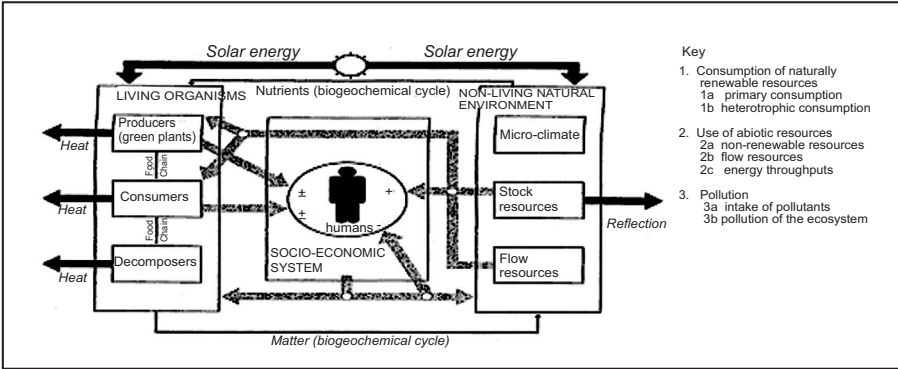
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19. OECD 1990.

20. WCED 1987: 5.

21. See Bartelmus 1986: 8.

Figure 2: Man and ecosystem-extension of environmental-economic system



Source: Bartelmus 1984: 40.

The composition of the Gross Domestic Product (GDP) as one of the economic growth indicators is crucial to understand the environmental impact. Different sectors of production have very different impacts on the environment and the usefulness of the output in relation to environmental improvements can vary.<sup>22</sup> The World Bank (1992) expresses the relationship between the production of GDP and the quality of the environment in the following formula:

Scale of the economy	X	Output structure	X	Input-Output Efficiency	X	Environmental Damage Per Unit Input	=	Quality of the Environment
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The formula demonstrates that the size of the GDP (the scale of the economy) is only one of the factors determining the impact on the environment from production in a given period during which there have been changes in the quality of the environment. Increasing economic activities have produced ever more environmental problems. For example, Meadows et al. (1972) in *The Limits to Growth*, extending the speculations of Forrester (1971) claimed that the world was heading for economic and environmental catastrophe possibly within 50 years if it did not curb its rate of economic growth.<sup>23</sup> Global economic collapse was believed to be a threat due to the rapid exhaustion of non-renewable resources and pollution on a widespread scale, which could ‘choke off’ production and adversely affect human health.<sup>24</sup> Environmental quality has historically improved in many respects particularly due to improvement in environmental

22. See Ropka 1997: 56.  
 23. Meadows et al. 1972; Forrester 1971  
 24. See Tisdell 2003: 57.

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health. On the other hand, the extent of the natural environment, especially the living environment, has suffered continual reduction with economic growth. The regional problems of smog forming, acidification, and eutrophication led to the upsurge in environmental policy in the seventies. Improvements in terms of one problem usually lead to negative effects in others. The increasing scope of environmental policy thus leads to increasing problems of coordination in policy formation and implementation.<sup>25</sup>

Environmental quality as a public good for consumption can be analyzed in two ways: First, the environment provides consumption goods that are measurable in physical units, such as oxygen in pounds inhaled per minute. Second, the environment provides consumption inputs which are only quantitatively valued, such as the amenity of the landscape.<sup>26</sup> In many cases, the process of production and consumption leads to an undesired impact on the production possibilities of producers or on the consumption possibilities of consumers. At the same time, there is no compensation for it via the market. Example of negative externalities are the pollution of air and water by a producer, who is negatively influencing other producers and consumers by his activities, while the victims of the pollution are not compensated for the damage via the market.<sup>27</sup>

Basically, there are two approaches for analyzing environmental policy. First, there is the traditional cost-benefit analysis which tries to analyze the cost and benefits of environmental programs. This is an attempt to express all costs and benefits of the program in monetary terms and to calculate the net benefits. Second, there is the macroeconomic approach that aims to identify the macroeconomic impact of environmental policy.<sup>28</sup> In this approach, the aim is to show the macroeconomic impact of the proposed environmental program in terms of effects on production and the positive environmental effects in physical terms such as the amount of emission reduction. For example, an avoided damage to forests in physical units, reduced health effects in physical units, or a monetary estimate of the avoided damage.<sup>29</sup>

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25. Huppes 1993: 2

26. See Siebert 1998: 10.

27. Pigou 1938 and Mishan 1967.

28. Nentjes 1989.

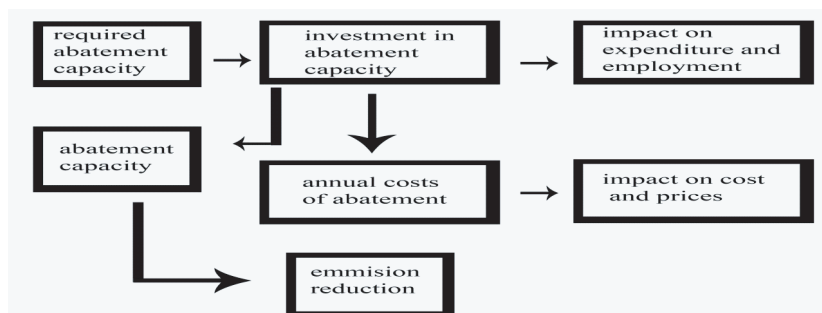
29. A detailed macroeconomics study for the Netherlands was done at the SEO, Foundation for Economic Research, University of Amsterdam, during 1980-1983, for the preparation of energy policy.

A prerequisite for integrating environmental and macroeconomic policies is the availability of indicators for environmental quality. A set of indicators is already available for the main targets of economic policy such as the level of national income, the level of unemployment, the rate of inflation, the balance of payments surplus or deficit and several monetary indicators such as the rate of interest and the national liquidity ratio. The increased primary costs of production caused by environmental policy will be expressed in the prices of goods and services. It can, *ceteris paribus*, be expected to create some inflationary pressure. In a small open economy, we may expect that the inflation pressure will result in a weakening of the competitive strength of the economy, provided that other countries do not pursue similar abatement strategies. There are three distinct structural forces that affect the environment – first, the scale of economic activity; second, the composition or structure of economic activity; and third, the effect of income on the demand and supply of pollution abatement efforts as shown here, algebraically:<sup>30</sup>

$$[\text{Ambient Pollution Level}] = [\text{GDP per unit area}] \times [\text{Composition of GDP}] \times [\text{Abatement Efforts}]$$

This equation is well explained by a non-linear dynamic input-output model with endogenous technical coefficients for energy branches called Model for Environmental Policy Analysis (MEPA). This model that includes about 1,000 equations makes it possible to calculate the impact of environmental policy both at the sectoral level and the macroeconomic level after aggregation<sup>31</sup> as shown in Figure 3.

**Figure 3: Model for Environmental Policy Analysis (MEPA)**



Source: Ehrlich 2001: 122.

30. Panayotou 1999 : 401-412 and Islam, Vincent and Panayotou, no. 701.

31. See Driehus et al. 1983, Hafkamp 1983, WRR 1981 and CPB 1988 and 1990.

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### Scenarios Update of Environmental Policies

Environmental problems differ in scope and intensity and, of course, they receive differing priorities in national planning and policy-making. Most of the evidence given in regard to reaching global limits of economic growth refers to exhaustible energy, resources, global warming from climate change, depletion of the ozone layer, land degradation and species extinction. Many uncertainties also surround the assessment of the depletion of the ozone layer and its effects on human health and ecosystems.

Four alternative scenarios were presented by the Inter-governmental Panel on Climate Change in 1990:<sup>32</sup>

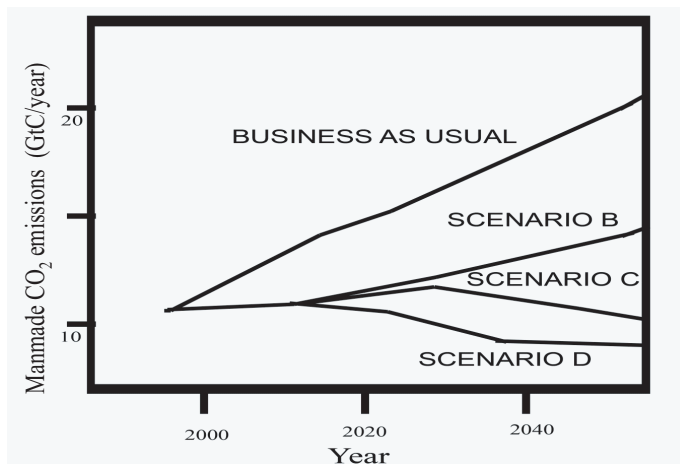
- a. Scenario A or “Business-as-usual” assumes that few or no steps are taken to limit greenhouse gas emissions. Energy use and clearing of tropical forests continue and fossil fuels, in particular, coal, remain the world’s primary energy source. The Montreal Protocol comes into effect but without strengthening and with less than 100 percent compliance. Under this scenario, the equivalent of a doubling of pre-industrial Carbon Dioxide (CO<sub>2</sub>) levels occurs by around 2025.
- b. Scenario B or “Low emissions scenario” assumes that the energy supply mix of fossil fuels shifts towards natural gas, large efficiency increases are achieved, deforestation is reversed, and emissions of Chloro-Floro Carbons (CFCs) are reduced by 50 percent from their 1986 levels. This results in an equivalent doubling of pre-industrial CO<sub>2</sub> by about 2040.
- c. Scenario C or “Control policies scenario” assumes that a shift towards renewable energies and safe nuclear energy takes place in the latter part of the next century, CFC gases are phased out and agricultural emissions (methane and nitrous oxide) are limited; an equivalent doubling of pre-industrial CO<sub>2</sub> will occur in about 2050.
- d. Scenario D or “Accelerated policies scenario” assumes that a rapid shift to renewable energies and safe nuclear energy takes place early in the next century, stringent emission controls are implemented in industrial countries and moderate growth of emissions occurs in developing countries. This scenario, which assumes CO<sub>2</sub> emissions are reduced to 50 percent of 1985 levels, stabilizes equivalent CO<sub>2</sub> concentrations at about

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32. International Panel on Climate Change (IPCC) Report on Projected Man-made CO<sub>2</sub> Emission (billion tons carbon per year), 1990, 15.

twice the pre-industrial levels towards the end of the next century. (These four scenarios have been outlined in Figure 4)

**Figure 4: Projected man-made CO<sub>2</sub> emissions (billions tons carbon per year)**



Source: IPCC 1990: 15.

Scenario studies offer an alternative approach to the benefit valuation methods as described in the economics of biodiversity analytical framework.<sup>33</sup> Scenario studies for biodiversity describe and analyze the past and the existing situation and sketch a future situation and how to arrive at it. Scenarios may indicate the threats to biodiversity of specific countries. Policy measures to protect biodiversity can then be ranked according to cost effectiveness, and priorities in biodiversity protection can be established. The analysis of the scenarios can be carried out by means of partial cost-benefit analysis, assessment of indicators, as well as by multi-criteria analysis, which makes it possible to rank alternative policy plans on the basis of explicit weights that are attached to the various criteria.

According to Tisdell, population, environmental variables, economic well-being and development are closely interwoven.<sup>34</sup> Increases in human population not only threaten the natural environment and global sustainability in low income situations, but also pose a problem in higher income situations. In communities

33. Introducing analytical frameworks that represent a useful way of thinking about the economics of biodiversity through the medium of abstract mathematical models can, among others, be found in Weitzman 1998.

34. See the updated version of Tisdell, *Population, Economics, Development and Environmental Security* 1994 which includes an extra case study on biodiversity conservation in China.

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with higher per capita incomes, the incremental impact of rising population on the natural environment tends to be greater than in low-income situations. Due to the quantity of natural resources transformed for human use, the wastes and pollutants generated by production and lifestyle maintenance tends to be far higher per individual. Market related systems are liable to be selective in the saving of species in relation to biodiversity.

The relationship between economic development and the state of environment is complex. Value judgments are required in deciding the factors that improve environmental quality. The natural environment tends to be a casualty of development due to the increasing demand on resources resulting from economic growth and development unless positive measures are taken to protect it. The World Bank (1992) identified loss of biodiversity as a development casualty. Both economic growth and increase in human population are threats to biodiversity and positive economic action is required to counter such threats. It is necessary to analyze and understand the forces that determine environmental change as well as to choose a set of nature policies that will move us toward a sustainable future through understanding of social institutions, and ecological and economic processes.<sup>35</sup>

A key implication of the interdependence between environmental and development goals as stated in International Energy Agency (IEA) baseline scenario is that GHG emissions will continue to rise rapidly over the 21st century and exacerbate current global warming trends.<sup>36</sup> This is possible if the adoption of low-carbon energy technologies is not supported by decisive globally coordinated policy action. Emerging clean energy technologies can move the global energy system onto a more sustainable path and return worldwide energy related CO<sub>2</sub> emissions back to today's level by 2050. Therefore, ecosystem degradation and global warming pose serious threats both for poverty reduction and development. This has been confirmed by many scenario studies and deserves high priority on the future development policy agenda. Global environmental scenarios have influenced global policy in several ways. They have focused the world's attention on key environmental issues, such as climate change.<sup>37</sup> They have been used to examine the prospects for world development<sup>38</sup> and also to

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35. See C.Martin van der Heide et al.

36. See Dirk Willenbockel, "Global Energy and Developmental Scenario: Implications for Development Policy."

37. IPCC 2001.

38. Gallopin et al. 2006.

involve experts and stakeholders in discussions about the global environment.<sup>39</sup> Many global scenarios incorporate hidden assumptions about the resilience of the ecosystems. Ecological feedbacks and emergent properties of interacting subsystems can serve as major drivers of global processes as suggested by several studies.<sup>40</sup>

Early results from the Millennium Ecosystem Assessment indicate that models for understanding interaction and trade-offs among ecosystems are lacking.<sup>41</sup> Consequently, ecological feedbacks are not thoroughly addressed in global environmental scenarios. Other steps that are important for scenarios include finding better ways to model ecological feedback, developing ecological scenarios at multiple scales, and improving the involvement of large, diverse stakeholder communities in scenario development. In addition, environmental and natural resources receive relatively little attention in the literature because of the difficulty to quantify their contribution to economic growth. In this context, Dasgupta (2003) argues that models of economic growth embed a rather simplistic notion of the contribution of the natural and environmental resources to economic growth.

Many of the factors that affect the global environment are interconnected. For example, three factors can be identified – water, fertilizer and population. Their relationship starts with water and is followed by land as next most important natural resource. The exploitation of land is essential for food, which in turn, is essential for survival of the population. Such exploitation is justified if it is done at a sustainable rate, that is at a rate that gives nature the time to recoup. There must be a balance between these three factors. If, on the other hand, modern farming methods are used to accelerate land exploitation that will require the use of chemical fertilizers. These fertilizers require huge amounts of water. Therefore, there must be a consonance and a balance between the use of fertilizer and water and the needs of the population. The environmental resource base upon which all economic activity ultimately depends includes ecological systems that produce a wide variety of services. Economic activities are sustainable only if the life-support ecosystems on which they depend are resilient although this is difficult to measure. The loss of ecosystem resilience is potentially important for at least three reasons:<sup>42</sup>

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39. UNEP 2002.

40. Bennett, Carpenter et al. 2003

41. See E M Bennett et al. 2003: 328.

42. See Kenneth Arrow, Bert Bolin et al. (2002): 13-14.

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- a. The discontinuous change in ecosystem functions as the system flips from one equilibrium to another could be associated with a sudden loss of biological productivity and later to a reduced capacity to support human life.
- b. It may imply an irreversible change in the set of options that are open both to present and future generations such as soil erosion, depletion of ground water reservoirs, desertification and loss of biodiversity.
- c. Discontinuous and irreversible changes from familiar to unfamiliar states increase the uncertainties associated with the environmental effects of economic activities.

### Conclusion and Policy Recommendation for Gulf States

#### *The Rationale*

A key implication of the interdependence of environmental-development goals as outlined in the Millennium Ecosystem Assessment (MEA) Scenario Report emphasizes the need for a meaningful integration of environmental sustainability concerns in national development plans and strategies of individual donors and inter-governmental development agencies. In addition, there is also the need for closer coordination between multilateral environmental agreements and other international institutions in the development policy sphere.<sup>43</sup>

As Bass (2007) puts it in his concept idea, efforts to mainstream the notion of sustainability into the development discourse have been pursued with considerable success for more than two decades.<sup>44</sup> It seems that recognition of the need for integrated strategies towards development and environmental sustainability can hardly be considered a novel insight.<sup>45</sup> The MEA's conception of embedding environmental management into national poverty reduction strategies appears to aim too short if climate change policy is excluded from such integrated strategies based on International Panel on Climate Change (IPCC) evidence. This has been emphasized by Stern (2007) who claimed that it is essential for climate change to be fully integrated into development policy and the rich countries should honor their pledges to increase support through development assistance.<sup>46</sup>

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43. Carpenter et al. 2005: 570-74.

44. Bass 2007.

45. This is an extension of Bass's research work on "Making Poverty Reduction Irreversible: Development Implications of the MEA," London: IIED Briefing.

46. Stern 2007.

Environment good or damage may be assessed in terms of its direct or indirect impact on other sectors of activity, for example, the production of goods having a market price, or it may be assessed on the basis of substitute or complementary goods that do have a price.<sup>47</sup> The internalization of the environment in evaluation practices requires:

- a. Developing ways of estimating in monetary terms the opportunity costs associated with alternative uses of economic and environmental resources by placing monetary values on environmental goods and services and also environmental 'bads' and
- b. Choosing the course of action that is judged to be the 'best' for the society.

There are two impacts caused by environmental evaluation practices based on the combination of analytical and normative premises. First, the act of 'costing' environmental damage is taken to find a way by comparing environmental with non-environmental goods in monetary terms. Second, the 'monetization' of environmental costs and benefits provides the basis for maximizing the balance of benefits over costs for the society through applying the criterion of Pareto Efficiency for policy and project selection decisions in the usual way. A wide range of approaches have been devised with a view to ensuring that the various categories of environmental change such as deterioration, depletion, damage and others are taken properly into account.

The choice of environmental policy instruments can be useful in terms of matching the evolution of instruments to the evolution of private institutions. A basis for discussing such evolution is provided by the notion of market and non-market 'configurations'. A configuration is defined principally by market structure which also reflects the non-market relationships among households, the government, the productive enterprises of either the private firms or government. Such relationships include both current procedures such as those involved in enforcement of contracts and expectations, and whether or not the government will rescue a failed private enterprise.<sup>48</sup>

Discussion of environmental policy in any developing country setting involves considering two configuration trajectories. The first describes the path of industrial and commercial development usually in urban settings. This development is linked to problems of air quality, sanitation and solid waste

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47. Hanley 1993.

48. See Russell 2001: 357-358.

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management that plague most cities. The second trajectory describes the unique path of rural markets. The pattern of land tenure, the extent of rural poverty and the importance of export production determine configurations within the agricultural economy and, therefore, will influence which environmental policies seem most promising at a particular time. According to Horst Siebert, the following questions arise if the comparison in the differences of environmental policy (endowment) among countries is taken into account:

- a. Does environmental policy affect the comparative price advantage of a country?
- b. To what extent will a change in comparative advantage influence trade flows, location, decisions, the balance of payments, the terms of trade and the exchange rate?
- c. Does environmental policy in one country have an impact on environmental quality in another country? Does a strict environmental policy in one country imply such a change in international specialization that environmental quality in the other country will decline?
- d. Are gains from trade affected by environmental disruption?
- e. How does the environmental problem relate to trade policy? Do environmental policy instruments create trade barriers? Can trade policy tools such as import duties serve to reach environmental targets?<sup>49</sup>

A long-run orientation of environmental policy is relevant because the application of specific instruments takes a long time. The demand for a long-run thrust of environmental policy contrasts markedly with the actual environmental policy observed. For instance, old landfills are an example of a rather short-run orientated environmental policy which did not anticipate future damage. Perceptions on environment as established by the political process shift quickly over time and it seems that the policy maker is tempted to follow such shifts quickly.

Environmental systems are interdependent and represent a complex network of interaction. Distinguishing different environmental media such as air, water or land is only an auxiliary analytical device to grasp the complex problem. Environmental policy must take this interdependence between environmental media, abatement, emission and production technologies and between pollutants into account. If environmental policy addresses itself to only a particular media, a

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49. Siebert 1998.

particular pollutant or a particular abatement or production technology, it is likely to fail in the long run. Consequently, environmental policy has to be integrative and encompass all environmental media and pollutants. Besides the shift in emphasis on different environmental issues and the issues of deregulation, there are other aspects that have changed the importance of environmental policy. For example, the unusual increase in oil price represented a supply shock for the world economy which required economic adjustments in an institutional setting that had reduced flexibility. Energy conservation was the pressing problem and alternative energy sources became more important. This factor is very relevant especially to Gulf countries in order to formulate the right environmental policy for themselves.

### Recommended Policy for Gulf States

#### *Emission Tax*

The intent of an emission tax is to introduce a scarcity price for emissions. The important incentive function of an emission tax is to stimulate the search for a less pollution-intensive production technology and a more favorable abatement technology. Each individual firm has a definitive incentive to improve its abatement technology and to reduce tax payments.<sup>50</sup> The correct tax base for an emission tax or an efficient charge is the quantity of emissions measured in pounds or tons. It is expected that information problems will arise and alternative tax bases such as emissions, emissions indicator, emission intensive input, output, capital input and sales will have to be used.

It is an important question of environmental policy whether emissions can be measured within reasonable cost parameters. A similar indicator problem arises in water quality management if emissions are calculated in unit equivalent to the waste per inhabitant. In the Gulf countries, there was agreement on opening up options in future discussions on long term cooperative action with reference to reduced emissions from deforestation and consideration of the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.<sup>51</sup> Emission technology has improved considerably since the 1970s. Self-reporting is the usual practice in monitoring emissions in the case of permits. Self-reporting, backed up by occasional checks and by measurement of ambient environmental quality, seems to be a practical approach to the measurement

50. A more detailed analysis can be found in Siebert 1976c. Also compare Siebert 1982b.

51. See Raouf 2008: 5-6.

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problem. One procedure that can be used to set the emission tax is by legislating a nationally uniform tax rate. The legislature also can define the quality targets for different environmental media with respect to the most important pollutants and transfer the right to determine emission taxes to an independent government agency. The agency would be limited by the quality targets and its role would be to set prices and adjust them in such a way that the targets would be reached. Institutional setting would be consistent with nationally uniform environmental policy instruments which can also applied to a regionalization of environmental policy such as for the GCC countries.

### *Pollution Licenses*

Pollution licenses limit the total quantity of tolerable emissions for an environmental medium. Then, these emissions rights are sold to those wanting to use environment as a waste receptor. The limited quantity of emission rights is allocated through an artificial market where polluters represent demand and the government determines supply. Pollution rights must be transferrable. If a firm learns that it can abate emissions at lower costs, it must be able to sell its pollution rights to another polluter. It must be able to acquire pollution rights by inducing abatement in an existing firm if a firm wants to locate in a different area. The transferability of pollution rights brings about flexibility in the allocation of the limited quantity of emissions rights.

This approach is beneficial because it combines the advantages of the regulatory approach with the advantages of emission taxes. Environmental quality is clearly determined with no uncertainty regarding the total quantity of emissions by specifying the total quantity of tolerable emissions.

Pollution rights may be easily used in the case of regionalized environmental policy. Assume that environmental policy sets different quality targets for regional media, for instance, to protect a specific area of natural beauty. Then, fewer pollution rights would be supplied for this area. The price for a pollution right would be higher; consequently, either more abatement would take place or fewer pollution intensive sectors would locate in that region.<sup>52</sup>

Gulf countries have been under fire for carbon emissions from the large scale use of fossil fuels. Per capita emissions are very high even though the region's total carbon emissions are very low at only 2.4 percent compared to other regions. Traditional and emerging environmental threats are all interlinked. For example,

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52. Titenberg 2003.

desertification leads to biodiversity loss; livestock increase and overgrazing leads to desertification; waste dumping releases methane, which adds to the global warming problem which in turn leads to desertification, water scarcity and many other ecological disasters.

### *Environmental Taxes on Energy*

The energy tax was first introduced by the Commission of the European Community. It is partly based on the energy context of the energy carriers for about a third of its value and partly based on the carbon context for the remaining two-third.<sup>53</sup> At the global level, total effects are quantitatively relevant for the environmental problems of energy use only if many countries join in emissions reductions. The combination of a high tax rate and broad application as in tax A at the level of the OECD also has a severe effect on the energy producers.

The effectiveness, efficiency and equality of an energy tax should be assessed when evaluating policy measures. The aim of the taxes is to reduce energy depletion and to reduce CO<sub>2</sub> emissions. The Wolfson Commission chose an aggregate effect on national income and similar measures in constant prices computed through a macro-economics sectoral model.<sup>54</sup> Environmental policy as in the models is part of macro-economic policy that contrasts with the usual analysis of emissions reduction in micro-economic terms. The specification of equality as an equal environment economy trade-off in all decisions affected depends on the specifications of the problem regulated. CO<sub>2</sub> emissions from fossil energy could be the global warming problem that needs to be addressed accordingly by the government and policy makers. All substances contributing to it should be treated equally in terms of costs induced per unit of environmental improvement if global warming is the problem.<sup>55</sup>

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53. The first public action by the European Commission on this subject was a working paper presented to the Council of Environmental Minister of 21/12/1990. One political reason for the mixed nature is that without a tax on energy content, nuclear energy would become very profitable. The World Bank includes only two aspects of technology input-output efficiency and environmental damage per unit of input. In fact, the importance of technology is somewhat broader. For instance, environmental consequences are not only determined by the effectiveness in the use of a given input but by the use and quality of cleaning technology as well -- it matters whether a poisonous substance is spread widely or deposited.

54. Huppes 1993.

55. See Huppes, "Case Study on Energy Taxes," 357-359.

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