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The Role of Economic Policy and Environment in Sustainable Development

Mossalanejad, A.

Faculty of Political Sciences, University of Tehran, Tehran, Iran

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ABSTRACT: Economic policies need to be analyzed within consistent and coherent framework. In the absence of an operational framework the policy analyst is confronted with an indeterminate model to work with. This paper intends to offer a specific framework for economic-environment integration to highlight the role of economic policy and environment in sustainable development for the purpose of empirical analysis and hypothesis testing. The term was used by the Brundtland report coined what has become the most often-quoted definition of sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is a multidimensional and multidisciplinary concept that has been emerged from a number of disciplines including economics, ecology, ethics, sociology and political sciences. This notion links the welfare of generations with the capacity of the biosphere to sustain life. Sustainable development is not a fixed state but rather a process of change in which resource exploitation, the direction of investment, the orientation of technological development and institutional change are made consistent with the future as well as present needs. This report does not consider the range of policy instruments that could be used in achieving sustainable development outcomes, but focuses on a specific framework for economic - environment integration with emphasis on the "social" component of sustainable development.

Key words: Economic, Policy, Environment, Climate Change, Sustainable Development

INTRODUCTION

Today, most views of sustainable development include economic, environment and social dimensions. Economic and social integration has been dealt with through the study on the Macro- Economic undertaken by the Social Policy Branch of The Treasury. Sustainable Development, as interpreted and used by policy makers, is open to wide interpretation. There is increasing recognition of the need for a multi-disciplinary and integrated approach to inform decision-making on sustainability issues at the political level. The goal of achieving sustainable development was given international prominence by the United Nations Conference held in Stockholm in 1972. This sparked a great deal of debate and research on the need to conserve natural resources and the environment in order to achieve sustainable development. It should not be surprising that the original work of the Club of Rome can be directly linked with the burgeoning literature on sustainable development. Work reported by the Club of Rome (Meadows *et al.*, 1972) emphasized the need to conserve stock resources such as fossil fuel and minerals, and to control pollution such as acid rain and CO_2 concentrations. Simulations undertaken by Forrester (1971) highlighted four forces that limited economic growth *viz.* depletion of natural resources, risk of pollution, increase of population and decline in food availability. Dynamic models belonging to the Club of Rome *genre* attracted strong criticism from system theorists and economists. The absence of mechanisms for signaling relative scarcity, the lack of technological progress, and limited substitution across natural resources and capital were considered serious shortcomings. For example, Nordhaus (1973) suggested that a pricing mechanism would reflect increasing scarcity and provide incentives for the search for substitutes and more efficient production techniques. Berlinski (1976) was particularly critics of the theoretical underpinnings of systems analysis in general and the "limits-to-growth" models in particular. Although the Club of Rome acknowledges the indispensable role of the market for allocating resources, stimulating innovation and competition, it now sees an irreplaceable role for the state in correcting and utilizing market forces (Colombo,

*Corresponding author E-mail: info@mossalanejad.com

2001). Recently, the Club of Rome has been prominent in the debate on climate change by emphasizing the significance of governance in sustainable development. It believes that the goal of international politics should be expanded to include the development and dissemination of more efficient technologies and organizational structures to achieve sustainable development. In the early 1980s focus shifted from the conservation of stock resources to the need to conserve living resources in order to obtain sustainable development. This view was given some impetus by the World Conservation Strategy (IUCN, 1980). By the end of the 1980s the significance of sustaining the functioning of natural ecosystems was well recognized and had been incorporated into notions of sustainable development. The concept of sustainable development has thus evolved out of a concern that existing socio-economic systems may lead to economic growth or production that is not sustainable and consequently lower the well-being of future generations.

Implication of Economic Growth on Environment

Inter-temporal preferences are well known and are consistent over time. To maximize the present value of utility each generation passes on to the succeeding generation exactly what is required (e.g. resource endowments). Typically, the economy is assumed to be closed and production is set equal to consumption plus investment (Pezzey, 1992).Daly (1991) distinguishes between growth, as a quantitative increase, and development as a qualitative improvement or unfolding of potential. Two principles are advanced for the management of renewable resources. First, harvest rates should not exceed natural regeneration rates. Second, waste emissions should not exceed the assimilative capacity of the receiving ecosystem. Non-renewable resources use in this approach to clarify sustainable development because it is not possible to keep them "intact". The laws of physics reveal that the energy services embodied in fossil fuels can only be used once. This problem is resolved by requiring investment in the exploitation of non-renewable resources to be paired with a compensating investment in non-renewable substitutes.

Role of Ecological Economics on Environment

Ecological economics is a trans-disciplinary field with a domain that spans the entire set of interactions between ecosystems and economics systems, including the co-evolutionary relationships (Costanza, 1991). Three disciplinary pillars support ecological economics: ecology, economics, and ethics. While ecological economics acknowledges the utility of economic instruments as a means for achieving an efficient allocation of scarce resources it is quick to point out the shortcomings of allocative efficiency *viz.* efficiency does not guarantee ecological sustainability or distributional equity (Lawn, 2001). A great deal of effort has made to develop frameworks for guiding policy directed at sustainable development. The disciplines of economics, ecology, and ethics, were prominent during the early stages of the search for a coherent framework. More recently, concepts from sociology and political science have been incorporated into the on-going search for a framework (Putman, 1995). To date there is no consensus, at least in the academic literature, of what is sustainable development. This of course, is not necessarily a bad thing. Some would argue that plurality of method serves to enrich the debate and the formation of policy (Norgaard, 1985). Given this state of affairs, it seems important that at the least we understand the principles and reasoning behind the range of perspectives on sustainable development. The dimensionality of sustainable development, its trans-disciplinary content and the open ended of the concept itself, presents a considerable challenge. This section provides an overview of some, but not all, of the concepts commonly used to underpin frameworks of sustainable development. The report does not dwell on the range of economic instruments available to manage externalities in the economy (OECD, 2000).

Economic Growth

The Solow (1956) growth model is the starting point for most growth analyses (a modern treatment of growth theory is found in Romer (2001). The Solow model focuses on four variables: output (Q), capital (K), labor (L) and knowledge (A), thus $Q(t) = F(K(t), A(t)L(t))$. Variable A is also referred to as the effectiveness of labor. Economic growth is defined as rising aggregate consumption (C) or output (Q). Because growth is measured in value and not physical units, growth in economic output does not necessarily mean growth in physical throughput of materials (and by implication increased residuals) and energy. The model implies that regardless of its starting point the economy converges to a balanced growth path, where capital per worker (K/L) and output per worker (Q/L) is growing at a constant rate. Growth in output per unit of labor is determined solely by the rate of technological progress.There are two possible sources of variation in output per worker: differences in capital per unit of labor (K/L) and differences in the effectiveness of labor (A). The principal conclusion of the Solow growth model is that the accumulation of physical capital alone cannot account for the growth over time in output per person or for the geographic differences in output per person. In other words the observed differences in real income are too large to be accounted for by differences in capital inputs. Growth in the effectiveness of labor *(A)* is exogenous in the Solow model. As a driving force of growth, the definition of (*A*) is not at all precise. For example, it could correspond to the stock of knowledge, education and skill levels in the work force (human capital), the quality of property rights, the quality of infrastructure, cultural attitudes toward work, etc.

Natural resources, pollution and other environmental considerations are absent from the original Solow model. When considering how environmental limitations affect long-term growth, the standard approach is to distinguish between environmental factors for which there are well-defined property rights (e.g. oil) and those for which there are not (e.g. air). If property rights exist then markets can provide useful signals on relative scarcity. For example, evidence that a finite stock of oil could limit production in the future is not a sufficient economic reason for government intervention; the market will address the issue of scarcity. In contrast, the case for government intervention is much stronger in situations where externalities arise from the use of environmental services for which there are no property rights.

On a balanced growth path, resource limitations can cause a drag on growth with output per unit of labor declining. But the overall impact on growth will depend on technological progress – if the rate of technological progress exceeds the drag of resource limitations then there will be sustained output per worker. This result clearly depends on the production function, more precisely the elasticity of substitution between inputs (for example, capital and natural resources). If elasticity is less than one – indicating a relatively low ability to substitute - then the share of income going to inputs becoming scarcer (e.g. natural gas) rises over time, and the fixed supply of the resource leads to steadily declining incomes.

Because some definitions of sustainability require the stock of natural assets to be kept "intact" introducing sustainability into a formal model requires the use of a principle of intergenerational equity. This of course requires the formulation of an objective function. To some, the conventional wisdom of using a net present value function tips the inter-temporal scales of justice too much in favor of the present generation. But arbitrarily perturbing the interest rate does not solve the problem of achieving intergenerational equity.

Intergenerational Welfare

Concern for the well being of future generations takes centre-stage in most definitions of sustainable development. In a static general equilibrium framework it is well known that the competitive market will come up with a different efficient allocation of goods and services for each initial distribution of income. The efficiency criterion cannot decide between efficient allocations because the choice of the initial distribution of income is logically prior to the workings of efficiency (Page, 1977). Introducing time into a welfare indicator adds the complication of how to evaluate welfare over time and the appropriateness of discounting future welfare. The issue of discounting is discussed in the next section.

Pezzey (1992) provides the following distinctions between optimality, sustainability and survivability. Each definition brings its own complication. All three definitions require an indicator *W* to measure sustainability. Survivable welfare requires welfare minima to be set. Optimal welfare requires use of a discount rate.Rawls (1971) developed an alternative theory of justice based on a social contract in which individuals operate behind a "veil of ignorance" in that no-one knows which position in society she or he may be born into, or their endowments. The principles developed by Rawls have been incorporated into economics as a welfare function based on "maximizing the minimum welfare". Rawls did not develop rules for inter-temporal social choice.

Dasgupta (1974) examined the behavior of a neo-classical growth model when the utilitarian objective function is replaced by a *maximum* objective function. The model allows output to be consumed now to gain utility or invested to increase the size of capital in the future. Transferring capital from an earlier to a later generation will in general mean that the later generation receives more, in terms of goods, than the earlier one gave up. The zero growth that results from the application of the *maximum* principle to the problem of intergenerational allocation, has led many economists to regard Rawls' principles of justice as excessively conservative.

Later, Pezzey (1997) considered the first definition more acceptable; the second definition of non-declining utility is considered too strong; and the third definition is considered too weak an expression of inter-temporal concern.

Discounting

The role of discounting is a contentious issue in the sustainability debate. Environmentalists have long criticized discounting because it is claimed that:

- High discount rates increase the approval rate of ecologically destructive projects. This concern is linked to the time. It takes time for ecological damage such as water eutrophication and desertification to become apparent, environmental rehabilitation projects may take a long time to produce beneficial effects. It may take decades for the rehabilitation of indigenous forests to yield significant beneficial outcomes.

- Simple models of optimal resource utilization show that it is rational to harvest a natural resource to extinction.

In an economy where the government engages in policy reforms and the policies (such as climate change, and biodiversity) are chosen in a sequential manner then the implicit social discount rate connects investment and consumption over time. Returning to the Economist's article, there is a presumption that social discount rates are independent of the income associated with the policy. Dasgupta (2000) shows that welfare depends on two parameters and that reflect different concerns: is an index of the value attached to intergenerational equity and is the weight attached to future generations' utility relative to the present generation. The larger is the more egalitarian is the optimal consumption path. Dasgupta (2000) applies this line of reasoning to global warming. If global warming leads to declines in global consumption over an extended period in the future, then consumption rates of interest could well be negative. Thus from our present point of view future global losses would be amplified as opposed to reduced to negligible figures through discounting. Thus the welfare economics of global warming needs to be developed within the context of optimizing economies, as done in Nordhaus and Yang (1996). The Ramsey-Koopmans theory advocates that projects having long-run effects should be subjected to the same conceptual treatment as those that have near-term effects. Dasgupta (2000) has demonstrated it is incorrect to use project-specific discount rates. However, Weitzman (2001) provides us with an argument for the use of a variable discount rate over time. He considers the choice of an appropriate discount rate to be one of the most critical problems in economics. Given a range of views on the role of government and the ethical foundations of intergenerational discounting, there is considerable scope for rational individuals to hold different views. At the empirical level, no consensus has ever existed about what actual rate of interest to use. In contrast to exponential discounting, Weitzman proposes a "sliding scale" social discount rate. A marginal discount rate of 4% is suggested for [0.5] years, decreasing to 0% for benefits and costs falling over 300 years.

A great deal of uncertainty surrounds the choice of an appropriate discount rate. Ethical differences and the absence of agreement on what rate to use are problematical because contemporary sustainable development challenges typically span generations. Given this state of affairs the proper procedure is to perform sensitivity analysis using several plausible discount rates and, perhaps, apply the sliding scale method advocated by Weitzman.

Ecology and Physical Laws

Ecology is the study of relations among plants, animals, people, and their environment and the balance between these relationships. Explicitly incorporating the structure, functioning and dynamics of life supporting ecosystems into models of sustainable development, as noted earlier, is one of the three pillars of ecological economics.

Some ecologists emphasize system function and resilience of ecosystems, concepts that do not appear in standard economic treatments of sustainable development. This view holds that ecological systems are only malleable within certain limits. Acknowledging these limits constrains our ability to substitute natural and manufactured capital over time. Two streams of analysis have their origins in the laws of thermodynamics. The first, known as the "materials balance approach", developed by Ayres and Kneese (1969), is based on the first law of thermodynamics *viz.* the law of the conservation of matter. All materials and energy used by economic activity are shown to go back into the environment. The framework is particularly useful in formulating and analyzing policy responses to the inevitable externalities associated with production and consumption. Recognition of the importance of the second law of thermodynamics is attributed to Georgescu-Roegen (1971). The second law recognizes the qualitative distinction between the inputs of valuable resources (low entropy) and the final outputs of valueless waste (high entropy). Thus economic activity takes low entropy matter/energy inputs (e.g. fossil fuels) and converts them into high entropy matter/energy outputs (e.g. dispersed gases and particles). The energy liberated by this process is irreversibly lost. In the longest of time frames (e.g. astronomical time) the second law tells us that sustainable development is meaningless. This is not terribly helpful to contemporary decision makers other than to remind us that complete recycling is not feasible. Deep ecology is an attempt to synthesize philosophical attitudes about the relationship between nature and human activity. Deep ecology substitutes. Other things being equal, higher elasticity imply lower carbon tax rates and tax revenues with a given target amount of CO_2 reduction. Vlachou *et al.* (1996) use estimated elasticity for the electricity industry in Greece to show that carbon taxes will induce a shift away from lignite-based generation of electricity to hydro and energy conservation.

The degree to which it is possible to substitute natural capital with manufactured capital is an empirical issue. If sustainable development is constrained by ecological facts then it follows that the substitution between natural and manufactured capital will be limited. Additional constraints would be imposed if Daly's (1991) suggestion was adopted as a principle for sustainable development *viz.* that the depletion of stock resources should be limited by the investment in enhancing renewable sources. However, the precise nature of the pairing is not clear. For example, must the investment in renewable natural capital (e.g. solar energy) be a close substitute for the exploitation of non-renewable capital (e.g. natural gas)? Or should the investment yield an equal value of sustainable consumption (e.g. electricity)?

It should also be noted that technical progress is a separate issue from substitution. Technical progress occurs when a higher level of output can be produced from a given quantity of inputs. Humphreys (2001) shows that increase in environmental costs have been more than offset by technological developments in the mining industry.

Economic Growth & Environment Policy

In This Article have asset out the complexity of the relationship between economic growth and environment, and the role of environmental policy in delivering environmental outcomes, such that the synergies with economic growth are maximized and that put the economy on an environmentally sustainable growth patch. Some natural assets have critical thresholds, which must be respected, and there is increasing evidence that we may be approaching or exceeding a range of the thresholds, not least regarding greenhouse gas emissions. Government intervention is required to ensure that production and consumption choices reflect the true cost of their environmental impacts. As long as prices paid by individuals and businesses do not reflect these true costs, and whilst incentives to use environmental assets cost-effectively remain weak, natural capital will not be allocated or consumed in a sustainable manner.

The natural environment is fundamental to the economy, providing both direct and indirect inputs to economic activity and acting as a sink to absorb the by-products of production and consumption. The relationship between economic growths will require decoupling economic growth from its environmental impacts, not just nationally but globally.

Developing consistent and coherent environmental policies to tackle the externality and other market failures is a significant challenge in terms of:

- Understanding major, non-marginal changes to natural assets;
- Valuing smaller marginal changes in the provision and use environmental assets and ecosystems services, and factoring them into economic decision;
- Investing in infrastructure and environmental R&D to correct for market failures but ensuring that it does not 'crowd out' private investment; and
- Overcoming barriers to behavior change and the take-up of cost-effective measures and practices that help protect the natural environment.

The role of environmental policy is to make sure that natural assets are consumed efficiently and at a sustainable rate, respecting potential critical thresholds. This will ensure that natural assets are available to contribute to our well-being and to enable and support economic growth in the future. Addressing these challenges is essential for designing effective policies that deliver environmental outcomes and help the economy achieve sustained and durable economic growth.

Environmental policy can also help enterprises to realize cost-effective resource savings and drive the take-up of best practice and improvements in the production process. For example, it has been estimated that enterprises in the UK could save up to £6.4bn per year by taking no-or low-cost measures to improve their resource-efficiency.102 information provision and other policies to overcome barriers to the business take-up of resource efficient measures and practices provide both financial and environmental wins.

In the long-term, environmental policy can support growth by incentivizing innovation and providing opportunities for UK environmental industries. The Stern Review (Stern, 2006) estimates that, by 2050, the global low carbon energy industry could employ more that 25 million people and the low carbon energy technology industry could be worth around $500 billion. The market opportunities are likely to be even greater in the context of reducing the wider environmental impacts of economic activity beyond carbon.

Smart environmental policy-making can limit any short-term negative impacts of making the shift to a more resource-efficient and environmentally sustainable economy. Designing legislation that minimizes administrative burdens on enterprises stimulates innovation and signals a coherent long-term regulatory framework will help minimize the costs of environmental regulations on the economy. It is worth noting that any near-term costs of implementing environmental policy must be viewed in the context of the costs of not taking action.

Finally, investment in infrastructure can reduce future environmental risks to economic growth-both by reducing the level of environmental risk faced by the economy and by increasing the resilience of the economy to these risks. The required infrastructure, both public and private, that is suited to long-term environmental needs and challenges. For example, more resilient water infrastructure and stronger flood defenses required to sustain growth in the face of a changing climate.

Designing policies such that the regulatory burden on the economy is essential for realizing all the potential growth benefits of environmental policy in terms of improving overall economic efficiency and in terms of securing long-term growth. Through this, environmental policy can help increase prosperity and wellbeing-not just greater incomes but improved health, education and quality of life-for future generations.

The primary goal of environmental policy is to ensure that the natural environment is managed and used sustainably, and to avoid the breach of any critical thresholds beyond which sudden, dramatic, or irreversible changes may occur; or beyond which substitution by other natural assets of other factors of production is not possible. This helps secure the many benefits that society receives from the environment, as an input to economic activity and as a driver of people's well-being and quality of life in its own right.

Government policy, and specifically environmental policy, has an important role in incentivizing technological progress and innovation. Policies aimed at ensuring that environmental inputs are likely to spur enterprises to innovate in order to reduce costs. For example, Reid and Miedzinski (2008) find that government policy is a major driver of green innovation. Specifically, government policy can encourage environmental innovation through 'demand-pull' policies, such as regulations or public procurement that increase demand for innovation, and 'supply-push' policies such as subsidies and tax breaks for research. (Frontier Economics, 2009).Technological progress and the development of new knowledge are important drivers of economic growth, and is a key factor in ensuring that the shift to environmentally sustainable growth happens at least cost to the economy. New knowledge is generated by R&D –which could be funded publicly or privately (Gouldner and Schneider 1999).

In addition, a consistent and coherent environmental policy can provide greater certainty about the value of investments and incentivize environmental R&D further towards the socially optimal level. Proter and van der Line (1995) find evidence to this effect, as well as the effect of environmental regulation in reducing inertia and raising awareness amongst firms of inefficiencies in their production processes. Requiring compliance with environmental regulations has also been found to increase innovation-for example, Jaffe and Palmer (1997) find and increase in compliance expenditure to be associated with an overall short-run increase in R&D.

Due to the wide range of factors influencing the economy, we cannot deny the effect of environmental policy on overall levels of R&D investment. For example, early studies of the impact of climate policies found that they stimulated innovation in alternative energy industries, but discouraged R&D in non-energy sectors-leading to a contraction in total production and reducing the overall rate of technical progress.

Environmental policy can result in savings and benefits to enterprises and industries-reductions in resource costs from improved resource efficiency; growth in expanding environmental industries and increased international competitiveness for 'first movers'; and lower risks to growth from improved business resilience to environmental shocks. It has also been noted that environmental policies need not have negative implications for investment (Defra, 2010).

However, more recent research has found mixed results. In particular, Frohwein and Hansjurgens (2005) analyze the Porter hypothesis in the context of recent EU REACH regulation. They find that although some firms may benefit from more stringent regulation, others would be worse off. Jorgenson and Wilcoxen (1990) find that capital investment to comply with more stringed environmental regulations slowed the US economy by 0.2% annually between 1974 and 1985 compared to business-as-usual. Furthermore, the study concludes that the growth effects would have been even more modest had more effective policy choices been made. In analyzing the economic impact of the EU Emissions Trading Scheme, Peterson (2003) similarly finds a negative macroeconomic effect, but effects were found to be equally if not more negligible. (Porter, 1991).

CONCLUSION

The early literature on sustainable development draws upon two broad intellectual traditions; one concerned with the limits of nature, the other with the potential for human material development (Redclift, 1987). Today the literature on sustainable development has exploded and appears in many disciplines. Pezzoli (1997) identifies ten categories of literature in which a view on sustainable development is expressed including: managerial; ecological economics; environmental sciences; environmental law; eco-philosophy; utopianism; and political ecology. The challenges, as Pezzoli (1997) sees them, include: (1) holism and co – evolution; (2) social justice and equity; (3) empowerment and community building; and (4) sustainable production and reproduction.

The following concepts are common to each definition of sustainable development:
• Sustainable development is multidisciplinary concept emerged from many disciplines.
• Sustainable development links the welfare of generations with the capacity of the biosphere to sustain life.
• Sustainable development has a policy focus because it about the “design” of policy that ensures delivery of a set of quantitative and qualitative outcomes.

Although we might agree on high-level concepts, differences will arise out of the multiplicity of views taken of sustainable development. The potential differences are listed below. These will become more evident in the next section.
• Most definitions of sustainable development are based on an ethical position; some (see Lawn, 2001). It must be recognized that views on sustainable development depend on the particular ethic adopted. At the theoretical level, it is highly obvious that there is no possible way of reconciling these views (Northrop, 1947). At the level of applied policy analysis, the discourse will be based on ethical values embedded in the analytical framework. These values, of course, must be transparent.
• The issue of substituting manufactured and natural capital has an ethical and technical feasibility component. The capacity (and likelihood) of technology, as expressed in manufactured capital, to provide likely substitutes for natural capital is an empirical issue that is unlikely to be resolved *ex ante*. Whether or not substitution is acceptable is an ethical issue.
• Methodological differences are apparent. Economics as a discipline has a long tradition of using mathematical models to analyze issues related to sustainable development. Methods used in ecological economics tend to be more pluralistic, look more to biological and physical sciences, and often adopt different ethical positions.

Neoclassical economic theory brings an understanding of important elements in growth and sustainable development. The theory provides a way of organizing one’s thoughts on these matters. However, the question about whether environmental decline is bound to be associated with economic growth can’t be answered decisively by the theory. The theory is useful because it assists us in pin pointing those considerations on which the answer depends.

The relationships illustrated can be formalized using the extended input-output accounting framework pioneered by Ayres and Kneese (1969). The input-output model accounts for material flows from the environment, the various stages of production, consumption and finally the residuals receiving media. The model is based on the conservation of matter. The original work of Ayres and Kneese was static and Toman *et al.* (1998) show how the static input-output framework can be adapted to account for changes in the quantity and quality of natural and environmental resources.

Toman (1998) provides a summary of the current state of knowledge on sustainable development from the perspective of what practical guidance is offered by economic analysis to decision makers. In short he doubts the capacity any more or less of a mechanistic rule, economic, scientific or otherwise, to provide definitive and reliable answers about sustainable policies or conduct. He is however more optimistic about being able to identify processes and procedures that can guide decision-making. In particular, he argues for methodological pluralism and the need to recognize the range of different values at stake. Lawn (2001) suggests that sustainable development is an ethical guiding principle and not a futuristic state. Thus:

- It is not possible to design an optimal set of instruments to achieve sustainable development.
- The sustainable development concept must incorporate “decision making” rules to guide appropriate action.

Clearly, it is not possible to design an optimal set of instruments if the end-state cannot be specified. This view leaves the policy analyst with an indeterminate model to work with.
The Principle of sustainable decision-making offered by Toman (1998) is aimed at promoting sustainable development:

- Prior assessment of what criteria and evaluation tools should apply to the issue.
- Assessment of physical impacts across time and space.
- Assessment of economic benefits and costs.
- Identification of whether and how social values and norms may be affected.
- Engagement in public discourse about the consequences of different actions.
- Pluralistic decision-making.
- Using the results of the decision process to incorporate new information.

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