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Methods of analysis used in global and regional assessments and indices of performance in environmental governance

Chapter 21

Introduction

This chapter examines the analytical methods used in the United Nations Environment Programme's (UNEP) reporting on the state of the environment. The flawed methods embedded in the DPSIR framework have significant implications for projecting the future of the planet. Policy-makers and their advisers need to be giving more attention to deficiencies in these frameworks, the inadequacies of the evidence base, and the consequences of using data whose focus is on administrative regions and national states as distinct from geographical areas with common ecological, geological, topographical, economic and cultural coherence. The review also stresses the need for greater attention to the complexities of the ecology of small states and islands and drawbacks in attempting to apply simplistic causal and effect models to the process of change and intervention attending fragile ecosystems and their vulnerability to exogenous shocks.

The DPSIR Framework

In the development of its Environmental Outlook publications UNEP adopted the so-called DPSIR framework for presenting its model of the relationship of the environment to human activity and for analysing relevant policy responses to the issues identified.

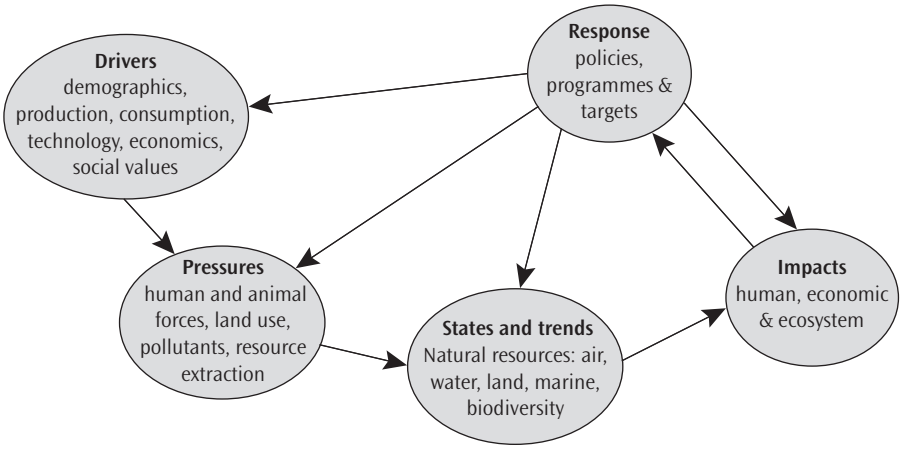
DPSIR stands for:

- Drivers,
- Pressures,
- States and trends,
- Impacts, and
- Response.

Figure 21.1 presents a stylised picture of the imputed relationships between these elements.

The DPSIR Framework is a common feature in the other main conceptual frameworks (see Figures 21.1–21.3 and Box 21.1). UNEP has used them in the development of the analysis for the *African Environment Outlook 2*, published in 2006, and for the *Global Environment Outlook 4* published in 2007. The DPSIR framework has a series of implied assumptions and inherent logical flaws in its use as a tool in critical review of the thematic areas for policy development.

Figure 21.1. The DPSIR framework



Source: Adapted from UNEP (2006) AEO2, Earthscan for UNEP

In the basic DPSIR model, whilst the 'circuit' diagram depicts, it seems, causal relationships between drivers, pressures, states and trends and impacts, the science base for this is assumed, but not evident. The case studies presented by UNEP in *AEO 1* in 2004 indicate a more complex, paradoxical or delinquent relationship between components and their likely illumination on outcomes[1]. In DPSIR, the states and trends are assumed to be identifiable, measurable and accurately measured by standard methods; the nature, power and direction of the impacts are assumed to be knowable, non-catastrophic and reversible; the capacity and commitment to respond is inferred to be present and sufficient; the relationship of benefits to intervention cost is assumed to be positive over whatever timescale is required for fruition.

Box 21.1 sets out the definitions of the terms used by UNEP with examples of the scope and content of each of the elements within the different analytical frameworks that have been developed for the African Environment Outlook and the Global Environment Outlook publications.

Box 21.1. Definitions of terms used in the methods of analysis

Framework: an essential supporting or underlying structure, which identifies the principal elements and their interdependencies. The concept of a framework in natural resource analysis may include ecosystems concepts which link living organisms to their immediate physical, chemical and biological environment; it may also include economic and management systems, concepts concerned with human groups, institutions, power, governance, social relations, the market place, flows of goods and services, and the impact propensity of interconnections. In examining a defined framework, it is illuminating to ask: what has been omitted and what are the meanings to be attached to the form of representation and the metaphors implied by the terms and the interconnecting lines and symbols? Examples of commonly-used frameworks in natural resource analysis are: **ecosystems**, **DPSIR** framework, **Opportunities** framework, the **Sustainable Livelihoods** framework, and the **GEO 4** Frameworks (see later).

The DPSIR framework consists of the interconnected elements of **Drivers, Pressures, States and Trends, Impacts,** and **Responses** as defined below.

Drivers: fundamental processes in society that drive activities with a direct impact on the environment. Examples of drivers include: demographics, consumption and production, technology, trade, value systems. These may be seen as the causal factors in pressures on the environment.

Pressures: forces exerted on an object by something in contact with it. In natural resource analysis, pressures arise from human or other living forces on the environment disturbing the equilibrium or homeostasis that is the steady state. Whilst it is recognised that both ecosystems and human systems are in states of continual change and that homeostasis may be a misleading theoretical concept, major changes in ecosystems are occurring globally and locally. Changing pressures on the natural environment derive from factors such as human changes in land use, extraction of natural resources, the use of chemicals in farming, and emissions of waste and pollutants.

States and Trends: The observed conditions of objects and the rate and direction of change in those conditions. Examples of environmental conditions include air and water quality, biodiversity, ice and forest cover. The change in such states may be positive or negative, and the trends continuous, cyclical, fluctuating or irreversible. Changes may arise from endogenous or exogenous sources, natural, or induced by a driver or pressure. Examples of natural factors affecting environmental states and trends include solar radiation, precipitation, diurnal and seasonal weather changes, fertilisation, extreme natural events such as volcanoes, cyclones, floods and droughts, and climate change. The complexity of the physical, chemical and biological factors in the ecosystem and their interrelationships makes it difficult to predict and to model environmental change. The vulnerability of the environment to change and its natural capacity to absorb change and to respond and adapt varies between regions and countries. Small states and islands are commonly considered to be more fragile, vulnerable and less naturally resilient to pressures on their natural environment. Their carrying capacity for absorbing shocks is believed to be low and therefore in need of more careful protection than other geographical types of country.

Impacts: The action of one object coming forcibly into contact with another, thus affecting its state. The impact may be on the state of the environment or on human well-being or both. It may be positive or negative, large or small. The nature of the impact may affect security, physical relationships or adaptive capacities.

Responses: The re-actions to an impact or to a change in the state of trend of an environmental or human condition. Responses take place in treaties, laws, institutional systems, policies and programmes and at global, regional, national and local levels. They may be positive, negative, effective, catastrophic, temporary or permanent.

The Opportunities framework: Opportunities are the circumstances affecting the choice of action in the use of natural resources. This concept within a framework of policy and programmes promotes a positive and anticipatory, forward-looking perspective, rather than one which merely responds to drivers, pressures, states, trends and impacts. This approach

embraces the precautionary principle, preparedness and sustainable management of natural resources rather than merely protection and conservation (see Figure 21.2). This framework incorporates the DPSIR components with the addition of the core issue of opportunities and the options for reviewing current and future policy and actions through programmes and projects. The Impact component more explicitly identifies human, economic and ecosystem dimensions and through the opportunities linkage it considers opportunity costs; that is, the benefits to be gained by particular policies and actions and not merely the adverse costs of shocks and damage. The hallmark of this analytical framework is the posture of review of proactive policy and institutional development and action in the pursuit of opportunities for sustainable development. The DPSIR framework tends to exclude precautionary action to restrict and prevent environmental, human and economic loss.

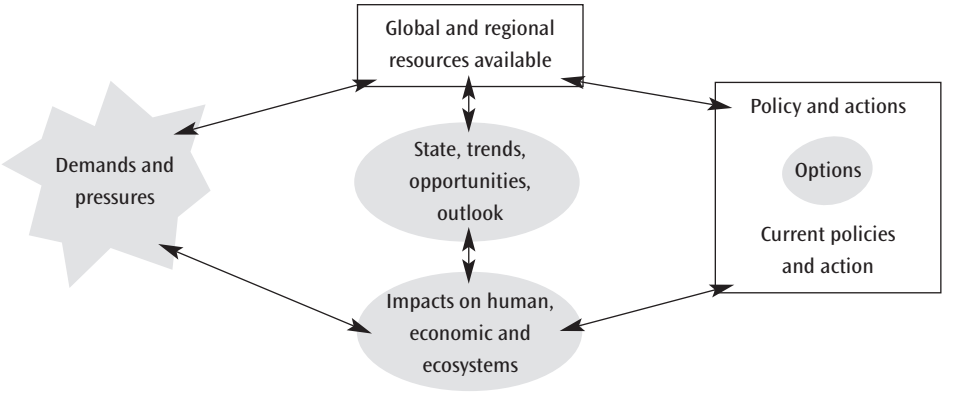
The sustainable livelihoods framework: This framework was developed for *AEO 2* in 2006, couples science-based environmental information, environmental policy-making and the interplay between economic, social and environmental dimensions of policy and action, in the pursuit of sustainable development. It takes livelihoods as an asset and examines how far these become vulnerable to external pressure (here denoted as shocks, meaning sudden large pressures, which can overwhelm the capacity for resilience). The assets are considered as capital stock and include human, natural, financial, social and physical capital (following a classification developed by Jeffrey Sachs[2]). Through the transforming structure component (public and private sector, laws, policies, culture, institutions, etc.), these elements of capital can be sustained, adapted and further developed to become more resilient to existing and future pressures. This is accomplished through livelihood strategies giving rise to new livelihood outcomes, with more income, greater well-being, increased resilience, improved security and more sustainable use of natural resources (see Figure 21.3).

GEO 4 Conceptual Framework: This framework was adopted for *Global Environment Outlook 4* (UNEP 2007). It incorporates the DPSIR framework components, but gives more emphasis to human well-being, ecosystem services and their interaction[3]. The stylised figures presented by UNEP indicate short-term and long-term time scales, the perspectives of global, regional and local inter-linkages. The sub-title of the review is 'Environment for Development', which shifts the focus from environment towards sustainable development.

The **Opportunities Framework** was devised to overcome some, but not all, of the deficiencies perceived in the basic DPSIR framework, but since it embraces the basic DPSIR model many of the assumptions and logical flaws remain, not least the idea that intervention is both effective and efficient in the use of human and natural resources.

This framework has an even more optimistic perspective than the basic DPSIR framework from which it emerged. It begins with future favourable options as the starting point for analysis, meeting the fundamental criticism of DPSIR that it only begins with the recognition of degradation of natural resources and asks what can we do about it. The opportunities are at the centre and all other components are depicted as operating through this box. This implies a liberal narrative of future progress and assumes an integrated rational process of systems' governance at global, regional, sub-regional and national levels.

Figure 21.2. The opportunities framework



Source: Adapted from UNEP (2007) GEO 4, and from AEO2 Progress Press, Malta for UNEP

This flies in the face of evidence that shows that both economies and ecosystems are more complex and operate especially at local and multi-national levels unrelated to international regions, sub-regions and nation states. The tragedy of the commons with respect to fisheries, air quality and land use for grazing, the extraction of natural resources and the disposal of waste, evidently, are major exceptions to the vision presented by this framework. It is especially ill-fitted to regions like Africa where the arbitrary boundaries of states and of the UNEP sub-regions have little rational linkage to the geography, topography and distribution and use of natural resources of the continent and its islands.

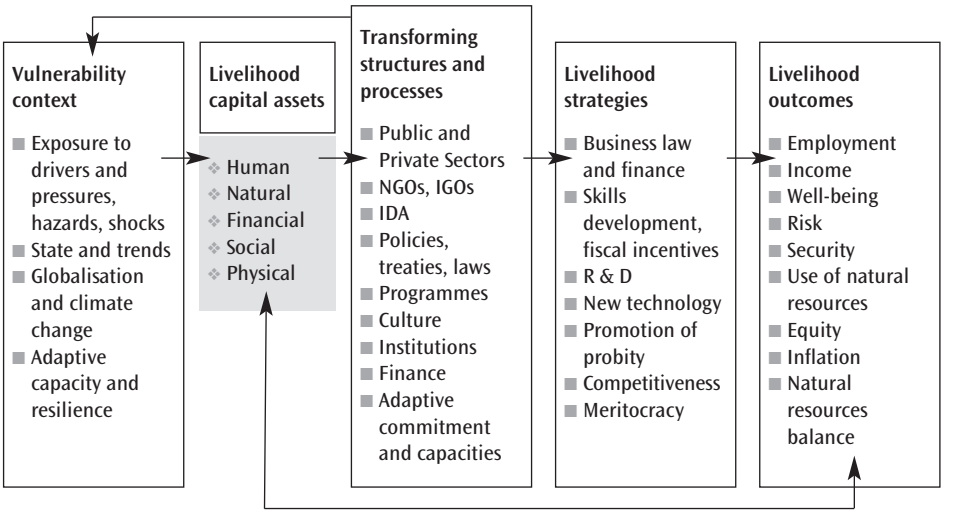
One strong feature of the framework is the recognition of exogenous factors affecting demands and pressures, states and trends, and policies and actions. This has been apparent in issues like global warming, climate change and sea level rise. This perspective supports a common need for developing relevant and effective responses to such common threats to promote better opportunities for sustainable development and the protection of vulnerable ecosystems and human welfare.

The **Sustainable Livelihoods** framework goes further in adapting the basic DPSIR framework to overcome its principal demerits. Nevertheless, the overall narrative for the framework is optimistic, instrumental and embedded in a simplistic set of causal relationships between the main components, with an underlying axiom that the intervention of mankind is worthwhile for sustaining the planet for the benefit of man[4].

The advances claimed for this adaptation of DPSIR are that it promotes a fresh awareness in analysis to the vulnerabilities of people, economies and ecosystems, the relevance of transforming structures (laws and institutions) and the effect these can have on promoting better livelihoods in the face of a changing social, economic and natural environment. It also elaborates on the nature of capital assets recognising the importance of distinguishing between physical and natural capital and the capital inherent in humans, finance and institutions.

The GEO 4 analytical framework in its various forms goes further in adapting the basic DIPSR framework to the task of analysing the issues for the pursuit of sustainable development. The framework has a time dimension and a clearer distinction between the

Figure 21.3. Sustainable livelihoods framework



Source: Adapted from DFID (1999) framework, Sustainable Livelihoods Guidance Sheet, London DFID

human and ecosystem areas. It contains more explanatory words within the component boxes, but does little to address the assumptions and logical flaws in the basic DPSIR model.

A central weakness in all these analytical models is the absence of an analysis of the nature of governance, the implications of market and policy failure and the valuation of natural capital as an integrated requirement for assessing progress in the creation and the protection of ecosystems and animal, including human, welfare. These issues are more consistently dealt with in the economic literature but are beginning to emerge in the processes now at the core of decision-making for sustainable development and in political science[5].

Tools for policy analysis

The UNEP frameworks for analysis were adopted for two purposes. First, to provide a method for reviewing the linkages between the environment, and development polices and programmes; second, to provide a set of consistent sub-headings for authors of the publications on the environmental outlook that UNEP was obliged to produce as part of its mandate. Through this process the frameworks have become common tools for policy analysis in the field of sustainable development.

There are certain key elements in undertaking policy analysis, only some of which are embraced in the UNEP frameworks approach. The missing elements are emerging as priority concerns in moving from theoretical review to policy commitment and programme development.

In addition to the knowledge elements in the DPSIR-based frameworks, policy analysts are increasingly engaged in:

- Identifying and consulting with stakeholders in the public and private sectors and with NGOs, for agenda setting, policy formulation and adoption, implementation and evaluation;
- Interactive processes for reviewing basic DPSIR type assessments, involving key players in discussions, conferences, briefings and public hearings;
- Preparation and dissemination of policy option documents, white papers, review of formal responses, public communications, public meetings, media briefings, website presentations and interactive discussions; and
- Commissioning research, expert reviews and special studies.

If DPSIR and its related frameworks offer a guide to problem and issue structuring, definition and review of evidence, further work is essential before policy analysis can effectively move forward into policy options, choices, prescription and implementation. An essential step in this process is in forecasting or modelling the likely outcomes of action and inaction and the evaluation of the expected outcomes and their technical, economic and political feasibility.

When the stage of making recommendation for the course of policy and action has been reached, it is helpful to assess the levels of risk, uncertainty and the constraints under which the future may emerge, including the externalities and the capacity building necessary for accomplishing the programmes. It is not uncommon for policies to be formulated, and for finance to be made available on estimates of expected costs, with little attention to the range of capacities that are needed for fulfilling the tasks, including skills, infrastructure, institutional development, education, public communication and consultation and effective management.

Humans and ecosystems are complex. Many problems exist because the existing systems are unsuited for accomplishing change or because changes that have been introduced have failed to resolve the issues and have perhaps made matters worse. The DPSIR framework has an optimistic linear narrative which compels users to assume that effects simplistically follow causes and responses, avert adverse impacts and promote a new equilibrium. Policy analysts need to be aware of these flaws in the models and ensure that at each stage in the development of responses and interventions, adequate and timely monitoring and evaluation is undertaken to provide feed-back on the real outcomes as distinct from political aspirations. In such circumstances, the existing institutional frameworks may be part of the problem rather than the solution.

The processes of analysis entailed in Environmental Impact Assessment (EIA) and Strategic Impact Assessment (SIA) are reviewed elsewhere[6]. These common tools are being supplemented in many countries with other tools that are helpful to analysts in the field of natural resources management and sustainable development. Some of these are reviewed below.

Triple Bottom Line Assessment

This tool differs from Environmental Impact Assessment in that it covers not just the impact of innovations on the environment but also their expected impact on two other areas of concern: social and economic outcomes.

Trade Sustainability Impact Assessment (Trade SIA)

In this approach, the analysis is concerned with trade and its impact on development. It emerged as a tool within the European Union to assist the process of reviewing the impact of trade negotiations on development. It is undertaken during trade negotiations to spot and explore potential economic, social and environmental implications of the trade regulations.

Integrated Environmental Assessment (IEA)

This is replacing the DPSIR based approaches to ensure that biophysical bias is balanced within analysis of the social and economic issues and that these are incorporated in examination of the current and expected outcomes of change, trends and intervention. Moreover, IEA is an inter-disciplinary exercise which includes participatory components that identify policy and programme options to promote multi-sector decision-making for sustainable development.

Integrated Scientific Environmental Assessment

The essential features of this approach to analysis is that it is based upon peer review of evidence-based assessments for guiding public decision-making on complex issues. It typically involves multiple stakeholders in inter-sector decision-making and engages experts from the key fields in a transparent and open public and professional process. The technical analytical concepts include review of eco-efficiency, waste minimisation, pollution prevention, green productivity, sustainable consumption and production. Initiatives adopting this approach are supported through the UN Commission on Sustainable Development and UN DESA.

Corporate Social Responsibility

There has been a long and distinguished history in the contribution of private sector companies to social development and the protection of the environment. Parallel to the development of current methodologies for analysis for sustainable development, this history has underpinned important fresh initiatives and movements in the private sector through a process of corporate social responsibility. These initiatives have been driven partly through professional management education but also through the re-engagement of private and corporate shareholders in the recognition of 'green' and 'ethical' concepts inherent in environmental governance addressing the global issues of market and policy failure[7]. In particular, this movement towards more ethical corporate governance draws attention to the need for greater engagement with the private sector, more environmental accountability and clearer recognition of the essential elements for corporate accountability in sustainable development policy and practices. This covers corporate reporting, directorial accountability for environmental issues, the publication of environmental reports in the accounting

process to shareholders and to Boards of companies, and the selective purchasing of 'green' shares in the 'ethicals' market.

Conclusion

The chapter reviews a number of methods which are commonly adopted in the analysis of policy options for better use of natural resources for promoting sustainable development. Each method has its strengths and weaknesses which are often left implicit in the system of analysis, with their own narrative overlain with ideological metaphors. It is important as a first step in applying any analytical method to explore its hidden agenda taking care to make transparent its concealed bias and the effect of this on the selection of evidence, the choice of indicators and the ensuing pattern of results.

Further reading

Brown, M.M. et al. (2003). 'Environmental Governance, Whose Voice, Whose Choice'; in *World Resources 2003–4*, World Resources Institute. ISBN 1-56973-532-8 (WRI is an institute supported by UNDP, UNEP, the World Bank).

Hargroves, K.C. et al. (2006). *The Natural Advantage of Nations*, Earthscan, London. ISBN 10 1-84407-121-9.

Huntingdon, S.P. (1997). *The Clash of Civilizations and the Remaking of the World Order*, Simon and Schuster, ISBN 0-7432-3149-X.

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www.greenfacts.org/ecosystems Summary of the UN millennium Ecosystem Assessment.

Notes

1 Nightingale, D.L.M. et al. (2004). AEO, case studies, human vulnerability to environmental change. Earthprint for UNEP. See especially Fuggle, R.F. Case study 3, Lake Victoria, a case study of complex interrelationships, and Roberts, J.L. Case study 12, Malaria Control in Mauritius.

2 Sachs, J.D. (2005). p. 256.

3 See UNEP (2007). *Global Environment Outlook 4*, pages xx–xxiii and Figures 1 and 8.2, (p. 368).

4 Cf Lovelock, J. (2006). *The Revenge of Gaia*, Penguin Books; 'The concept of Gaia ... counters the persistent belief that the Earth is a property, an estate, there to be exploited for the benefit

of humankind ... (p. 173) 'Evolution is iterative, mistakes are made, blunders committed ... Perhaps our ... greatest error was the conscious abuse of fire ... It has haunted us ... and combustion could now be our auto da fe, and the cause of our extinction'. (p. 186)

5 The theme for AEO 3 has been proposed as management of the environment for development.

6 See Madhoo, Y.N. Chapter 3 in Nath, S., J.L. Roberts, and Y.N. Madhoo, (eds.) *Saving Small Island Developing States*.

7 See Brown, M.M. et al. (2003).