John L Roberts

Overview

So much of man's history has been about the achievement of technical progress in which marginal productivity continues to increase for the same levels of factors of production, that for centuries man has assumed this approach to development is incontestable. If he does not already live in the best of all possible worlds, then only time is arresting his inevitable progress to that end. People in small states and SIDS have for centuries enjoyed outstanding natural assets which are now increasingly threatened by an approach to economic development that values such natural wealth at zero. Such people, and the tourists who flock to their shores seeking a taste of paradise, seem too often bent on forms of development that are destroying these gifts of nature on which their survival depends. This book is offered as an antidote to this traditional western concept of progress and the narrow perspective of the liberalising march of history.

Paradigms for policy

Nath in Chapter 1 argues that the traditional vision as part of the former dominant social paradigm (DSP) has been challenged by the new environmental paradigm (NEP). The latter acknowledges the environmental impact of development and seeks to redress it by preventive and mitigating measures, which value natural resources and include them explicitly in the system of social welfare accounts.

Many natural resources are not renewable, and they decline in the face of economic development; others are lost, or threatened with extinction or degraded by past and existing processes of production of goods and services. Two factors are at work here. Increasing levels of consumption and production per capita and increasing global population. It is now more commonly recognised that the limited natural resources of this one planet, Earth, do not have the carrying capacity to absorb the combined impact of both these factors.

In 1900 this planet offered 8 hectares of land per person on which to thrive; by 1950, the population had increased to the point where the planet had only 5 hectares of land per person. By 2005, the ratio was 2 hectares of land per person. The present world population is about 7 billion, and is expected to increase to over 9 billion by 2050, shrinking available space to 1.5 hectares per person.

The Millennium Ecosystem Assessment in 2001 found that 60 per cent of ecosystem services have been degraded and are unsustainable in the face of a growing demand for food, fresh water, timber, fibre and fuel. This degradation, principally from over use, is exacerbated by pollution and by the process of climate change intimately linked to current patterns of production and consumption.

Since 1900, the global economic development gains have been immense in terms of income, trade, increased expectation of life and improved standards of living. These gains have, however, been unevenly distributed with the lion's share going to the lions, and at great loss to environmental resources in quantity and quality.

In small and island states, the drivers of change and their impacts are evident to all; smallness means few people escape the issues: isolation and fragmentation inhibit flight. Moreover, much of the inherited biodiversity remains, at least as vestiges of its past glory. Deforestation is tangible whilst some forest remains; damaged coral evokes commitment to rescue the remnants; the presence of fewer fish promotes the drive for regeneration; the lost dodo becomes a metaphor for the perils of inaction. The people of many of these small states leave a low ecological footprint, and follow a life that is not 'poor, nasty brutish and short' but that is rich in nature's delights, and pleasant to enjoy and long-lived. On the Happy Planet Index[1] they rate high in satisfaction, length of life and do less damage to the ecosystems that support them than their counterparts in many large developed countries. Being close to government, many people in SIDS readily press for policies that will preserve their inheritance for their children and grandchildren. But such awareness and drive are not universal and without these protective factors small and island states remain highly vulnerable to ecosystem collapse.

This book explores the nature of the quest for progress without ecological disaster in small and island states. It does so through the lens of economic theory and practice and with tools that policy-makers and their advisers are currently using or which are available to them. In addition, the book provides some evidence of the outcomes of the application of this science in small and island states, to indicate how much success has been achieved in preserving the beauty and fruitfulness of nature in many 'paradise' locations.

These small steps towards the goal of sustainable development are being made in the face of the global impact of unsustainable use of natural resources and unsustainable population growth. This raises the question whether action in small and island states, to choose pathways that curb their carbon intensive development, can help to avert the doomsday scenario for planet Earth and provide a model for others to admire and follow.

Part I Theory and its applications

Environment as capital

The theoretical underpinning for sustainable development is presented in this book in Part 1, linked to its application in the real world of policy development in small and island states. **Nath** in presenting *Concepts and public policy issues in environmental and natural resource analysis* includes natural resources as part of capital in environmental governance. This encompasses natural resources in a framework that requires both renewal and maintenance. This approach is distinct from the practice of the past centuries, under the frontier expansion model, in which the process was merely one of search for fresh natural resources, conquer and then exploit to the point of exhaustion.

Mitigating the externalities of economic development

Madhoo in her chapter on *Valuation of non-market environmental goods and services* addresses

a major aspect of environmental economics, presenting both technical methods of assessment and their value for decision-making. Her focus is on those elements in small and island states with positive values such as rivers, coral reefs, natural plants, and beaches, as well as those with negative values such as smoke and noise pollution from transport, which is supplied without any evident demand. She examines the choices of relevant values, in terms of direct use, indirect use, non-use and intrinsic use. She then explores technical methods of assessment using a broad conceptual framework.

In her subsequent chapter, *Impact assessment and biodiversity conservation: An application of EIA and SEA*, Madhoo sets out the role of environmental services as critical factors in sustainable development and explores the use of environmental impact assessment and strategic environmental impact assessment as tools available to policy-makers and managers. Experience from the Pacific region and from other countries in the use of these tools is cited, bringing into focus the strengths and weaknesses of the analytical methods applied to the management of fisheries, tourism and forestry. The value of these tools depends greatly on the political will to establish legal enforcement of their findings and to overcome pressure from interested parties to block effective implementation of biodiversity protection.

These issues are further examined by Madhoo in the chapter on *Environmental policy instruments and governance*. This follows through the commitment to the new environmental paradigm (NEP) to redress market failure. For guiding the choice of instruments, she sets out a taxonomy showing their objectives and operational characteristics within the context of the political realities of states and the constraints which often inhibit good governance for sustainable development. Policy failure is part of this reality. The chapter examines economic instruments and command and control measures, distinguishing between those concerned with outcomes and those addressing the implementation of technical equipment and process standards. The chapter explores the differing objectives that may be pursued in the choice of instruments including efficiency, effectiveness, equity, and health outcomes. Madhoo finds an empirical link between government effectiveness and transparency and the stringency of environmental regulations and their enforcement. This, she argues, arises from interacting political and social forces in the market for environmental regulation which determine the level of regulation in any state. The chapter concludes with the recognition that environmental control, in developing states, may be more effectively promoted through community-based management of natural resources.

Part 2 Seminal published papers

The exposition of theory and its application in the real world of development policy and practice is further illustrated through the section of seminal articles from published journals, which have become required background reading in this field, as they present in lucid and telling ways the underlying scientific and ethical issues compounded together, sometimes uneasily, in studies on sustainable development.

The mythology of economic analysis

Fullerton and Stavins in their chapter *How economists see the environment*, expose four principal myths in the way that others may perceive the economist's approach to the

analysis of environmental issues. In particular, they underline the interest of economists in market and non-market solutions to issues and the importance of equity as a guide to the distribution of costs and benefits and as a counterweight to the application of the concept of efficiency in resource use. They call for greater transparency, better communication and closer joint working between environmentalists and economists in studying the field of environmental policy.

At the interface of theory and practice

Portney in *The obligations of a policy economist*, reinforces this perspective with his elegant reflections on the obligations of a policy economist providing advice for improving governance, whether in the public sector, private sector or in civil society. He describes as 'poppycock' the notion that allocative efficiency is a sufficient basis for decision-making and he calls for economists to even-handedly present the wins and the losses in any assessment of the likely outcome of policy, asserting: 'I have never seen a win-win policy in which someone doesn't lose his shirt'.

Finally, he urges economists '… to roll up their sleeves and work with the lawyers and others who are charged with the actual drafting of environmental and natural resource policies'.

It is a brief paper that comes from many years of experience of the friction that exists at the interface between the design of policy derived from theoretical principles and its successful implementation in the real world of powerful interest and pressure groups.

The planet's carrying capacity

The joint paper by **Arrow** and colleagues from academic centres for economics, meteorology, ecological economics, zoology and entomology, *Economic growth, carrying capacity, and the environment*, calls for the environment to take front and centre stage in the examination of economic growth. They base their argument on the view that the carrying capacity of the environment has critical finite limits that are not acknowledged in the long-term positive association, formerly asserted, between economic growth and environmental quality. The paper calls for economists to address the development of measures: 'to promote greater efficiency in the allocation of environmental resources at all income levels … (that would) assure a sustainable scale of economic activity within the ecological life-support system'.

Nailing sustainability

The concluding paper in the set of seminal published contributions to the theoretical underpinning of natural resource analysis comes from Robert Solow. He is a Nobel prize-winner for his contributions to the theory of economic growth and the critical importance of technological innovation, the so-called 'Solow residual'.

In his witty paper *Sustainability: An economist's perspective*, originally presented as a lecture at the Woods Hole Oceanographic Institute in Massachusetts in 1991, **Solow** addresses the issue of defining the concept of sustainability claiming,'… it is very hard to be against sustainability. In fact, the less you know about it, the better it sounds'.

He tersely dismisses received definitions from distinguished bodies such as UNESCO and UNEP claiming that they press us to do things which he claims are either not feasible or not desirable. In particular, he hits out at the paradox of using sustainability as a concept to focus on the interests of some people being short-changed by our actions now, namely people in the future. To which he responds: '… then I think you are really obligated to ask, "well is anybody being short-changed right now?"'.

This is the issue of resolving both inter-generational equity (our concern for those who might lose out in the future population of the planet) and intra-generational equity (our neglect for those who are losing out now). He asserts that poor people today want children as an insurance against old age, meaning they want consumption rather than investment; whilst rich people want to curb population growth in the third world and to deny poor people the use of the cheapest sources of energy, such as coal, because this will undermine the interest of generations to come. Solow denies that sustainability can be defined and measured exactly, but urges its continued use as a general guide to review policies that have to do with investment, conservation and resource use.

These four papers bring into sharp focus five principal issues confronting those concerned with the pursuit of sustainable development: the assessment of current and of future welfare, the carrying capacity of the planet, growth in both population and in consumption, and equity.

Part 3 Case studies: Valuation, policy instruments and projects

Within this broad context of theoretical concepts for policy review, the book offers, in Part 3, a series of case studies covering the practical use of valuation methods, policy instruments and interventions through projects, to illustrate both the range of themes being addressed in natural resource analysis and the situations in which they are being applied in small and island states.

Aversion to risk

Munro in his chapter on *Environmental valuation methods in SIDS* emphasises the importance of valuation for the design of economically efficient and socially relevant policy. He critically reviews progress in valuation methodologies applied to SIDS in recent decades, through critical review of technical methods and by the use of case studies arising from the special features and vulnerabilities of SIDS. Recognising that SIDS have higher economic and ecological risks than many other states, and that their economies increasingly depend on tourism, he presents the core analytical issue as the exploration of the economic function of risk and risk aversion in the principal beneficiary groups. Defining risk as the variance in the probability of an event, he illustrates the challenges of valuing the outcomes of investing in risk reduction in terms of improving the utility of both the resident and the non-resident populations of beneficiaries.

Munro's review succinctly explores pricing, revealed preference, and stated preferences, mitigation costing and the importance of the dose-response relationships in exposure and in intervention, and examines the strengths and weaknesses of the methods commonly

adopted. His apt choice of case material drawn from SIDS illustrates the increasingly recognised importance of critical factors in differentiating social preferences, for example in the valuation of increasing protected marine areas and securing safer bathing water. His chapter concludes with some searching questions for students of the subject.

Internalising the environmental impact

Nath and Schroeder in *Tax instruments for environmental management in tourist destinations* look at the opportunities and some results of introducing environmental tax instruments. They argue that the externalities of tourism should be borne by the tourists and not the resident population of tourist destinations. The externalities include depletion of biodiversity and the ozone layer and the contribution of these locations to climate change by rising consumption of fossil fuels. Measurable adverse impacts can be seen in pressure on scarce water resources, reduction in land quality, through built infrastructure, soil degradation, air pollution, and damage to flora and fauna, including the destruction of coral reefs. The impact on natural resources is critical where the adverse effects exceed the rate of regeneration. They argue that whilst regulation can be used to curb the excessive increase in tourism, Pigouvian-type taxation can help to preserve the environment by funding better environmental management. The authors propose a tourist property tax and a tourist business district authority for its management.

Clearing the fog

Ayrga in *Road transport, motorisation and pollution* reviews policy initiatives being taken in the island state of Mauritius for controlling pollution from road transport. He finds a positive association between the density of roads and economic growth in SIDS in all three regions, but shows that for Mauritius the extensive road network is dominated by private transport over public transport, and the efforts to control the externalities of air pollution with regulations on emission standards have not been integrated with other effective polices to reduce pollution and intensive private motor transport use. The four-fold increase in carbon emissions in the past twenty years in Mauritius and increased traffic congestion present formidable challenges to government with an adverse impact on human and natural resources of the country.

The tragedy of a lost sea

Madhoo's final case study in Part 3 re-visits Hardin's iconic moral tale of the tragedy of the commons, in *An illustration of the tragedy of the commons: The demise of the Aral Sea*. This chapter takes the story of this major environmental degradation as a metaphor for the ultimate stage of market and policy failure; the end-state of unregulated pollution and dereliction of governance. This case study highlights the emergence of a trans-boundary natural resource problem and the significance of international co-operation in alleviating the grave damage done to the gift of nature for selfish and unco-ordinated economic motives.

The case studies presented in Part 3 illuminate the conceptual basis of natural resource analysis, the techniques of measurement, evidence emerging from projects and the implications for policy. This serves as a prelude to Part 4, which explores what happens

when people try to do something to save small and island states from the ecologically destructive impact of man.

Part 4 Policy in action

Now we move on to the more general perspective of the wider application of policies in the real world, including policies on climate change, disaster risk management, the evidence base for decision-making, intellectual property rights, the environmental implications of patterns of trade, water management, coastal ecosystems and sustainable and renewable energy. These chapters examine the specificities of small and island states which present particular challenges to policy-makers in adapting global trends in 'greener' policy to the local and special needs of these most vulnerable economies and environments.

Global warming

Munro in *Climate change and SIDS* reviews the action being taken by SIDS to mitigate the impact of climate change and adapt to its consequences drawing on the reports of the IPCC. He examines the evidence for the Environmental Kuznets Curve and the reduction in pollution as countries become more developed, but his view is clear-cut: 'though some individual countries have begun abating or controlling emissions, overall the world level continues to rise, fuelled by population growth and economic prosperity'.

He broadly endorses the guidelines set out on climate change in the UN 2005 SIDS Mauritius Strategy, which are to promote measures for:

- greater energy efficiency and development of renewable energy sources;
- dissemination of new technologies and ideas to SIDS;
- raising the scientific capacities of SIDS with the support of the IPCC; and
- greater investment in monitoring of global and local climate changes.

However, in the face of the options of fight or flight and the history of denial of the doomsday environmental scenario, he sees the case for flight for people to escape from their most vulnerable locations, for, he stresses: 'Many SIDS are highly exposed to the risks created by climate change. For low-lying atoll islands the risks from sea-level rise are particularly acute … . They may also suffer from the consequences of the policies taken by other countries, particularly if tourism demand weakens. … The most economically efficient way of adapting may not involve hard structures or protecting existing infrastructure and lifestyles. Instead, retreat and accommodation may be more sensible, particularly when population density is low or existing infrastructure is limited.'

Migration and evacuation are currently options being seriously considered for some of the most vulnerable islands both in the Indian Ocean and the Pacific.

Avoiding disasters

Roberts in *Disaster risk reduction: Practical adaptive options* considers the nature and extent of disaster risk in SIDS by comparison with other causes of premature death, injury and damage, and the international framework and guidelines for policy response. He identifies

the need for greater attention to be given to evidence-based policy, the better assessment of risk and a more thorough evaluation of both the cost-effectiveness of intervention and the opportunity cost having regard to other areas of investment for increasing human welfare. The chapter poses questions for students to explore aspects of hazards, vulnerability and capacity for effective response. Disasters, like wars, capture the headlines; this chapter puts the issue of disasters into the broader perspective of the management of natural resources for sustainable development.

Building on scientific knowledge

Morrison and Kaly in *Coastal lagoon management in three Pacific Island situations: Is scientific knowledge used effectively?* examine how far policy development exhibits effectiveness in the use of scientific knowledge for coastal marine management of tourist areas in SIDS. The growth in tourism and urbanisation in and around coastal lagoons is producing one of the most threatened global environments. The chapter explores the evidence base for action being taken in Fiji, Tonga and Tuvalu and the extent of integration of information gathering for effective management. This chapter paints a sad story. It tells of the fragmented state of local relevant scientific studies, the lack of integration between national and local planning functions, and the absence of key skills. It records the slow pace of response to international recognition of the need for integrated coastal zone management in SIDS. Timely action is needed to avert the rising impact of the pollution and the degradation of the natural resources and environmental services, such as water, air and coastal areas. The authors conclude that until such issues are addressed: 'management of the lagoons will continue to be ineffective and the overall quality of the local environment must deteriorate, to the detriment of both the human residents and the ecosystems as a whole'.

Safe water for all

Mycoo reports on the progress made in water policy development in an island state in the West Indies, in *Environmental policy for water resources development: A case study of Trinidad*. The government is committed to improving water quality and equity in access to water and sanitation, promoting water conservation, and achieving the optimal use and management of the nation's limited water resources. It has developed a range of policies and plans which head in this direction, but which have been mostly blocked or diverted. Policy pronouncements and laws articulate the need for effective water resources management to no avail. At the heart of the problem is the lack of integrated management arrangements for water resources.

As the author states: 'Water resources management responsibilities are scattered amongst a plethora of government departments and statutory authorities that restricts the systematic application of these official policies'. The UN 2005 SIDS Mauritius Strategy recognised the importance of such facilities as follows: 'The access to safe drinking water, the provision of sanitation and the promotion of hygiene are the foundations of human dignity, public health and economic and social development and are among the priorities for small island developing states'.

The UN SIDS Mauritius Strategy called for countries to provide integrated programmes of

water management by 2006. Much remains to be done. The story from Trinidad and Tobago highlights many of the testing issues of water governance where action fails to follow the policy directions set.

Renewable energy islands – Is it a dream?

The chapter by **Deepchand and Nath**, *Sustainable energy from renewable biological resources: Sugarcane bagasse energy cogeneration in Mauritius*, introduces the concept of the ultimate dependence of GDP on the invisible hand of the photosynthetic product of the planet (PPP). This product is the primordial source of global natural wealth and the sustainability of life. The authors suggest that the principal global threat comes not so much from global warming as from the degradation or depletion of the earth's critical natural capital. This chapter examines the credentials of increasing the supply of energy through the highly energy efficient and renewable resource of sugarcane bagasse[2]. Using a process of cogeneration of energy, combining bagasse with other sources, such as coal, the authors use data from Mauritius to demonstrate the potential for technical transfer of best practice to other small and island states with a history of sugarcane production. This fresh development in sugarcane products comes at a time when many of these countries are facing decline in demand and less favourable trading arrangements for sugar itself. The authors call for an 'aggressive renewable energy policy' in Mauritius and other island states where the 'sea coastal location and access to other renewable energy sources, namely solar, wind, and sugarcane bagasse, should constitute an integrated renewable energy package. The success of bagasse-based energy cogeneration can provide avenues to move towards the objective of becoming a renewable energy island[3] (REI) in the near future'. Thus, the demise of the sugar trade becomes an opportunity for saving small and island states in a new era of renewable energy production, with at its core, harvesting the yield of PPP.

Trading off nature for wealth in the Caribbean

In *Trade liberalisation and environmental considerations for the Caribbean*, **Scott Vaughan** and his colleagues show why the sustainable development of SIDS must be closely integrated within the framework of international, regional and national policy on global trade policy. It critically reviews the story of trade liberalisation and its impact on environmental and natural resources. The focus is on the need in the Caribbean for better environmental laws and tighter enforcement of environmental standards. The authors examine threats to the environment from both exports and imports. But they see the opportunities for trade to enhance environmental quality. They present case material from the US ban on fish imports from the Caribbean islands whose fishing methods for shrimps failed to comply with the CITES[4] principles for protecting endangered species of turtle. Opportunities for developing trade in environmental goods and services are also examined as potential areas for new economic ventures that can benefit both Caribbean trade and the environment.

The authors stress the following areas for priority development most relevant to their region: sound management of agro-chemicals; the effective enforcement of environmental laws; market-based approaches to the conservation of biological diversity; strengthening environmental education, and the dissemination of a 'tool kit' on trade and sustainable development. This is advice relevant to the wider world of trade in all small and island states.

Protecting a brain child

Gangopadhyay and Gangopadhyay in *Intellectual property rights and anti-competitive behaviour: Major deterrents to ecology and economic progress of SIDS* show these two developments having emerged as two major deterrents for their economic progress and ecological balance. The authors demonstrate how game theory can be applied as the basis of an outline for policy to protect SIDS from expropriation of their intellectual property in the face of their evident vulnerability to outside predators in this field.

In this part, the examples show policy in action as it emerges from its conceptual and theoretical phases. In addition to the thematic issues, this exploration of policy in action demonstrates how national specificities can give rise to the emergence of inter-state, regional and international consensus on policy development and its evidence base. However, the variable international political geometry of the pursuit of national interests does not inevitably coincide with the regional patterns of geographical alignment. South–South technical exchange occurs in response to common interests, leadership and the serendipity of opportunities.

Part 5 Global issues and environmental management

Roberts in this final part in the book explores the planetary dimensions of environmental management with a series of illustrations from the use of MDGs and their adaptation to the needs of SIDS; the use of standard analytical methods and performance indicators; concluding with the ways in which SIDS are responding to the challenges of sustainable development through improving their resilience to external shocks and better management of their natural resources.

Annexes

The annexes to the book are provided as aids to students and policy-makers. They include an annotated glossary of the key concepts and players in the field, a record of the milestone events in the elaboration of global policy, and a mischievous exercise in scenario development for policy players, either to aim to save or to destroy a vulnerable island state.

Notes

1 See http://www.happyplanetindex.org
2 Bagasse is the fibrous residue remaining after sugarcane or sorghum stalks are crushed to extract their juice. Sugar cane is one of the plants with the highest bioconversion efficiency in terms of using solar energy for photosynthesis; this plant is able to fix 55 tonnes of dry matter per hectare of land on an annually renewable basis.
3 An island with 100 per cent energy produced from renewable sources.
4 UN Convention on International Trade in Endangered Species