can find practical tools and suggestions for implementing it in one's own context and the research scholars interested in the area of team building.

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Environmental Economics : An Indian Perspective, edited by Rabindra N Bhattacharya, Oxford University Press, Rs. 550.00

Environmental Economics is a discipline that uses the ideas and tools developed in other branches of economics such as the study of consumer and firm behaviour, market structure, efficiency and equity concepts, design of taxes and subsidies, public good and externalities, optimal control theory, game theory, econometrics etc., to study and model the current state of the biosphere. It is a relatively new area in Economics, especially in India, and is one of the fastest growing branches of economics (Sankar, 2001). ***Environmental Economics : An Indian Perspective*** fulfils a long standing need for simplifying and introducing this subject for a large and heterogeneous set of Indian readers in a manner that they can relate to. The book brings together the rich teaching experience of seven practising economists, with each of them contributing a chapter related to their area of research and interest. The editor has done a commendable job in bringing these contributions together keeping the distinctive nature of each chapter intact, while maintaining continuity and avoiding excessive repetition of similar ideas.

In his capacity as editor, R. N. Bhattacharya provides a comprehensive overview of Environmental Economics and provides an introduction to the issues covered in the seven chapters of this book. He starts with a discussion of the issues that motivated the evolution of environmental economics as a sub-discipline of economics, touching upon the Brundtland Commission report, Earth summit at Rio, evolution of environment interest groups and environmental laws. He defines environmental economics as a way of examining the various tradeoffs involved in almost all environmental issues

that we confront. Environmental economics also throws light on why people behave the way they do towards the natural environment, and how to restructure the prevailing systems and associated practices to rectify harmful outcomes. He chooses to cover both the economics of natural resources and environment under the holistic title of environmental economics. He differentiates the two and provides good reasoning as to why the two should be considered together, given the extent of overlap in a book such as this.

The section on Introduction and Overview goes on to discuss the purpose of the book and the audience it is aimed for. In the author's words, "there exists (also) a dearth of suitable (particularly with an Indian orientation and perspective) text books which could come in handy for teachers as well as for students". While there is a lot of thrust in introducing environmental issues into the teaching of economics by organisations like the World Bank and the Ministry of Environment and Forests, Government of India, which have resulted in courses at the Masters' level, exposure to this sub-discipline is yet to be achieved at the undergraduate level. Hence, this "joint-venture text" is an attempt to develop a text with an Indian perspective, utilising existing mainstream theories, without delving into complex mathematical details.

Bhattacharya next summarises the basic concerns that each of the forthcoming chapters deal with, discussing how each of them are interlinked. Since he has already indicated that the book has been written with an Indian perspective in mind (which is also mentioned in the title of the book), the editor could have refrained from referring to this in almost every paragraph where he summarises the contents of the seven forthcoming chapters.

The next four and a half pages of the section on Introduction and Overview, which discuss a couple of fundamental and inter-related concepts in economics, like externalities, market failure and property rights, are critical for any reader, and perhaps it would be best to devote a complete chapter to it after the introductory chapter by Gautam Gupta on the inter-linkages between environment, ecology and economy. This is even more relevant considering that review questions are appended to each chapter, but not to this introductory

section, which means that most students would not read, or at most gloss over this portion. Yet these concepts are the basic building blocks of the study of environmental economics. Perhaps since the author was limited by space considerations, he has not been able to treat these concepts with the clarity that is expected in a book aimed for undergraduate study. Even his illustrative figure demonstrating the divergence of private and social costs could be better labelled, with words along with symbols for the reader's ease. In order to avoid equations, the author has tried to discuss everything in words, and in the process, has made the exposition rather confusing. Perhaps, he would have been better off by providing the equations in addition to his explanations. Throughout the book, there is an inherent assumption that the reader is very clear about these concepts, especially in chapters 2, 4 and 6, which creates difficulties in developing an intuitive understanding of the concepts developed there. One could refer to the treatment of these topics by Hanley et. al., Kolstad or Pearce and Turner who have also written text books aimed at the undergraduate reader.

The first chapter by Gautam Gupta aims to provide a broad framework for the study of environmental economics within the context of the economy as a whole operating in spaceship Earth, with its limited resources. He starts by illustrating the threefold connection between the environment, human society and its economy, emphasizing that the environment is not a passive sink but an active receptor, which responds to the economy in a multitude of ways. The elements of ecology and its subtle differences with respect to the term environment have been very skillfully woven into this discussion about their inter-relationship, and their relationship with economics. Thus, Gupta interprets the term environment as an anthropocentric concept, giving primacy to man and his needs and putting him at the centre of a complex set of relationships between other living and non-living beings. The difference in ecology and economics is well illustrated through several examples, and he explains how, although the book will take a myopic anthropocentric view of the environment, one has to contextualise all findings in a broader ecological framework. Thus, he goes on to discuss ecological cycles, introducing the concept of biotic and abiotic components for these cycles.

In this context, it would have been useful it a figure was included, illustrating the food chain, which has been discussed in words, both to add further clarity and to summarise the biotic component:

Having introduced the biotic and abiotic components, the author introduces energy flow and energy system dynamics before briefly introducing bio-geochemical cycles. In this section, considering that the Laws of Thermodynamics are discussed in a separate box, the author would do well to state the formal laws themselves before proceeding to explain them in the context of the chapter, so that the interested reader can get an idea of the laws and their implications in entirety. In another box (Box 1.4) on units for measuring energy, the author has erred when covering kwh to kcals, as the two are not equivalent units – the kcal unit lacks a time dimension. Finally, Gupta discusses the carbon cycle, nitrogen cycle, water cycle and oxygen cycle as examples of biogeochemical cycles. Considering that he spent two sections introducing biogeochemical cycles, the introductory paragraph in this section is superfluous and repetitive, and could have been edited. This chapter concludes with a general comment on the State of the World's environment, the major reason for the rising popularity of environmental economics. He breaks up causes of environmental degradation into 10 categories for the discussion, although it must be mentioned that these are not mutually exclusive. Thus, the category on acid rain is in fact a sub-category of air pollution, as is climate change and depletion of the ozone layer. This section is replete with Indian examples and data, although more recent data would be useful in the section on biodiversity. Since most of the readers are not ecologists, the data on Indian biodiversity is not very useful unless a comparative statistic on world diversity is provided.

Having introduced the context for environmental economics. R. N. Bhattacharya deals with the economics of exhaustible and non-exhaustible natural resources in the next chapter. First, he classifies natural resources by introducing three conventionally used concepts to delineate them. He uses the McKelvey diagram to describe the resource taxonomy, which looks at the economic dimension (related to the cost of extraction of the resource) as

well as the geological dimension (related to existence and availability or the resource). The diagram, as illustrated in Fig. 2.1 in the book, is not very helpful, however. It would have been clearer if the dimensions were clearly labelled as economic and geological, and if sample resources (coal, wood, oil etc.) were placed in different quadrants of the diagram. The author provides good illustrations of exhaustible and renewable resources in India in boxes, but these would have greater impact if the boxes appeared after the distinction between exhaustible and non exhaustible resources are conveyed to the reader. In his section on the economics of exhaustible resources, Bhattacharya tries to convey the basic concepts of optimal extraction through basic algebra and graphs. However, he is not entirely successful, as the intuitive understanding of these concepts is not clearly communicated to the reader, who is lost without sufficient background knowledge on negative externalities and common property regimes. Similarly, when he is exploring the issue of a backstop technology, it would help if the matter were simplified a little, even if this was at the cost of loss of technical detail. The reader would benefit immensely, for example, if the switch point. T was marked on the figure on backstop technology (Figure 2.3). Another suggestion could be the introduction of a box on the trend in World oil prices to demonstrate the role of technology and politics in natural resource pricing.

The economics of renewable resources follows next. The author deals with this in a fairly lucid manner, first introducing the reader to growth curves, and then explaining the concepts of efficiency and sustainable yield using a growth stock curve and an effort yield function. A basic knowledge of economics at the under graduate level is assumed throughout this section. The notion of tragedy of the commons is introduced, followed by an illustration of the concepts introduced through the study of forests as renewable resources. Finally, the author looks at the irreversibility of some types of anthropogenic activity, coupled with the element of uncertainty, that economists or environmental scientists are not even in a position to correctly and accurately fathom the impact of human activity on the ecosystem. To summarise, this chapter is heavy reading, with almost no repetitions, and considering that it deals with a large area around which there has been a lot

of research, the effort by the author to summarise everything into a single chapter is commendable.

Environmental regulation and policy in the context of providing economic incentives to limit pollution is looked at next by M. N. Murty, who is well known for his expertise in this area. Once again, this chapter could do with some editing, as the contents on history of environmental resources, the first section, has been more or less covered in the introductory section and the first chapter. Murty first discusses the role of the government as an alternative institution to market and community to manage the environment. He then discusses non-market and market-based instruments that the government can use. Command and control instruments in the form of fines, penalties and legally enforceable threats of closure are examples of non-market based instruments. Price-based instruments such as Pigovian taxes to increase the marginal cost of production to the marginal social tax are examples of market-based economic instruments. Tradable pollution permits are an example of quantity-based instruments which create a market for pollution. Hybrid instruments are a combination of the above instruments to make a compromise between the prohibitively high information costs of market-based instruments and the inefficiency of command and control measures. Murty discusses the Coasean bargaining problem and the role of property rights and discusses in brief the impact of macroeconomic policies on environment. The role of monitoring and enforcement is highlighted, before discussing in some depth, the state of environmental policy and legislation in India. This leads him to conclude that the design of policy is as important as its monitoring and enforcement for the policy to be effective.

While the chapter is very well written, a lot of concepts have been summarised into a couple of pages, which makes the chapter fairly difficult to read. Considering the range of issues covered, the author could have expanded further on several of them to make their presentation more lucid, and easier to absorb for the reader. The section of legislation in India is very well summarised, and boxes have been used very effectively, providing useful information for the interested reader. One statement, however, is a little

misleading. The author refers to the role of the government in the Coasean solution as minimal, whereas its role should be critical to enforce property rights so that the Coasean solution can be implemented.

The greatest contribution made by environmental economics to the field of economics is considered to be in the area of valuation of non-market goods. This has been dealt with in considerable detail by S. Banerjee in the chapter on Economic Valuation of Environmental Benefits and Costs. To start with, she discusses irreversibility, uncertainty and uniqueness as three important features of environment goods and defines each of these features. In addition, she defines the use value of environment as the actual value derived from its use and option value as the insurance against ignorance based uncertainty of its use. The total economic value is defined next as the sum of the user value, option value and existence value of the environmental good in question. The concepts of well being and welfare, which are repeatedly encountered in literature on environmental economics, however, should have been elaborated further. Next, the concept of objective standard based valuation is dealt with followed by subjective preference based valuation. Considering that the focus of this book is to provide under graduate students of economics an exposure to environmental economics, the author need not have gone into as much analytical details as has been covered. Thus, the author goes into Tobit regression models and varying parameter models, albeit in foot notes, which is not required for the purpose of this text. The travel cost method and hedonic pricing methods have been covered under indirect methods of environmental valuation; even here the discussion is very technical

Somehow, this chapter appears not to have been formatted property. Thus, sections and subsections are harder to identity as the font of the section headings are not uniform. Also, examples of actual applications, such as the case study of Keoladeo National Park and Harrison and Rubinfeld's study on the air quality in Boston would be far more effective if they were placed in boxes rather than in part of the running text. Similarly, when discussing contingent valuation methods as a direct method of environmental evaluation,

it would have been better if some of the mathematical details were left out and the Ganga Case Study was put within a box. In spite of all the criticism of the chapter, one must say that this is a very comprehensive introduction to valuation techniques in environmental economics, with illustrative, relevant and apt case studies.

Gopal K Kadekodi explores the concept of sustainable development while looking at the relationship of Environment with Development. He illustrates the gradual shift in development paradigms towards sustainable development – from growth, to development, to social development and finally, sustainable development. Thus, sustainable development is all encompassing, in that it includes the notions of efficiency, equity, proper valuation, resource stock recognition and resilience. Developing sustainable development in this manner has the unique advantage of explaining why, for the less developed world, there is a conflict between environment and development, as it has not evolved to the latest development paradigm. Kadekodi looks at rules to operationalise and implement sustainable development, as proposed by different schools of thought, starting from the Hartwick approach to Daily's operational principles. He moves on to discuss pressure indicators, impact indicators and sustainable indicators to capture all aspects of ecological and environmental changes. Measures of sustainable development are elaborated, including project level measures such as discounted present value benefits and measuring depletion effects and economy wide measures like the Pearce-Alkinson measure and sustainable income. There are several typographical errors in the titles of sections in this chapter, which should be avoided in future editions. The notion of sustainable accounting as integrated environmental and economic accounting is covered in considerable detail, including green NNP. The environment economy nexus is revisited, this time looking at the link between poverty and environment and discussing concepts such as the Environments Kuznets curve. Empirical evidence on the linkages between environment and people, in terms of poverty, or energy consumption over time is highlighted. Sustainable development in the context of common property resources and related institutions is covered next, with Kadekodi defining common property resource regimes, comparing such regimes to that

of private property, discussing associated institutions and the extent of common property resources in India. The reader is also introduced to the role of planning and government, institutions such as the WTO and UN, various protocols starting from GATT to the Kyoto protocol etc. in sustainable development.

While entitled Environment and Development, this chapter could have been more appropriately been entitled Sustainable Development. Kadekodi has successfully accomplished the enormous task of looking at the multiple facets of sustainable development, and presenting them in a simple uncomplicated manner to the reader, thus retaining his interest and educating him at the same point. In general, most other chapters lack this simplicity in approach. There are some serious editing flaws in this otherwise immensely readable chapter; for example, the entropy law is re-discussed, after being discussed at length, both in the first chapter by Gupta and in the fourth chapter by Banerjee. Although issues like the economy-environment inter-linkage and common property rights are revisited, they are done in a different context, and add value to the reader's existing knowledge on these issues. Also, boxes and figures have also not been used consistently. Box 5.2 would have been better described as a figure, while some of the tables would have been better represented in boxes.

The linkage between International Trade and Environment has been explored in depth by Kalyan Sanyal, although he appears to have stressed the theoretical aspects. His treatment of the Ricardian approach of comparative advantage and the Heckscher Ohlin approach is excellent; he has explained the concepts of price differentials, arbitrage and free trade with illustrative graphs and simple algebra very lucidly. Having brought the reader up to mark with the concepts of international trade, he goes on to discuss the issue of environment giving rise to externalities, which in turn results in market failure. The divergence between private and social costs in the production of dirty goods is the cause of concern leading to the analysis of the impact of free trade on the environment. He theoretically demonstrates the possibility of differences in the degree of environmental regulations resulting in

asymmetric patterns of trade, and goes on to examine the empirical evidence on whether free trade is causing dirty industry to shift to the south, and concludes that there is a reasonably strong case for those who claim that international trade pollutes the South to keep the North clean. For this, he uses results from a study by Low and Yeats, which uses the concept of revealed comparative advantage. While concluding, he very briefly touches on the issue of the WTO, and the environmental concerns raised during the Seattle round.

Perhaps more emphasis should have been laid on the WTO, environmental concerns and property rights issues when discussing the issue of international trade. Also, the author takes for granted that students are aware of the "Prebisch type characterisation", the nature of goods produced in developing countries, and their evolution, which may not be the case. Another noticeable editing flaw is that there are no boxes in this chapter. The message from the Low and Yeats study, role of the WTO, concept of revealed comparative advantage and some demonstrative numbers for selected goods would be far more effective if they were presented in the box format, which has been religiously followed in the previous chapters.

P. Chakraborti tries to being together a comucopia of issues in his chapter on Global Environmental Issues and Initiatives. The issue of trans-national externalities finds a fleeting mention; perhaps it should have been dealt with in greater depth considering its importance, and examples of trans-boundary disputes could have been included. Chakraborti has reproduced some very illustrative figures depicting the linkages of food production and linkages among environmental issues, but he fails to explain them adequately. At some point while reading this chapter, one wonders whether he/she is reading the chapter on international trade, as Prof. Chakraborti seems to have covered additional aspects of international trade and environment that Sanyal has not presented. Perhaps this section could have been merged with the chapter on International Trade. Global warming has been called a part of climate change, but "other parts of climate change" have failed to get a mention. The concept of global warming itself has not been adequately

explained, the same being the case with the problem of ozone depletion. While biodiversity loss has found a mention in this chapter, the reader would benefit from information about some national initiatives to arrest biodiversity loss. The author has done a commendable job in giving a brief overview of the state of India's environment, with recent and striking data. He has also provided an idea of the cost implications of environmental damage, both in a global context and the Indian context. He has also given a short overview of international agreement and treates, and the role of developing countries such as India in such agreements.

Overall, as the topic suggests, this chapter is a collection of several thoughts on global issues, and Chakraborti rambles on, without structuring his presentation into a set framework. The box concept has fallen out of favour with the author and editor, as not a single box has been used. Errors such as printing CO_2 in place of SO_2 in page 249 have gone uncorrected. Another editorial flaw is that of allowing excessive amounts of repetition. The concept of entropy finds a fifth mention in this chapter, after being discussed in the Introduction, Chapters 1, 4 and 5. Similarly, the author has once again covered sustainable development which is already discussed adequately in chapter 5 and the issue of dirty and clean industries and their migration, another issue already covered by Sanyal.

To conclude, this book assumes a basic knowledge of economics, which would indicate that this textbook would be appropriate for undergraduates in their last year before graduation. It is a very bold effort by Indian economists to "indianise" the concepts of environmental economics so that their audience relates to it better, and to this end the book is quite successful. While better and more consistent use of boxes and illustrations is advocated, it must be mentioned that the editor's effort to link up the chapters is commendable. Very good review questions are provided at the end of each chapter, which will go a long way in clarifying the concepts presented for prospective readers.

Considering that the authors' aim was to provide a "text with an Indian perspective", one must say that it is not too clear where exactly this book

fits in. While it is excellent supplementary reading for the undergraduate, there is still a need for a comprehensive text book that explains the various aspects of environmental economics with clarity and continuity which is almost impossible to expect from an edited volume with contributions from various authors. One wonders whether the intent was that this book be supplemented by Kolstad, 1999, another Oxford publication, or some other similar book in which case a lot of the theoretical discussion in this book would appear superfluous.

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Runa Sarkar

India's Environmental Policies, Programmes and Stewardship, by O. P. Dwivedi. Macmillan (London). Price : 45 pounds sterling, Pages : 235

Dark skies, acid mist, masked people...these are not images from some Sci-Fi movie but a reality that awaits us round the corner. All is not well with the state of environment today and our natural resources are fast depleting. In such a scenario one of the most important players is the State. The most important tool in the hands of the State is regulation. India has floundered when it comes to regulation, in any field, including environment and natural resources. It is therefore time for us to stop and take a critical look at the present situation and this is what Dwivedi's book tries to do.