*Ecology, Economy and Society–the INSEE Journal* 3 (2): 197–201, July 2020

**BOOK REVIEW**

# Revisiting Environmental Economics: Concepts, Methods, and Policies

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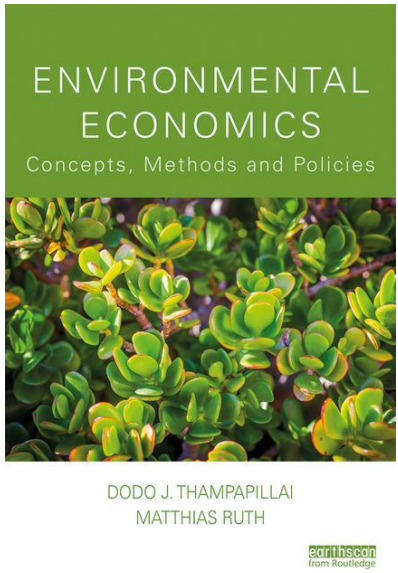
Dodo J. Thampapillai and Matthius Ruth. 2019. *Environmental Economics: Concepts, Methods and Policies*. London: Earthscan. ISBN: 978-1-138-06005-0, pp. 324, GBP 34.99 (PB).




Humans constitute one of the innumerable species inhabiting Earth, particularly its biospheric segment. Like other species, humans have developed a relationship with their natural environment, comprising both living organisms as well as their abiotic environment. However, the relationship between humans and nature has changed vastly over time, resulting in major changes in the biosphere, with climate change and biodiversity loss being two major consequences. The main concern of economic science has been the development of human material well-being, which depends on the production, consumption, and

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Published by Indian Society for Ecological Economics (INSEE), c/o Institute of Economic Growth, University Enclave, North Campus, Delhi 110007.

ISSN: 2581-6152 (print); 2581-6101 (web).

DOI: https://doi.org/10.37773/ees.v3i2.214

distribution of resources among individuals in society. In the process of production, a variety of material and energy resources are drawn from ecosystems and are converted through chemical, biological, and physical transformations into products and ultimately into waste at the end of the economic life cycle. In the process of humans rearranging matter through conversions of resources into waste, the molecular structure of resource systems is disordered, raising their level of entropy (or the degree of disorder). This results in a loss of efficiency in their ability to effect similar conversions that ensure the well-being of human society.

If the waste flows exceed the absorptive capacity of nature, the unabsorbed wastes accumulate as pollutants and contaminants in the ecosystem, generating adverse health effects for humans as well as the ecosystem. We may define environmental capital as the total stock and fluxes of all resources of ecosystems, including their waste absorptive capacity. For long, economists have neglected the role of entropy and other ecological laws in economic processes and the specific role of environmental capital in the process of economic development.

Conventional environmental economics addresses the problems arising from the loss of environmental capital as a consequence of market failure due to the public good and non-tradable nature of many of the ecoservices as well as the externalities caused by the residuals of material resources. The latter arise as waste at the various stages of production, transportation, and use of the products thereafter. At the microeconomic level, the analytical framework used for these issues has essentially been one of applied welfare economics. On the other hand, at the macroeconomic level, environmental economics has focussed mostly on the sustainable accounting of national income and its growth.

These micro- and macro-level analyses do not, however, factor in the role of *environmental capital* explicitly, nor do they articulate methods of analysis that consider environmental issues as derivatives of the role of environmental capital.

The book *Environmental Economics: Concepts, Methods and Policies* by Dodo J. Thampapillai and Mathias Ruth (2019) fills this gap in the construction of an analytical framework of environmental economics. The book provides an understanding of the connection between environmental capital and the allocation of resources at the micro level and the growth of income and capital accumulation at the macro level; here, capital is redefined to include all stocks of resources, natural or human-made.

The book is divided into the following five parts:

(1) The environment and economy: This part shows how environmental capital operates in the circular flow of values among households, firms, and governments while revealing the connections with the external sector of trade as well.

(2) Microeconomics and the environment: This part is concerned with issues relating to consumer demand, the economics of renewable and non-renewable resources, production, costs and supply at the firm level and, finally, market organization in the context of allocation of resources, including environmental capital and human-made capital and labour.

(3) Macroeconomics and the environment: This part discusses the adaptation of both short-run and long-run macroeconomics for the explicit incorporation of the role of environmental capital—its depreciation as well as investments in capital and associated technologies. Finally, this part contextualizes environmental capital in the analysis of the trade policies and globalization.

(4) Theory of valuation and estimation of environmental capital: A framework to assess the sustainability of an economic system that interacts with ecosystems and to derive policies based on this.

(5) Environmental policies: Finally, the book discusses environmental policies aimed at the sustenance of environmental capital by reducing its damage as well as investment policies for abating damages and restoring environmental capital.

The book is lucidly and elegantly written, making it an extremely useful reference text on environmental economics. I would, in addition, like to highlight a few novel features in the analysis in the context of issues that arise while adapting the standard economic theory for environmental effects.

1. At the level of microeconomic analysis, the adaptation of the standard theory of consumer behaviour for environmental effects has shown how the endowment effect of consumption due to a price change may cause a shift in the preference structure (indifference map) involving a choice between environmental and non-environmental goods and services. This may help to explain the difference between the result of a price change and that of its reversal. Such analytics also helps us to explain the divergence between the willingness to pay and the willingness to accept a change in the environmental endowment and that of a reversal of such change. The concerned chapter (Chapter 7) also shows how the

environmental attributes of consumer goods, along with income and other factors like advertisement spending, can influence market demands along with the elasticity of the environmental quality of the consumption good.

2. The chapters covering production, costs, and supply show how an increase in the use of labour and human-made capital leads to an increasing use of environmental capital (KN—the notation used in the book), resulting in its increasing fragility due to a rise in entropy. The latter is shown to set a limit on the maximum output yielded by a production function, which in turn would shift downwards with the shrinking KN. Capital is defined in the book as inclusive of both human-made and natural capital, with such choice of their respective numeraires that they are additive. Such a redefinition of capital yields a production function that points to the overstatement of output (in a comparative sense) by the conventional production function, which considers capital only as human-made or manufactured. The concerned chapters show the implication of the absolute bounds on the achievable output and the sharp rise in marginal cost as the output rises up to the limit set by the entropy law. The adaptation of isoquants and cost curves in such an analysis is shown to have important implications regarding the firm-level equilibrium and expansion path of output with changes in firm-level budgetary conditions. The concerned chapters point out the important implications of the short-run and long-run planning of a firm for the scale of production, resource use, and costs.

Finally, at the micro level of analysis, the impact of environmental capital's use on the market equilibrium supply and unwanted emissions is discussed both under the conditions of perfect competition and monopoly and are compared with the benchmark of the sustainability condition. The analysis is insightful in showing the conditions under which the perfectly competitive market equilibrium is a better benchmark than a monopoly within the context of sustainability, which is defined with reference to the absorptive limit of the ecosystems.

3. The treatment of the role of environmental capital in short-term and long-term macroeconomics has, in my opinion, been the most significant contribution of this book. It elegantly presents how the analysis of aggregate demand and aggregate supply, as functions of price level, can be adapted to the limitation of productive capacity due to the limit of environmental capital. It discusses the possibility of incorporating the impact of the depreciation of environmental capital on the one hand and of investment in KN on the other in short-term equilibrium income, employment and price level, etc. The implication of

such equilibrium is also compared with the benchmark of full-employment equilibrium in cases of both linear and non-linear depreciation of KN with the rise in production.

The book further reworks the analytical framework of environmental macroeconomics to consider both the waste absorptive role of environmental capital and the impact of its entropic depreciation on income and output. The implications of the results are important for ecological sustainability, full employment, and the stabilization of economic fluctuations. It is also important to examine if such varying objectives would have any conflicting considerations with regard to the choice of policies.

4. The long-run macro analysis in the book has shown how the standard versions of Harrod, Solow-Swan, Romer, and other endogenous growth models can be adjusted to incorporate the role of environmental capital as distinct from that of human-made capital and their joint implications with respect to a steady state solution. The models recognize the role of the productivity of the KN service and also incorporate the feedback effect of depreciation of KN on growth rate and on the character of its steady state solution. The chapters have also illustrated the results of both short- and long-term macroeconomic indicators as well as those of long-term growth for Australian and South Korean economies, respectively.

Before concluding the book, the authors deal with trade, the valuation of environmental capital, and environmental policies, extending the same consistent framework of adapting economic analysis to accommodate environmental capital. Taking an overview of the various chapters, one can conclude that the book provides a highly useful alternative text for environmental economics, which is firmly rooted in ecological principles and entropy law, the latter being the source of resource scarcity and a limitation to economic scale or growth. The book fulfils the interdisciplinary purpose of integrating ecological laws into the models of functioning of an economy at both the micro and macro level. A reader will be able to discern how interdisciplinary considerations relating to ecological limits can be built into economic theory with appropriate adaptations. Such theoretical reformulations that adapt to environmental concerns will be helpful for both understanding and interpreting the economic consequences of the environmental crises of today as well as for developing the appropriate policy insights for achieving sustainable development in the future.