

# ENVIRONMENTAL ECONOMICS AND SUSTAINABLE DEVELOPMENT

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## Summary

Until the beginning of the 1990s, traditional economic analysis provided suitable tools to environmental economics for the study of environmental issues and related policy problems: i.e. the theory of non-renewable and renewable resources; the theory of missing markets; Pigouvian taxation and the theory of property rights; the economics of public goods; welfare economics.

At the beginning of the present decade, the emergence of “new” environmental phenomena which have an intrinsic transnational and long-run dimension, are closely inter-linked with human development patterns and involve a great deal of uncertainty and information asymmetries (i.e. climate change, ozone layer depletion, marine pollution, etc.), “crowd out” much of the existing knowledge, practice and conventional wisdom, thus opening new perspectives for economics analysis and requiring the development of new analytical tools and policy analyses.

The environmental economics discipline has responded to these challenges, experiencing a kind of breakthrough, both in terms of methods and focuses of the analysis.

New developments of the literature have been grouped and discussed under three major “research headings”: sustainable development issues; transnational environmental problems and international policy co-ordination; uncertainty and information asymmetries. Important contributions to the understanding of environmental phenomena, their causes, effects and possible solutions have been developed from various areas of economic theory and from original applications and developments.

Further theoretical improvements and empirical studies are nonetheless needed if economists are to provide an increasingly effective contribution to the study of environmental issues and to the pursuit of sustainable development. In particular, empirical analyses are of fundamental importance both to environmental economics and to the sustainability debate. To implement this, one needs more data sets and more empirical models. Also, local studies are very important to better understand the interactions between the ecological and the economic systems.

Finally, given the interdisciplinary nature of environmental problems and their strong links with the other dimensions of human development, the contribution of economic analysis to the pursuit of sustainable development crucially depends on the capacity of the discipline to integrate its efforts with other disciplines such as ecology, physics, biology and sociology.

## **1. Introduction**

Environmental and natural resource economics has emerged as a mature field of research over the last three decades. In the 1960s and 1970s it was the subject of a comprehensive research program which dealt with a wide range of issues and policy problems, such as the economics of natural resources, the methods and problems in the correction of externalities, the management of common property goods, the economics of nature preservation. Against this background, suitable analytical tools were provided by economic analysis: the theory of non-renewable and renewable resources; the theory of missing markets; Pigouvian taxation and the theory of property rights; the economics of public goods; welfare economics. The research program was very successful and, in the following decade, it gave rise to several text-books.

In the early 1980s, however, scientists have highlighted a set of “new” environmental phenomena, such as global warming, ozone layer depletion, acid rain, fresh water and ocean pollution, desertification, deforestation and the loss of biodiversity. Some of these phenomena, such as ozone layer depletion, were newly discovered; some others, such as global warming, were known but attracted new attention, due to their unexpected scale and socioeconomic implications. Given their scale and importance, the new environmental problems entered the agenda of policy-makers and became the center of worldwide debate and a massive diplomatic effort, culminating in the UN Conference on Environment and Development held in Rio de Janeiro in 1992, followed by the Cairo UN Conference on Population and Development (1994) and the Istanbul UN Conference on Cities and Sustainable Development (1996).

The new environmental phenomena share a set of common features:

- they are closely related to demography, economic growth, and structural change;
- they can have a very long-run dimension, affecting future generations as well as the present ones;
- they have an intrinsic transnational or global dimension, due to the nature of the externalities involved;
- they have important international repercussions through trade and factor mobility and involve North–South–East relationships; and
- they involve a great deal of uncertainty and information asymmetries.

The economists' community has increasingly recognized that the above common characteristics translate into big challenges for environmental economics: they raise new questions, or pose old questions in a new context. In particular, traditional environmental economics had focused on environmental issues which were “limited” both in time and space and analyzed in a closed, competitive, full-information economy, in isolation from all other economic and social dimensions of human development. The new environmental phenomena “crowd out” much of the existing knowledge, practice and conventional wisdom, thus requiring new analytical tools and fresh policy analyses. Most importantly, the general framework for the analysis has changed: environmental issues emerged as a particular dimension of human development.

Against this background, environmental economics has received a new impulse and experienced a kind of breakthrough, both in terms of methods and focuses of the analysis. In some cases, the required tools are being taken from other areas of economics: macroeconomics and the theory of growth, applied microeconomics, welfare economics, the theory of property rights, taxation, international, industrial and labor economics, etc. In other cases, the analytical requirements provide an impulse for original applications and developments. In addition to making connections with many other sub-disciplines in economics, environmental economics has gradually broadened its focus by making connections with the social, political, natural and physical sciences, thus attracting a much larger group of contributors. The “new” developments of the environmental economics literature, both on analytical and policy grounds, may be grouped into three major research areas: (a) sustainable development; (b) transboundary environmental issues; (c) uncertainty and information asymmetries. In the following pages, we will consider (under the above-mentioned three “headings”) the theoretical questions posed by the new environmental phenomena, the way in which economic theory and environmental economics have dealt with those questions so far and, finally, the issues that call for further advances in economic theory and, more generally, in environmental economics research.

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### **Biographical Sketches**

**Umberto Colombo**, born 1927, is a member of the Board of Directors of ENI S.p.A., ACEA S.p.A., Ericsson S.p.A. and Energy Conversion Devices (US). He is also the Chairman of Fondazione LEAD (Leadership for Environment and Development) in Geneva and of the Scientific Committee of the ENI-Enrico Mattei Foundation in Milan. He is a member of the Club of Rome's Executive Committee. Professor Colombo received a doctorate degree in physical chemistry from the Pavia University in 1950 and was awarded a Fulbright Fellowship in the Department of Chemical Engineering at the Massachusetts Institute of Technology in 1953. He also has received honorary degrees from Anna University, Madras (1991) and Mendeleev University, Moscow (1994). Professor Colombo has held a number of positions in the government, including Chairman of the Board of ENEA (National Agency for New Technology, Energy and the Environment, 1983–93) and Italian Minister for Universities, Science and Technology (1993–94). From 1991 to 1993 Professor Colombo served as Chairman of the European Science Foundation. Professor Colombo is author of numerous books and over 200 papers on energy, environment and science and technology policy. Among the many honors he has received are the Honda Award for Ecotechnology (Tokyo, 1984) and the Triennial Prestige Lecture before the Royal Society and Fellowship of Engineering (London, 1988).

**Domenico Siniscalco**, born 1954, holds a laurea in Law from the University of Torino and a PhD in Economics from the University of Cambridge. He is professor of Economics in the University of Torino and Managing Director of Fondazione Eni Enrico Mattei. Since 1998 he is a member of the Council of Economic Advisors of the Italian Prime Minister. He is one of the ten economic advisors of the Italian Prime Minister. He is also front-page columnist of *Il Sole 24 Ore*. Professor Siniscalco has published extensively on game theory, coalition formation, industrial organization, privatization processes, environmental economics. He is currently involved in several European Commission research projects, and is associate editor of three international journals in economics. He is also past-president of the European association of environmental economists (1987–1995); associate of the Royal Institute of International Affairs and member of the board of the Beijer Institute of the Swedish Royal Academy of Science.