
Preface

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Management of the environment demands the bringing together of economic, technical and scientific information on complex processes, and the development of social processes for decision-making and implementation of chosen actions. This is true for the environmental obligations of private sector enterprise managers, and also for public policy-makers. The words 'sustainable development' are now part of common language, and signal the need to bring considerations of irreversibilities of environmental change and long time-scales – such as climate change processes, half-lives of radioactive wastes and tropical forest ecosystem destruction – into the ways that commercial and political decisions are justified in the short term.

The contributions brought together in this special issue are all focused around this theme of the information and institutional requirements for effective environmental management and decision-making. Three articles explore principles of economic valuation and their application for environmental decision-making. Five further articles demonstrate the new challenges facing scientists, economists and managers through detailed analyses of particular problems or case studies.

The opening article by Martin O'Connor, 'The internalization of environmental costs', examines at a methodological level the problem of implementing the 'Polluter Pays principle' (PPP) in the European Union. Officially, the PPP has been adopted within OECD countries for over twenty years. Yet in reality, most pollution is still 'externalized', that is, the inconveniences and damages are borne by a much larger public than those buying and selling the goods in question. That 'the polluter should pay' is a double principle – for internalizing external costs and for assigning liability. In our price-oriented society, its application may seem to entail a need for monetary valuation of damages. This can allow environmental impacts and protection questions to be formulated as optimal pollution and optimal resource use problems through the extension of traditional cost-benefit analysis techniques. However, reasons such as uncertainty, distributional concerns, and diversity of ethical positions make monetary valuation difficult and controversial. Some judge it as inappropriate. In this context, 'internalization' may be given a richer institutional meaning, as a social-political process where conflicts emerge and must be resolved among competing interests, among people holding different value systems and different principles of judgement, and also among different representations of future states and different visions of the world. The process of 'internalization' of environmental damages is thus expressed through broad societal adjustments. In the article this perspective is illustrated by a selection of environmental policy problems within the European Union, including eco-tax, green national accounting, industrial safety and industrial partnership for sustainability.

Alan Holland, in 'The foundations of environmental decision-making', develops further an argument that environmental 'values' should not be considered solely in economic terms of the 'preferences' of consumers and pricing, but that they are often the expression of principles of right action based on ethical claims. In a principled critique of contingent valuation methodology, he identifies the tendency to dichotomize between

'purely subjective' preferences (which are beyond dispute) and supposedly 'objective' scientific information. He then argues that environmental decision-making requires the exercise of 'judgement' in the sense of public argument, explanation and social responsibility. Decision-support techniques may thus be sought that do not depend exclusively on monetization, such as multi-criteria and deliberative methods, so that environmental decision-making is linked specifically back to political and moral discourse.

Clive Spash, in 'Reconciling different approaches to environmental management', also picks up on themes of the uses and limitations of monetary valuation for decision-making purposes. He argues for the importance of analyses for environmental policy based on a sustained inter-disciplinary activity, with scientific, economic and wider social dimensions (such as distributional justice and other ethical claims) being set in dialogue with each other in democratic processes. He shows, as an example, how this sort of interdisciplinary approach can be developed through cost-effectiveness analyses. The identification of constraints, such as sustainable fishing yields or pollution thresholds, is understood as a social judgement partly based on scientific understanding, and economic analysis can be used to quantify the economic opportunity costs associated with respect of the identified constraints. In this way, scientific and economic information is provided into a public debate. A discussion of the justifications or benefits of environmental policy is made possible without having to rely on monetary estimates of the environmental values and damage. It is possible to use scientific, social and economic information to gain an understanding of the magnitude of possible adverse effects. Policy options can then be identified that seem reasonable as responses to the identified concerns. The decision as to reasonableness is complex, involving dimensions of risk-sharing and judgements about uncertainties, extended stakeholder participation in decision-making, the confrontation of divergent ethical positions, and resolution of conflicts of economic interests.

Nuria Castells and Silvio Funtowicz give a real world example where cost-effectiveness analysis became a component in political debate, in 'The use of scientific inputs for environmental policy-making: the RAINS model and the sulfur protocols'. Acid rain in Europe is a policy problem where the scientific, distribution and economic cost criteria have been explicitly articulated. The adverse impacts of acid depositions on forest and aquatic life in many parts of Europe have become plain since the 1980s. Quantification in monetary terms of the significance of damages is difficult, as long-term as well as short-term ecological effects are involved. The distribution and intensity of damages across European states depends on prevailing wind directions relative to major emissions and on the sensitivity of ecosystems. There is no correlation between the share of emissions, the significance of these emissions as a contribution to the overall damage, and the share of damages received. A feature of the European policy-making analysis has been the extensive use of simulation modelling with integrated scientific and economic components for the identification of the severity of acidification damage and of cost-effective mitigation action. A policy target was agreed by Oslo Protocol signatory parties of a reduction by 60% of depositions in excess of critical loads within each country. The basis for achieving this target of 60% 'gap closure' was to be defined by the RAINS simulation model, which generates as outputs a set of national targets of emission reduction for the parties to the agreement. During the negotiations, it became clear that decisions on precisely how to formulate the closure targets (geographical scale, aggregation, etc.) were going to have a major impact on policy implementation costs for

each country. The policy targets finally settled on are not precisely those generated from RAINS with the 60% closure scenario. They were negotiated and changed in the bargaining process.

Reasonable or well-judged decisions are complicated to arrive at. They are often diffusely spread over time, punctuated by critical moments. One good illustration of the complexity of procedures for arriving at an 'internalization' of pollution-associated risks is the Seveso Directive relating to hazardous industrial installations, discussed by Bruna de Marchi in 'Seveso: from pollution to regulation'. The name Seveso comes from the locality of an event on the 10 July 1976, when an explosion occurred in a TCP (2,4,5-trichlorophenol) reactor, at the ICMESA factory in Lombardy, Italy. A toxic cloud containing TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) was accidentally released, contaminating a densely populated area downwind. At the time of the accident, neither the residents nor the local and regional authorities had any suspicion of the factory being a source of risk. This accident, and other similar ones during the 1970s, dramatically increased public concern about industrial risks, and accelerated the European regulatory response to the safety of chemical installations. This has meant increased awareness of the hazards connected with the production, processing, storage and transportation of chemicals. It also changed attitudes, and made no longer acceptable, to either the authorities or the public, the random presence of thousands of dangerous installations all over Europe. Thus the disaster gave impulse to the creation of a new system of regulation, embodied in the Directive 82/501/EEC issued in 1982 and subsequently amended twice, on the major-accident hazards of industrial activities. One of the noteworthy features of the Directive is its explicit recognition of a public, or widely social dimension of safety legislation. It is no longer a matter for experts alone, but for the citizenry as well.

Christophe Defeuilley and Olivier Godard, in 'The economics of recycling in France: institutional framework and technological adoption', discuss a more banal aspect of the waste disposal problem – the measures put in place since 1992 by municipal authorities in France for the management of packaging waste. Until recently, incineration has been the main alternative to disposal in landfill sites, but the growing volumes of waste have given impetus to attempts at recycling. This poses the question of economic incentives, and particularly the commercial viability of the collection, sorting and reuse processes. New procedures for collection and for promotion of recycling are being experimented with, through the creation of a quasi-commercial enterprise called Eco-Emballages as the intermediary between the municipal authorities (which are required by law to implement recycling and other alternatives to waste dumping) and the manufacturers and merchants responsible for the production of packaging materials. Fixed prices per unit of sorted material are negotiated, the aim of the system of guaranteed prices being to assure a market for recycled materials through creating some stability and predictability in conditions of 'supply and demand'. In fact, the municipal authorities are being asked to carry quite large financial risks for their investments in selective collection and sorting operations. Such investments typically are justified over a 15–20 year depreciation horizon, but, under the current arrangements, they have no way of ensuring the conditions for receiving a return on the sorted materials beyond six years. The municipal authorities are being required to take entrepreneurial risks; at the same time they are legally responsible for ensuring long-term public good.

Virginia Setbon, in 'Waste incineration in cement plants: constraints and development

opportunities', examines the particular case of the incineration of wastes as a supplementary energy source in cement kilns, and the differences between France and Germany in this regard. This is an activity that, on the fact of it, can have a double dividend: needed energy inputs at a relatively low cost, and an effective mechanism for disposing of some solid wastes. The controlled incineration of wastes thus allows the cement industry to present a 'green' image while pursuing commercial objectives. It is an example of the environment as a new strategic opportunity, in the sense that environmental concerns are translated into new market opportunities, in this case low-cost energy sources. However, the commercial rationality of the waste-incineration option depends on many factors, including cheap and reliable access to the flows of waste materials, technical assurance of the quality of the cement produced with the modified input mix, and the social acceptability of the waste incineration process itself.

The last article in this special issue, 'Social perceptions of environmental issues' by Sybille van den Hove and Martin O'Connor, reports an experimental sociological study of the views of a range of French industrialists on the responsibilities of industry towards the environment and concerning waste production in particular. The study was carried out through an interpretative analysis of recorded interviews. Composition of the article in the form of letters from a traveller is a device that helps highlight the fact that solutions to environmental problems are defined first and foremost socially. It is the social framing of the issues that determines the way in which technical measures are implemented. The sample interviewed in the study define their responsibilities first of all with reference to regulation. In the stylized 'France' that emerges, the regulatory framework is established by public authorities, based on a scientific appraisal of the needs. The members of the public, the citizens and/or consumers are not given a major role in this process. We see here an image of the technocratic rather than populist character of French government and business management.

These contributions are quite diverse in character, yet they all serve to bring out the institutional and social complexities of environmental decision-making. The adequacy of a decision support procedure depends not only on standards of theoretical rigour and internal coherence, but also on external considerations. In a synthetic way, we may distinguish five broad sets of considerations, which are interlocking:

- *Scientific adequacy*: do the description and evaluation methods deal well with the important features of the natural world and its characteristic processes of change?
- *Social adequacy*: do the methods furnish information in ways that support reasoned political debate, that permit the exercise of judgement, and that respond to the full range of stakeholders' needs?
- *Economic rationality*: do the suggested courses of action that emerge from the valuation process respect economic efficiency, in the sense of appearing to be a reasonably cost-effective way of arriving at the envisaged outcomes?
- *Statistical adequacy*: are the empirical measurement and subsequent aggregation procedures consistent with the guiding theoretical precepts, and do they conform to norms of reliability, coverage or representativeness?
- *Budgetary realism*: can the proposed analytical approaches and decision-making procedures be expected to yield reliable and useful results (judged in terms of the four sets of considerations above) within the limits on resources that can be committed by the parties concerned?

We suggest in this way that the bringing together of scientific, social, and economic considerations in real time, as a sort of interdisciplinary dialogue and social learning process, furnishes a basis for prioritizing and revising actions in the environmental domain. There is not just one way in which this 'dialogue' can or should take place. It depends partly on cultural forms and traditions, and also is a matter of principled argument and practical judgement. Good designs for environmental decision-making have to be demonstrated with specific cases, and the strengths and weaknesses of various experiments subjected to critical appraisal, as we have tried to show through the contributions brought together here.

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