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Preface

Risk assessment and environmental policy making[☆]

1. Risk research and EU policy support¹

Born as a research institution for technology development, the Joint Research Centre (JRC) of the European Commission has seen its mission shifting steadily towards the study of the side effects of technological development, and scientific support to EU policies, in particular those on health and environment protection. According to Article 130r(2) of the EU Treaty [1] “the Community policy on the environment shall aim for a high level of protection, taking into account the diversity of situations in the various regions of the Community. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and the polluter should pay.” The objectives are: preserving, protecting and improving the quality of the environment; protecting human health; prudent and rational utilisation of natural resources and promoting measures at international level to deal with regional or world-wide environmental problems.

A recent JRC paper² discusses the need for accepting and managing the many uncertainties in the basic science necessary to meet this commitment. Therefore, the authors reflect again on risks connected with decisions “on the basis of what we know now — not what will be known once the research is complete.” Among their conclusions is that: “conflicts caused by the uncertainty can be minimised by involving stakeholders in all stages of the (policy-related) scientific process rather than presenting a complete finalised solution to them.” They also investigate the role of recent developments in information technology in making this process transparent to the public from its very beginning.

[☆] Post Scriptum: During the publication of this issue the European Commission has issued a Communication on the Precautionary Principle [COM (2000) 1, Brussels, February 2], which can be viewed at: http://europa.eu.int/comm/environment/docum/20001_en.htm

¹ The ideas expressed reflect the thinking of the authors, and do not imply any endorsement by the European Commission.

² See Ref. [2]. (The debate is being enlarged to Science and Governance in the EU, JRC-Draft Report, Ispra, January 2000.)

On the discussion of the policy-related science itself, they therefore converge on perspectives similar to those that have originated from other viewpoints [3] and that focus on risk management, as described below.

2. Risk-informed decisions in a democratic society

Risk research addresses the identification and management of situations that might result in losses or harm, immediate or delayed, to individuals, groups, or even to whole communities or ecosystems, often as a result of the interaction of human activities with natural processes. Since resources for reducing or mitigating risks are limited, priorities need to be assigned. Early deliberations on risk advocated a three-stage approach; establish the probability and magnitude of the hazards respecting the inherent scientific uncertainties (a technical process), evaluate the benefits and costs (a social process), and set priorities in such a way that the greatest social benefits are achieved at the lowest cost [4].

This perspective strictly separated the risk assessment phase from the risk management one. However, comparative risk analyses (CRA) to set priorities on reducing risks across disparate risk contexts, or proposals to the public of pre-engineered risk based decisions were found to be difficult to implement, because of the public's concerns about the nature and context of the risks. Too often risk studies have not questioned the fundamental distinction between facts (including probabilistic expectations of certain harmful consequences) and values [5]. Kurnreuther and Slovic [6] noted how "the conflicts and controversies surrounding risk are not due to public irrationality or ignorance but, instead, may be seen as a side effect of our remarkable form of participatory democratic government, amplified by certain powerful technological and social changes."

A new perspective on risk analysis was elaborated in a recent publication of the U.S. National Research Council, entitled *Understanding RISK — Informing Decisions in a Democratic Society* [7]. The distinguishing feature of this new approach is that it sets out an *analytic-deliberative* process that builds on the notion that value judgements are an inherent feature of expert approaches to risk assessment. One objective of the analytic-deliberative process is to provide a synthesis and summary of information about a hazard that addresses the needs and interests of policy makers and of interested and affected parties. This is referred to as *risk characterisation*. The success of risk characterisation "depends critically on systematic analysis that is appropriate to the problem, responds to the needs of the interested and affected parties, and treats uncertainties of importance to the decision problem in a comprehensible way. Success also depends on deliberations that formulate the decision problem, guide analysis to improve decision participants' understanding, seek the meaning of analytical findings and uncertainties, and improve the ability of interested and affected parties to participate effectively in the risk decision process." This calls for a participatory procedure, in which the different stakeholders are involved early in the risk analysis process to "characterise" risks, even before they are given a formal assessment. The proposed procedure does not diminish the role of modelling and quantification, but is aimed at

eliciting the “values” and the perspectives of the community involved so that the multiple dimensions of risk can be taken into account early on in the assessment. With this procedure, tacit recognition is given to the notion that the expert³ risk estimates are influenced by the context of the risk, that the experts cannot generate “facts”, even probabilistic measures, that are void of values.

3. Contents of this issue

The articles in this issue, have been selected, bearing in mind the current state of the risk management debate, to provide the reader with case studies on EU approaches to environmental legislation, linked support and research activities, and public involvement and trust; a few insights from a wider international context are also incorporated.

3.1. Integration and prioritisation

Patricia Cirone and *Bruce Duncan*’s article describes the attempt to incorporate stake-holders in a holistic view of risk assessment following the new NRC risk management paradigm [7], and reviews problems connected with an integrated human health and ecological assessment of watersheds; a framework is also discussed for dealing with multiple causes and effects, which is relevant to the new EU Water Framework Directive [9]. *Richard Morgenstern* et al. start from the US-EPA “Unfinished Business” for reviewing several CRA conducted in various developing countries and economies in transition. They are presenting CRA as a framework that allows involvement of the public in setting environmental priorities “that fairly and realistically recognises the importance of both science and values.”

3.2. EU policy process

Markus Amann and *Martin Lutz* explain how, in the EU legislative approach to control air pollution, sustainability is interpreted as not exceeding of critical loads and critical levels, e.g. the ‘no-damage’ exposure thresholds for human health and vegetation as the environmental long-term objective. For ground-level ozone, this is resulting in a directive on National Emission Ceilings. The article discusses modelling and uncertainty issues, and the scenario underpinning the proposed NECs, as well as the environmental gains and costs for member states. *Georgios Papadakis*’s paper describes the development of a EU legislative process (on major accident hazards pipelines) after a consultation⁴ activity to identify gaps in national legislation and to ensure precautionary measures are taken with respect to potential accidents rather than reacting only after an

³ About uncertainties, risk and experts, see Ref. [8].

⁴ For discussion of consensus building consultation in decision making in Europe, as opposite to “appeal to objective forms of knowledge” as a way to overcome controversies, see Ref. [10]. In this paper, the author, instead of opposing (or attempting to bridging) in risk analysis a social “culture” to a hard science one, calls for “interactions that allow the contextualisation of scientific knowledge and the integration of knowledges.”

accident has happened. This was the case for the early “Seveso” Directive⁵. *Stuart Duffield* et al. discuss environmental problems in EU access countries as they emerged from a topical workshop on land recovery and man-made risks. They highlight conclusions and recommendations from the participants to fill gaps in legislation, decisional criteria, modelling and monitoring tools.

3.3. *Inherently cleaner and safer technologies*

The EU principle of prevention, that environmental damage should be rectified as a priority at the source, is demonstrated by *Dermot Cunningham’s* paper describing the Irish mandatory requirements for Environmental Management Systems. “In Ireland a repetitive process of companies having to consider all other options before resorting to end-of-pipe solutions has conditioned them to think creatively . . . The legal requirements . . . have led to the beginning of a sustainable production ethos.” In a similar manner, *Nicholas Ashford* and *Gerard Zwetsloot* suggest that rather than assessing the risks of existing production systems, one should move towards discovering technological alternatives. And they propose inherent Safety Opportunity Audit and Technology Options Analysis to advance the adoption of primary prevention health, safety and environment strategies. In addition to their arguments based on economic considerations, one might remark that too often, cost–benefit analyses fail to catch the benefit of innovation.

3.4. *Methodology and supporting tools*

Denis Sarianni and *Giuseppe Triacchini’s* article proposes a methodology for assessing the impact of large-scale use of new technology (e.g. biomass to energy in the actual study case) on a particular geographical area. The objective is to support policy-making by providing scientific tools facilitating the integration of multiple governance objectives in a structured framework. *Vladimir Gorsky* et al. describe analytical solutions to the evaluation of toxic doses from accidental releases and propose interval analysis for the treatment of uncertainties in risk assessment. In contrast to nuclear power plant risk studies, too little effort seems to have been devoted to uncertainty analysis in quantitative risk assessment for chemical installations. *Michalis Christou* and *Marina Mattarelli* propose a multi-objective methodological framework for decisions on land use planning taking into account the risk of major accidents. This is an issue to be resolved essentially at local level. The methodology is proposed as a means to facilitate discussions among the parties involved. *Sergio Contini* et al. also illustrate the use of new information technology and Geographic Information Systems at

⁵ On the evolution of the legislation on major accidents hazards control in fixed establishments, see a previous issue (Ref. [11]).

various level of geographical extension (EU wide, regional, local) as a way of making transparent the dialogue among the parties in the management of major accident risk.⁶

3.5. Participation and public trust

Eliciting local knowledge about risks to promote awareness and encouraging actions to reduce community vulnerability to risk is the scope of *Bruna De Marchi's* paper, which offers a methodological guide to interpret citizens' concerns and aspirations. Presenting results from three study cases, *Luigi Pellizzoni* and *Daniele Ungaro* discuss participation, deliberative democracy, public trust and governance of risks. A case study (by *Anne Lalo*) on prior information to citizens about accident risk and people reactions after a major accident in France shows that the practice did not correspond to citizens' expectations even if it was sufficient to avoid disruption. Finally, *Merle Jacob* and *Tomas Hellström*, with reference to the BSE-CJD crisis, discuss the difficult use of scientific information consistently with the assumed policy objectives under conditions of high uncertainty and low public trust.

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⁶ The "Seveso II" Directive in a relative short time has changed the "secrecy" which in most country surrounded chemical risks into unprecedented transparency, which is not yet required for other types of risks in the EU (e.g. the consequences of dam failures). For the "evolutionary construction of a regulatory system" in reference to the Seveso case, see Ref. [12].

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