

# **GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTE AS A "MEGAPROJECT": A SURVEY OF POTENTIAL METHODOLOGIES FOR SOCIO-ECONOMIC EVALUATION**

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Long-term geological disposal of high-level radioactive waste – the nuclear waste management option preferred by the majority of industry and government experts – has not yet been implemented anywhere in the world. However, a number of countries, including France, have advanced plans for implementing such a disposal project. The French national radioactive waste management agency, Andra, has recently sought to introduce greater reflexivity into its operations, in response notably to the legal obligation to ensure the reversibility of decisions and the retrievability of the waste packages. As part of such efforts, Andra seeks advice on methods and approaches for the “socio-economic” evaluation of the disposal project. This paper presents the results of the first part of a research project aimed at designing a framework for socio-economic evaluation of radioactive waste disposal in France.

Long-term geological disposal of radioactive waste can be described as an extreme example of a “megaproject” (e.g. Flyvbjerg 2007). Such projects differ from many conventional industrial projects by the multiplicity of temporal and spatial scales involved; continuous evolution and dynamism owing to the uniqueness of the project and the long time scales; the complexity of the causal relationships involved; high degree of scientific, political and institutional uncertainties; and a great likelihood of disagreement among parties involved concerning the normative principles underpinning the project (e.g. Altshuler & Luberoff 2003 ; Flyvbjerg et al. 2003; Priemus & Flyvbjerg 2007). The extremely long time scales involved distinguish radioactive waste disposal from other megaprojects, as the governance structures and the institutional framework are certain to undergo fundamental changes during the lifetime of the project.

Research on existing megaprojects has highlighted a number of “negative uncertainties” typical of megaprojects, which accentuate the risk of chronic overestimation of the benefits and corresponding underestimation of the required costs and timescales for the realisation of the project (par ex. Flyvbjerg 2007, 12-13). These “negative uncertainties” pose in particular problems of accountability – one of the key focus points of policy evaluation – whereas the “positive uncertainties” have received less attention. These offer a number of opportunities, notably the possibility for iterative reorientation of the project in line with changing context and expectations of the parties involved. Scientific and technological progress, changes in the role of nuclear industry, and shifts in societal attitudes and preferences may open new opportunities for social learning, reflexivity, reversibility, and possible revision of dominant modes of thinking and earlier decisions, in the spirit of “adaptive governance”. A challenge for the evaluation of the disposal project is to combine the objectives of greater accountability and enhancement of social learning, in order to take into account the negative uncertainties and fully exploit the positive ones (see e.g. Lehtonen 2005).

The first part of the research project, the results of which are presented in this paper, had three main objectives: 1) identifying the characteristics relevant to socio-economic evaluation and specific to the French disposal project as an example of a “megaproject”; 2) identifying the expectations of the various participants concerning socio-economic evaluation of the project; and 3) outlining the key methodological challenges and

possibilities for socio-economic evaluation of the project. The analysis drew on 1) a literature survey of existing evaluation methods and approaches, with an emphasis on the areas of public policy evaluation, ex ante impact assessment (e.g. EIA, EA, IA, SIA, TA), and ecological economics; and 2) interviews with stakeholders, experts and affected parties in France. The survey pays particular attention to the following aspects of the method/approach: its applicability to the evaluation of megaprojects; adherence to the principle of “plural and conditional expertise” (e.g. Stirling; Söderbaum); multidisciplinary and integration of different types of knowledge; and emphasis on social learning. The expectations of the participants are placed within the broader institutional and governance framework of the disposal project. The survey of participants’ views feeds into the development of an initial framework of evaluation, notably on the questions of the focus of evaluation (meaning of “socio-economic”); the temporal dimension (roles of ex ante, ex nunc, and ex post evaluation); the purpose of evaluation (accountability, learning, knowledge-enhancement, empowerment, political/strategic objectives); the expected users, uses and consequences of evaluation; and the role of the evaluation process itself as a source of learning.