

The logo for IRSN, featuring the letters 'IRSN' in a bold, sans-serif font. The 'I', 'R', and 'S' are red, while the 'N' is blue.

INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Enhancing nuclear safety

Insights economic sciences can bring to social sciences and radiation protection

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Nuclear technology: what matters

- In all the domains dealing with the nuclear technology, there are potential or immediate consequences in terms of:
 - Environment
 - Health
 - Economy
 - Society

- All these aspects have to be taken into account to avoid taking decisions which could be :
 - Unjustified from an economic perspective,
 - Inappropriate from public perception's perspectives,
 - Misunderstood by the population

Nuclear technology: what matters

- A progressive awareness of the importance of accounting for all these dimensions



« The mental health impact of Chernobyl is the largest public health problem unleashed by the accident to date »

Chernobyl Forum report on health, 2003-2005

« To be considered acceptable, a concept for managing nuclear fuel wastes must have broad public support, be safe from both a technical and social perspective, have been developed within a sound ethical and social assessment framework [...] »

Canadian Environmental Assessment Agency (Seaborn Report), 1998



Consensus on the contribution of economic sciences

➤ Approach



- D2.2 CONCERT deliverable identifies key research topics in the field of radiation protection and risk communication / risk perception related to EURADOS, ALLIANCE, NERIS, MELODI platforms
- We explored what contributions economics can bring to these research topics / priorities and elaborated a questionnaire to evaluate their relevance for the CONCERT project
- This questionnaire was sent to all platform leaders, WP leaders and WP2 task leaders

Consensus on the contribution of economic sciences

- Results in the field of emergency preparedness and management of post-accident consequences
 - Assess different strategies associated with the prevention and remediation of the consequences of the accident :
 - Account for societal aspects such as the importance of culture and traditions in the evaluation of costs and benefits of decontamination
 - Compare decontamination techniques, assessing the costs and the benefits of each of them



Consensus on the contribution of economic sciences

- Results in the field of emergency preparedness and management of post-accident consequences
 - Assess different strategies associated with the prevention and remediation of the consequences of the accident :
 - Compare benefits in terms of health effects saved due to evacuation with possible costs in terms of psychological burden and life lost in road accident
 - Take due account of stakeholders' interest by valuing the loss of welfare associated with life in a contaminated territory
 - Compare different strategies of management of contaminated goods



Consensus on the contribution of economic sciences

- Results in the field of emergency preparedness and management of post-accident consequences
 - Compare and analyze discrepancy between societal expectations in terms of emergency preparedness and post-accident management and authority policies
 - Assess the relative impact of different compensation mechanisms in case of a nuclear accident



Consensus on the contribution of economic sciences

➤ Results in the field of dosimetry and medical application

- Assess costs and benefits associated with a medical practice:

- Compare different intervention techniques

Example: Comparing PET / MRI technologies

- Compare the benefits associated with the systematic screening of thyroid cancer among children after a nuclear accident, to the psychological burden for the child and its family associated with such a practice



Consensus on the contribution of economic sciences

➤ Example of a non-nuclear study in the field of medical application:

« Reducing false positives in Newborn Hearing screening program: How and Why ? » Lin HC et al., Otol Neurotol Journal, 2007; 28(6):788-92

- Authors compare the cost effectiveness of two methods for newborn hearing screening : transient evoked otoacoustic emissions (TEOAE) and automated auditory brainstem response (AABR)
- TEOAE is a cheaper technology *a priori*; but the cost assessment taking into account tangible and intangible costs (parental anxiety) shows that it is costlier due to the higher false positive it induces.



Consensus on the contribution of economic sciences

➤ Results in the field of radioecology

- Account for stakeholder's interest in the process aiming at comparing different remediation techniques and restrictions of use, related to:
 - dismantling of nuclear installations and future use
 - management of very low level waste
- Impact assessment of the siting of a new nuclear facility
- Impact assessment of an accident occurring at a specific site



Consensus on the contribution of economic sciences

➤ Example of a non-nuclear study in the ecology domain:

« Valuing environmental impacts of a large dam construction in Korea: an application of choice experiment », S.Y. Han, Environmental impact assessment review, Vol. 28, Issues 4-5, May-June 2008, Pages 256-266

- Authors measure the overall environmental cost of a dam construction considering the loss of welfare of the population due to the construction impact on forests, fauna species, flora species, historical remains
- The study allows to provide policy-makers with quantitative information that can be useful in decision-making process related to large dam construction projects



Consensus on the contribution of economic sciences

➤ Results in the field of risk perception

- Finding optimal ways of presenting radiation dose to make it more understandable (e.g, comparing it to other risks for instance)
- Testing the hypothesis that risk could be easily understandable by the population and decision makers if radiation dose were translated into a loss of life expectancy
- Assess the impact of information on risk perception :
 - Compare risk perception among different subgroups of stakeholders having various degree of understanding and of information regarding radioprotection and the effects of ionizing radiation
- Provide information about stakeholders' perception of nuclear risks and benefits



Focus on two specific studies

- IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident
- NREFS studies and methods for socio-technical management of big nuclear accidents (Philip Thomas, Bristol University)

IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

- Context: IRSN estimate of the total cost of a nuclear accident
 - All-payers perspective: what would be the total cost to society?
 - All-costs perspective: both direct and indirect costs, both tangible and intangible costs



IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ Rationale

- Need to account for the long term: the private sector tends to over-focus on the very short term
- Higher accident costs tend to lead to higher investment in safety

IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ What is the intangible value of a territory?



- Some goods and services are not directly tradable: social link, the proximity of urban amenities, green spaces, forests, ...
- They do not have a market value
- But they matter, they have got some value, for the inhabitants
- Since they are more difficult to assess than tradable goods, they are often dismissed from accident cost estimates

IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ Main objectives

- Understand which elements of the territory are most important for its inhabitants
- This in turn helps better prepare crisis management and response to a nuclear accident
- Prepare the most appropriate methods for public participation given the challenges associated with the situation



IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ Method: Choice experiment method

- Method currently used in environmental economics since the 80's
- Elaboration of an appropriate questionnaire to elicit the willingness to pay of respondents to avoid a deterioration of their quality of life after a nuclear accident
- Face to face interviews with 400 employees from IRSN and ASN; need to broaden the population sample to the general public



IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ Interim results (study currently under progress)



- In general, people tend to suffer most from:

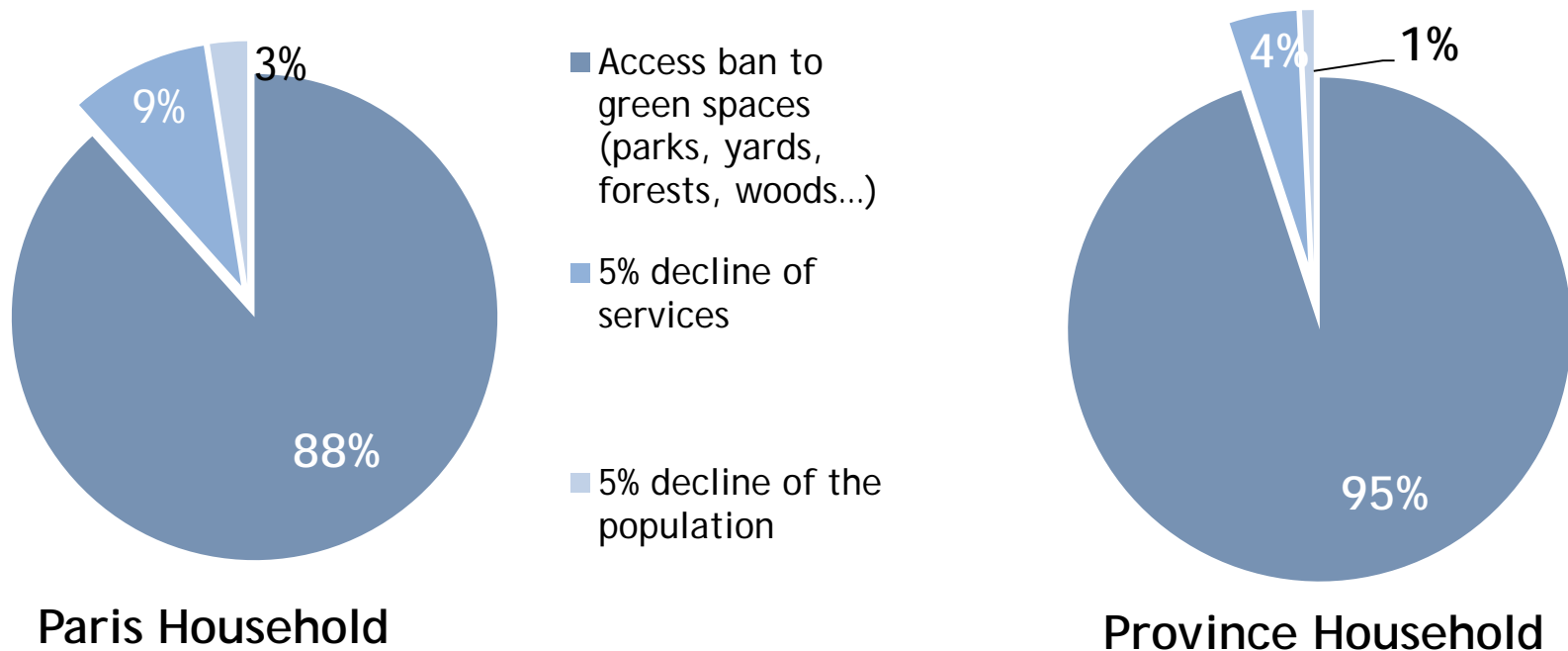
1. the ban of access to green spaces
2. a possible reduction in the density of services (public services, health services, transport services, schools, local stores, etc.)



IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ Interim results (study currently under progress)

- Results strongly depend on the population impacted:



IRSN study on the loss of intangible assets in the territories contaminated after a nuclear accident

➤ The potential outcomes of such a study

- Better understand the needs of various population sub-groups
- Get better prepared in the case of a nuclear emergency; more specifically, it helps taking appropriate actions in a timely manner



- Compare costs and (real + perceived) benefits associated with different types of measures, regarding the evacuation (or not) of the population or the rehabilitation of a territory

Focus on two specific studies

- NREFS studies and methods for socio-technical management of big nuclear accidents
 - The 4-university NREFS project applied a range of quantitative and qualitative methods
 - The Judgement- or J-value used country-specific economic and actuarial data to indicate whether or not to proceed with a protective action such as temporary evacuation or permanent relocation

Conclusion and perspectives

➤ Economics can contribute to:

- Provide information useful for radiation protection

➡ Need to cooperate with members of the CONCERT project

- Better integrate societal aspects and people's preferences in the decision-making process

➡ Need to cooperate with social sciences and humanities experts

Thank you for your attention