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Stakeholders and Radiological Protection: Lessons from Chernobyl 20 Years After

Vincent Baumont

A Report by the Committee on Radiation Protection and Public Health (CRPPH)

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FOREWORD

The Committee on Radiation Protection and Public Health (CRPPH) of the OECD Nuclear Energy Agency (NEA) has always taken an interest – and where appropriate involved itself – in issues relevant to radiation protection arising from the accident at the Chernobyl nuclear power plant in April 1986.

The present report, published 20 years after the accident at Chernobyl builds on, amongst other things, the lessons learnt from the ETHOS projects and the Co-operation for Rehabilitation (CORE) Programme. It describes how radiation protection has been adapted to meet the needs of people still affected by the accident or, in some cases, the lessons learnt from this. The report strives to demonstrate how a technical discipline, such as radiation protection, can adjust to be more effective in meeting the needs of ordinary people forced to live in extraordinary circumstances. As such, this report goes beyond supporting the work of the Committee and will also be stimulating reading for anyone with an interest in planning for emergencies involving widespread contamination and their aftermath.

Prior to this publication, the Committee produced two reports on the Chernobyl accident: *Chernobyl Ten Years On – Radiological and Health Impact*, and its follow-up report C*hernobyl: Assessment of Radiological and Health Consequences – 2002 Update of Chernobyl: Ten Years On*. These reports summarised the events surrounding the accident and the then state-of-the-art in related scientific and medical knowledge. These reports have for many years been the most-accessed documents on the Nuclear Energy Agency website. However, even in these earlier reports the need, and difficulty, of putting radiation protection to the efficient and effective service of the affected public, and other involved professions (for example doctors, local administrators and farmers), was recognised as an important yet relatively poorly developed area. This, among other issues, led

to the Villigen series of workshops on stakeholder involvement, whose results have been documented in the following proceedings and summary report:

- *The Societal Aspects of Decision Making in Complex Radiological Situations – Workshop Proceedings, Villigen, Switzerland, 13-15 January 1998.*
- *Better Integration of Radiation Protection in Modern Society – Workshop Proceedings, Villigen, Switzerland, 23-25 January 2001.*
- *Stakeholder Participation in Radiological Decision Making: Processes and Implications – Summary Report of the 3rd Villigen (Switzerland) Workshop, October 2003.*

Another important action taken by the Committee following the Chernobyl accident was to devise a series of emergency exercises to learn lessons that would be difficult or impossible to discern on the basis of a national exercise alone. As these exercises have developed (and been adopted more widely), it has become increasingly recognised that planning needs to include a wider range of interested parties, such as the food industry, particularly with respect to the aftermath of an incident, beyond the initial emergency or reactive phase. These exercises form part of the "INEX" programme, and have been reported in the following summaries:

- *INEX 1: An International Nuclear Emergency Exercise,* OECD, Paris, 1995.
- *Experience from International Nuclear Emergency Exercises: The INEX 2 Series,* OECD, Paris, 2001.
- *INEX 2000 Exercise Evaluation Report,* OECD, Paris, 2005.

"The Chernobyl accident happened 20 years ago, and society is continuously developing. As authorities we have learnt a lot, and we know that local involvement, information, communication and open discussions will be very important in managing a possible future accident."
Member of staff involved in reindeer monitoring, Norwegian Radiation Protection Authority.

Acknowledgements

This report was approved by the CRPPH following preparation by its Expert Group on Science in the Service of Stakeholders with the active support of the NEA Secretariat. The Expert Group consisted of the following people:

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EXECUTIVE SUMMARY

Introduction

This report is a tribute to the people living in areas that, 20 years after still live with the effects of the Chernobyl disaster. It shares the experiences of radiation protection professionals who reached out to some of those impacted by the Chernobyl accident, engaging to assist them to become knowledgeable and active managers of their own radiation exposure while living in a radioactively contaminated environment. Active stakeholder involvement gave these residents the capability to participate in the decision-framing process to address their issues regarding the rehabilitation of their living conditions in the contaminated territories. This more inclusive approach to decision-framing and issue resolution allowed the affected residents to gain greater control over their future. The report also describes stakeholder involvement initiatives from Norway and the United Kingdom, as examples from countries further afield.

In the conduct of ongoing reviews of existing nuclear and radiological emergency protocols and preparing for emerging threats it is important to consider and implement as appropriate the many lessons learnt from the Chernobyl accident.

The lessons learnt in dealing with the aftermath of the accident have broad application to any situation with the potential to expose people or populations to risk from a release of toxic substances to the environment.

The report also shows the complexity of dealing with long lasting contamination for all parties, and particularly for the radiation protection profession, for which stakeholder involvement becomes a key tool of first consideration in establishing a more inclusive and open decision process to lead to sustainable

decisions. Engagement in stakeholder involvement processes however calls for new expertise for policy makers, and radiation protection and other professionals in order to assure its successful implementation.

The introductory chapter positions the report by explaining how it develops NEA's considerable efforts within its mandate to identify and share the lessons learnt from the accident at Chernobyl (more detail of its work in the field of radiation protection will be found in the report's Appendices).

Background on the Chernobyl accident

In order to appreciate the context of the rest of the report, it is extremely important to have some understanding of the accident and the scale of its consequences. An overview of the accident sequence and a short description of its effects, including its impacts on people, agriculture, and health in the affected areas, is provided.

From top-down to stakeholder involvement

There was a transition from top-down management, during the early phase of the accident, to the more participatory management of the longer term and rehabilitation phases, using stakeholder involvement in rehabilitation projects. The Chernobyl accident was unprecedented. Millions of people were – and continue to be – directly affected. Beyond the acute effects, chiefly on emergency workers, the most obvious impact of the accident, other than the physical contamination was the need for the affected populations to come to terms with living in a contaminated environment in the long term.

The top-down approach by authorities to the response and management of the early phase of the accident was to some extent adequate. Note indeed, that there has been recent fulsome praise from the International Atomic Energy Agency Chernobyl Forum for the emergency response by the Soviet authorities. It is beyond this phase where the problems of a top-down approach are manifest. It became apparent in the longer term, during the period following the accident, that this type of "top down" approach was not working; the actions implemented were not efficient and resulted in a crisis of confidence for the people living in contaminated areas. A new approach was needed. The ETHOS Project was accordingly established in Belarus based on stakeholder involvement to engage some of

the affected population in the decision process. The success of this project has led in due course to its extension to other areas (the CORE Programme).

Perspectives on stakeholder involvement

Stakeholder involvement enhanced the lives of various stakeholders in responding to the challenges of living with contamination. By the early 1990s the national radiation protection authorities realised that their anticipated role in handing down information and solutions to the population was not working and that a partnership was needed. These authorities recognised they did not have all the answers and that they needed to engage stakeholders in order both to understand the scale and scope of issues and to develop workable solutions. By active engagement with the affected people sustainable, quality-of-life improvements increasingly emerged, and the authorities began to rebuild confidence and trust with the stakeholders. Establishing a local radiation monitoring capability was critical to addressing stakeholder issues and identifying more efficient strategies. By developing detailed maps of contamination and having local monitoring capability, people were in a position to make informed decisions on critical issues such as food products, where to graze livestock, milk for children, and areas where children could play.

As a result of stakeholder involvement, doctors found themselves an integral part of a comprehensive effort to engage the local population in the development of a radiation protection culture, which had a positive impact on public health. As food production plays a vital role in the overall picture of public health, stakeholder involvement allowed farmers to understand the radiological condition of their land in greater detail and thus to take steps to improve the radiological condition of their produce. Stakeholder involvement also resulted in mothers being able to ensure that clean food could be provided for their children. Teachers also expressed support for this involvement process so they could educate the children on the spectrum of issues facing the people, as a consequence of the accident, and teach them about actions that could be taken to manage future radiation exposure.

Local officials freely admit that positive experiences with stakeholder involvement have led them to copy this approach and to change their assessment of the willingness and ability of local people to help themselves – not just in relation to radiation protection issues, but also in relation to other issues of interest

and concern to the community. As a result, stakeholder involvement has been shown to have the potential to allow local authorities to make decisions that are sustainable in terms of making a positive contribution to the local economy, local public health and environmental protection. The affected people feel that decisions taking account of their concerns are more acceptable and have the active support of the local community – precisely because they have had an opportunity to participate in the framing of issues and the development of solutions.

Lessons learnt

There were many key lessons learnt in stakeholder involvement arising from post-Chernobyl activities; this knowledge is being assimilated into the international emergency exercises devised by the NEA (part of the "INEX" programme). Clearly the Chernobyl accident was unprecedented and created significant challenges and profound questions about the interaction of science and society. Some important lessons emerged from the post-accident rehabilitation effort in some of the territories affected by Chernobyl that have broad application to future situations with the potential for the environmental release of toxic substances. These include a recognition that there is a need in such situations to focus on certain key issues, first amongst which is engagement and involvement of stakeholders in assessing problems and seeking solutions, which in turn leads to a re-emergence of self-reliance and a rebuilding of trust; in short, a more bottom-up approach is suggested. Furthermore, the problems that will be faced are complex and so require an adequately complex response, built on a multidisciplinary approach and sound science (for which independent validation may be requested), leading to collective learning amongst stakeholders. The output of this approach, with these characteristics, can be sustainable decisions leading to an improved quality of life for the affected population.

It is also useful to consider what it is about such an approach that is particularly valued by stakeholders. They, after all, are the people whom the professionals, authorities and policy makers exist to serve. Their assessment of that service is accordingly of particular importance. In this regard, stakeholders involved in the post-Chernobyl rehabilitation process particularly valued the following features of the participatory approach:

- The very fact that they were involved instead of being passive recipients.
- Closer and more productive relationships with professionals and authorities.

- The fact that the participatory approach focused on tangible results.
- The fact that this approach was well adapted to individual contexts.

The role of the radiation protection professional and future opportunities

In conclusion, this work emphasises the role and responsibilities of the radiation protection professionals and potential future opportunities to engage with stakeholders. The Chernobyl accident has revealed local stakeholders to be an indispensable part of the success of the rehabilitation effort, so it is increasingly recognised that they have an important contribution to make in planning for the emergency and rehabilitation phases of any future contamination event, whether associated with an industrial accident or a deliberate release, and whether in a rural or an urban setting.

Chapter 1

INTRODUCTION

Since the Chernobyl accident, in April 1986, the OECD Nuclear Energy Agency (NEA) has put considerable effort into identifying the lessons from this unprecedented event relevant to helping member countries improve their nuclear safety, emergency preparedness and response, and post-accident rehabilitation capabilities. To date, the NEA has published over 60 reports in these areas. Nuclear safety efforts have focused on such aspects as severe accident management, safety performance, human performance, inspection practices and probabilistic safety analysis (PSA). Emergency management efforts have focused on international communications and data management, urgent countermeasures, and preparedness and training through international exercises. Post-accident management efforts have been focused on understanding and improving the interactions between professionals and stakeholders in decision-aiding and decision-making processes. This last theme is fundamental to both the nuclear safety and emergency management aspects that the NEA has addressed, and is also the central theme of this, the latest NEA report on the Chernobyl accident, 20 years after.

Beyond the need to prevent the occurrence of large-scale accidents, it is prudent to prepare to react to possible, even if extremely unlikely, accident situations. In this regard, the NEA has studied the impacts of the Chernobyl accident, so as to contribute to promoting best practices in the rehabilitation of living conditions in contaminated territories and also to help its member countries be best prepared to react with appropriate types and magnitudes of resources that would be necessary in case of a future event. Two key reports developed in this area: *Chernobyl Ten Years On: Radiological and Health Impacts* (1996), and *Chernobyl: Assessment of Radiological and Health Impacts, 2002 Update of Chernobyl Ten Years on* (2002),

provided broad overviews of the health and environmental impacts, in the former Soviet Union and in OECD countries.

In parallel with these efforts, the NEA has also placed considerable focus on how to improve the operational and policy aspects of nuclear emergency preparedness and response.* The NEA initiated and coordinated, starting in 1993, four series of international nuclear emergency exercises (INEX). These improved the quality and coordination of emergency response systems through the testing and analyses of arrangements and new concepts. Experiences and lessons identified in the areas of international coordination, operational response arrangements and countermeasures, technical and public information, liability and longer-term consequence management have helped countries to improve their emergency response arrangements (NEA, 2001; NEA, 2002a). The INEX experience is also providing increased insight into how radiation protection fits into a larger integrated emergency management and rehabilitation framework. The NEA's Working Party on Nuclear Emergency Management is addressing this convergence as it analyses the relevant technical and social issues in emergency management, from planning and preparedness, through the urgent response phase to the rehabilitation phase.

Another related topic identified by the NEA in the early 90s, is the need to better consider input from stakeholders in the assessment and management of radiological risks. This reflection resulted in three workshops, in Villigen, Switzerland (1998, 2001, 2003), that broadly led the radiological protection community to clearly understand the need to better integrate radiological protection science into broader societal risk assessment and management processes. A key point that emerged from these three workshops is that stakeholder involvement is central to the resolution of complex radiological protection situations.

The rehabilitation of areas affected by the Chernobyl accident has been marked by its complexity. Even 20 years after, considerable uncertainty remains with respect to the exact extent and nature of all human and environmental consequences of the accident. The extremely inhomogeneous nature of environmental contamination, and the variability of levels that can be found in locally-grown foods continue to challenge even the most detailed characterisations. Even more difficult and intangible are the accident's social effects, influencing virtually every aspect of "the way of life" in the affected areas. Attempts to manage this complexity, initially through top-down approaches gradually evolving to more

* A more detailed discussion on this topic is contained in Appendix 2 of this report.

local-driven and individual-focused initiatives, have proven to be as multi-dimensional as the situation being managed.

This report builds on the collective knowledge from these three areas of the NEA's work, characterising the impacts of the Chernobyl accident, improving nuclear emergency preparedness and response, and on the involvement of stakeholders in radiological protection decision making, to distil out the most important lessons and experience. These will allow the identification of the most effective approaches to improve the lives of those most affected by the Chernobyl accident. They can also assist national governments to best be prepared to address any future, large-scale and long lasting contamination event that could occur, or radiological terrorist attacks.

This report is a tribute to the people in areas that, 20 years after still live with the effects of the Chernobyl disaster in the countries of the former USSR that were the most affected, and particularly Belarus. It shares the experiences of radiation protection professionals who reached out to some of those impacted by the Chernobyl accident through individual engagement to assist these residents to become knowledgeable and active managers of their own radiation exposures while living in a radioactively contaminated environment. Active stakeholder involvement

Who is a stakeholder?

A stakeholder is anybody with an interest (a "stake") in a problem and its solution. The term is therefore very context specific and will probably change with time as various people and groups become more, or less, engaged in an issue. This report covers several different circumstances over a number of years and therefore the "stakeholders" cannot be definitively listed. However, unless the context suggests otherwise, this report generally focuses on stakeholders as:

1. An individual or group (e.g., residents, teachers, doctors, farmers, etc.) affected by the Chernobyl accident and living in a contaminated area.
2. Outside the normal decision-framing process with no other effective mechanism to get their issues heard and addressed.

Stakeholder involvement

An evolving decision-framing **process** within and between stakeholders that is inclusive and participatory, with open and two-way discussions, leading to relationships where issues can be identified, discussed and resolved, resulting in sustainable decisions.

gave these residents the capability to participate in the decision-framing process to address their issues regarding the rehabilitation of their living conditions in the contaminated territories. This more inclusive approach to decision-framing and issue resolution allowed the affected residents to gain greater control over their future. The report also describes stakeholder involvement initiatives from Norway and the United Kingdom, as examples from countries far away from the Chernobyl nuclear power plant which have been significantly contaminated on large territories and which are still, 20 years after, managing the consequences of this contamination.

Policy makers, professionals (including radiation protection professionals) and stakeholders will benefit from a careful study of this report to enhance planning and response to events that could lead to the environmental spread of radioactive contamination in rural or urban areas, such as inadvertent environmental discharges from current operations, accidents from licensed activities, or sabotage involving a radiological dispersion device. This report shows the complexity of dealing with long lasting contamination for all parties, and particularly for the radiation protection profession, for which stakeholder involvement becomes a key tool of first consideration in establishing a more inclusive and open decision framing process to lead to sustainable decisions. Stakeholder involvement, however, calls for new expertise for policy makers, radiation protection and other professionals in order to ensure its success.

Chapter 2

THE CHERNOBYL ACCIDENT

Even twenty years after the 26 April, 1986, accident in Unit 4 at the Chernobyl nuclear power station located in the Ukraine, there are still significant numbers of people living in, and dealing with, a radioactively contaminated environment in the republics of Belarus, Ukraine and the Russian Federation, and to a lesser extent in other areas of Europe. At the time of the accident, the Soviet Union was undergoing significant political change in the form of "glasnost" and "perestroika," with regional nationalism on the rise. In response to the Chernobyl accident the Soviet government at the time took a traditional top-down, authoritarian approach

The accident

De Cort *et al.* 1998.

The power plant at Chernobyl following the accident.

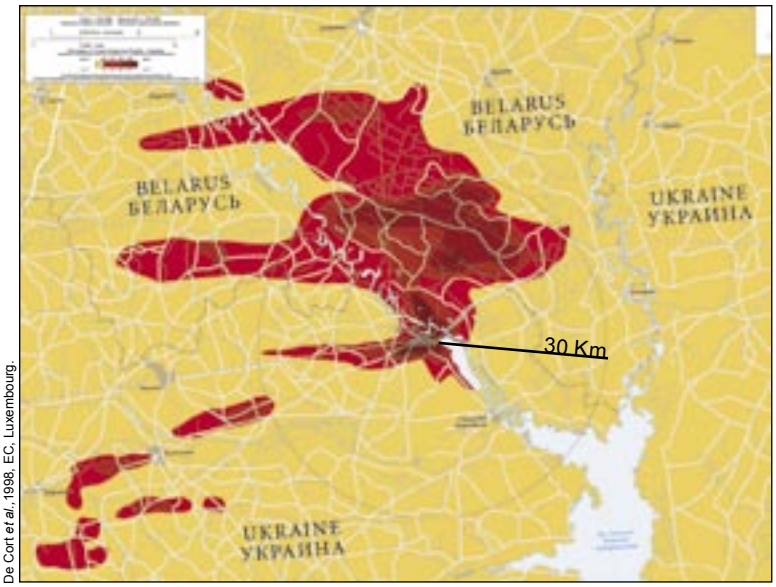
Due to the inadequate exchange of information and lack of coordination between a research team conducting an experiment on Unit 4 and personnel in charge of the operation and safety of the reactor, at 01:23 hr on Saturday, 26 April 1986, two explosions destroyed the core of Unit 4 and the roof of the reactor building (NEA, 2002a). The two explosions sent structural and radioactive material into the air, exposed the destroyed reactor core to the environment and allowed the plume from the resultant fire to also be released into the environment. Due to the ten day duration of the

fire and frequent changes of wind direction during the release period, the area affected by the radioactive plume and the consequent deposition of radioactive materials on the ground was extremely large, encompassing the whole of the northern hemisphere, although significant contamination outside the former Soviet Union was only experienced in part of Europe (NEA, 2002a). Figures 1 and 2 show the deposition of Caesium-137 following the accident.

The causes of the accident at the Chernobyl nuclear reactor are well established and safety reviews and changes have been made at similar reactors in the Former Soviet Union. This reactor design ("RBMK-1 000") is found only in the Former Soviet Union and nuclear reactors found elsewhere, such as in Europe, the United States and Japan are of different designs that prevent, as much as possible, an accident like that at the Chernobyl reactor.

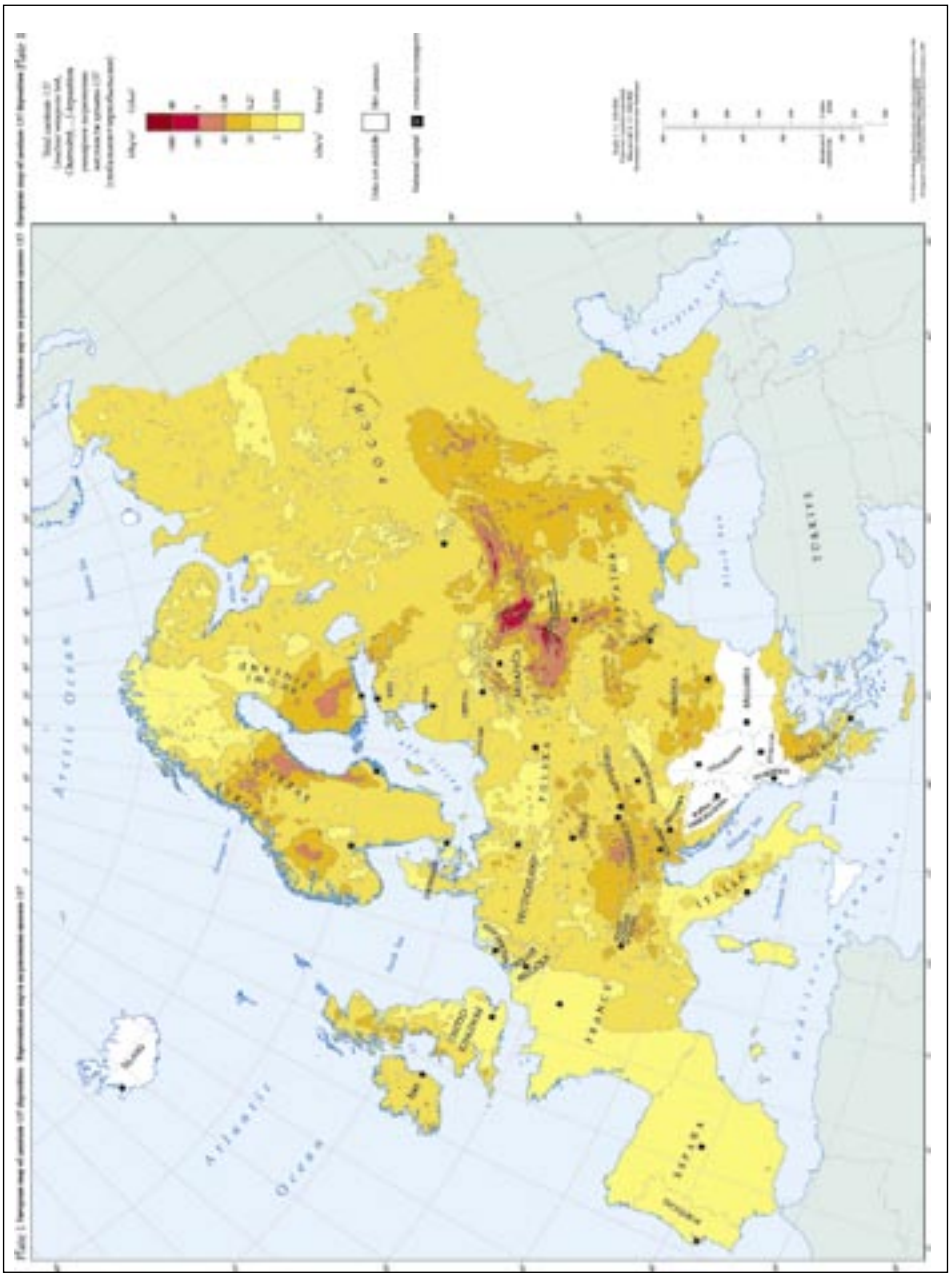
in dealing with the affected population. By the early 1990s there was general distrust among stakeholders regarding the accuracy and usefulness of information and distrust of scientists from the Central Government. In attempting to move forward, the Soviet Union called for the establishment of multi- and bi-national agreements with foreign experts and organisations to visit the contaminated areas and establish projects to evaluate the radiological situation and its potential impacts particularly on health (NEA, 2002a), at least partly with the hope of restoring trust in government actions.

Figure 1 Caesium-137 deposition around Chernobyl following the accident. The red areas correspond to areas with over 1 480 kBqm^{-2}.



De Cort *et al.*, 1998, EC, Luxembourg.

Figure 2 Map of Caesium-137 deposition following the accident.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Atlantic Ocean
Caspian Sea
Black Sea
Mediterranean Sea
Iceland
Norway
Sweden
Finland
Russia
Estonia
Latvia
Lithuania
Belarus
Ukraine
Poland
Germany
Denmark
Netherlands
Belgium
Luxembourg
France
Switzerland
Austria
Czech Republic
Slovakia
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Croatia
Bosnia-Herzegovina
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The accident had wide-ranging effects on hundreds of thousands of people affecting all dimensions of living conditions: environment, heath, social, economic, education and even cultural.

The accident resulted in contamination of large amounts of territory; this will be described in more detail below but included 23% of Belarusion, 4.8% of Ukrainian and 0.5% of Russian national territory. Many major countermeasures were undertaken, often urgently and shortly following the initiation of the accident. Most strikingly, large populations were relocated including the abandonment of the city of Prypiat and many smaller villages. Countermeasures also included restriction of access to vast areas as well as a 30 km "exclusion zone" around the power plant, decontamination of roads and buildings, urgent improvements to water systems (e.g. 100 km of levies, 14 new reservoirs, 18 new dams), construction of around 100 new waste storage areas, imposition of food restrictions and extensive agricultural countermeasures. The direct and indirect costs of the accident in Belarus alone are estimated to be around $235 billion (IAEA, 1991; Karaoglou, 1996; Shevchouk, 2001).

Acute effects emerged soon after the accident. In 1986, 31 people died of radiation-induced injuries soon after the accident, many of them fire-fighters who, despite the risks, helped to control and eventually suppress the fire at the nuclear power plant. Since then, a further 19 individuals involved in fire fighting and other urgent protection actions have died of radiation-induced injuries (WHO, 2006). Longer term health impacts of the accident are still emerging, and significant uncertainties exist even after 20 years. What is clear, however, is that there has been a steady increase in the number of individuals with radiation-related health problems over the years. Despite the uncertainties, some description of the health impacts is important to understand the significant magnitude of the accident's effects; extracts describing the long-term health effects of the accident have been taken from a recent report by the World Health Organisation (WHO) and are given in the text box beside.

Regarding the longer-term health effects, studies will continue and more (and other) effects may emerge with time. It will be important for the health and radiological protection communities to maintain their active engagement with the affected populations in order to best address their ongoing and possibly emerging health needs, and to best reflect this experience in the protection of other and/or possible future populations of exposed individuals.

Health effects reported by the World Health Organisation

(WHO, 2006)

To understand the context of this report, some information on health effects needs to be given. The below information on effects on the general population has been extracted from a very recent World Health Organisation analysis, which was based on peer-reviewed articles and current scientific understanding of the health effects associated with radiation exposure:

- ***Thyroid cancer*** – Due to the large release of iodine-131 and other shorter-lived isotopes of iodine from the Chernobyl accident, the thyroid glands of those living in Belarus, the Russian Federation and the Ukraine at the time of the accident received, through inhalation and subsequently by food ingestion, substantial doses of radiation. The substantial increase in thyroid cancer rate in those exposed as children or adolescents in Belarus, the Russian Federation and the Ukraine since the Chernobyl accident shows no signs of diminishing. Approximately 4 000 thyroid cancers have been diagnosed, between 1992 to 2000, in Belarus, the Russian Federation and the Ukraine in children and adolescents who were 0 to 18 years of age at the time of the accident, and 15 of these patients have died because of that disease. In the current published studies, there is little if any data as of now in the various exposed population groups of increased thyroid cancer rates in those exposed as adults to the radiation from the Chernobyl accident.

- ***Leukaemia*** – Among those individuals exposed *in utero* and as children, no firm evidence has been found to date to suggest that there is a measurable increase in the risk of leukaemia. Although there have been few studies, there is no compelling evidence thus far that the incidence of leukaemia has increased in adult residents of the exposed public that have been studied in the Russian Federation and the Ukraine.

- ***All solid tumours*** – For Belarus evacuees or those resident in the contaminated zones, there appears to be no evidence thus far of any pattern of increasing incidence of solid tumours as a result of radiation exposure from the accident at that time in the available studies. For individuals living in the Russian Federation, there is no evidence of any statistically significant increase in the incidence rate of all solid cancer in the five most heavily contaminated regions in any time period. There then appears to be no evidence of any measurable increased risk of all solid cancers combined in the general populations of the three most affected republics at this point in time. Studies on the incidence of solid cancers in liquidation

workers have been inconclusive to date, with some reports showing a slight increase and other reports showing a slight decrease. This may be due to a lack of additional diagnostic confirmation, the modest size of the study group, and limited duration of follow-up. Based however on the relatively limited study of the morbidity or mortality from solid cancers in the exposed populations the possibility of increased risk for solid cancers cannot be ruled out. If any risk does occur, it may be greatest in liquidation workers, especially those receiving the highest doses.

- ***Cardiovascular mortality*** – There is little solid evidence to date of any demonstrated effect of Chernobyl-related radiation cardiovascular mortality.

- ***Other symptoms*** – As discussed in the WHO report, symptoms expressing themselves as increased levels of depression, anxiety (including post-traumatic stress symptoms), and medically unexplained physical symptoms and pathologies have been found in populations affected by the Chernobyl accident. Further studies are suggested to understand better these effects, and possible biological mechanisms that could explain these symptoms and pathology.

CORE Programme.

Memorial to a fireman who died as a result of the Chernobyl accident. *(CORE Programme)*

The following are a few illustrative facts about the impact of the Chernobyl accident, reproduced to indicate the scale of the impact in the former Soviet Union, Norway and the United Kingdom, in order to give some context to the rest of the report:

Impacts in contaminated areas of the former Soviet Union: People living in contaminated areas of the former Soviet Union – Over 750 000 hectares of agricultural land and around 700 000 hectares of forestry were abandoned following the accident at the Chernobyl nuclear power plant. Only a small amount of this land (less than 10%) has been formally returned to use. It is known that some of the population have returned to, or are making use of, some of the officially abandoned land. Aside from this formally abandoned land, at the end of 2000, about 4.5 million people were living in areas considered to be contaminated from radioactive material from the Chernobyl accident (that is, a level of ^{137}Cs of 37 $kBqm^{-2}$ or more). From an initial number of over 230 000 people, in 1995 there were 193 000 people who continued to live in radioactively contaminated areas where deposition levels of radiocaesium (^{137}Cs) exceed 555 $kBqm^{-2}$, the level established by Soviet Authorities where protection measures are required to reduce radiation exposures to the population. Recent figures show that in Belarus alone, 30 000 people still live in such areas (Com, 2004). In addition, an exclusion zone of around 4 000 km^2 (400 000 hectares) has been defined, including an area with a radius 30 km around the reactor (IAEA, 2006; IAEA, 2002).

ETHOS Project.

Cows grazing on land affected by the Chernobyl disaster in Belarus.

Impact in contaminated areas of the United Kingdom – Due to the distribution of fallout from the Chernobyl reactor accident, restrictions were placed on the movement, sale and slaughter of over 4.2 million sheep in areas in southwest Scotland, northwest England, North Wales, and Northern Ireland, affecting nearly 9 000 farms, with activity concentrations of 20 to 40 $kBqm^{-2}$ of radiocaesium in parts of upland western United Kingdom. By January 1994, some 328 000 sheep in England and Wales were still affected by restrictions. According to the most

Beresford-CEH Lancaster, United Kingdom.

Sheep hillfarm in the United Kingdom, typical of the areas restricted following the accident at Chernobyl.

recent data, from July 2005, there are 81 400 hectares in the United Kingdom still covered by restrictions, affecting the movement and slaughter of over 220 000 sheep. These restrictions affect 382 farms, of which 359 are in Wales. Although the strategy adopted in the United Kingdom to tackle this situation (including direct compensation) has allowed sheep farming to continue in these areas, these restrictions place an additional burden on an already marginal industry and still require dedicated monitoring schemes (UKFSA, 2005; NRPB, 1999).

Impact in contaminated areas of Norway – Certain areas in Norway were among the most heavily contaminated areas in Western Europe, with deposited radiocaesium activities above 500 $kBqm^{-2}$. The most contaminated areas are mostly sparsely populated, but are, however, important in connection with several nutritional pathways; notably grazing of cattle, sheep, goats, reindeer and game, and wild freshwater fish. Restrictions were placed on slaughter and trade of products of these animals, and on consumption of reindeer, game and freshwater fish. Mainly to protect reindeer herding as a way of life of the Saami population in Norway, but also because the potential risk of increasing the levels was seen as being negligible, the authorities adopted the elevated intervention level of 6 000 Bq/kg for radiocaesium in reindeer meat in November 1986 as otherwise about 85% of the country wide reindeer meat production in 1986 could not have been sold. However, it was also deemed necessary to combine this elevated intervention limit with dietary advice to limit the intake of contaminated reindeer meat. In 2005, nearly half of the reindeer herding districts

in central and southern Norway, covering an area of about 2 460 000 hectares, implemented countermeasures to comply with the current intervention limit of 3 000 Bq/kg in slaughtered animals. About 30% of all sheep in Norway were subjected to countermeasures in 1986, of which about 3% (about 2 300 tons of mutton) was found unfit for human consumption. The number of sheep subjected to countermeasures was reduced about ten-fold from 1986 to 1995, and in 2004 in total about 12 000 sheep in 34 of Norway's 434 municipalities were clean fed before slaughter. Although most costs for the reindeer herders and farmers are compensated by the authorities, the contamination is having an adverse impact on the effort required to manage the herds (Skuterud, 2005; NEA, 2002a).

Skuterud-NRPA and Reindeer Husbandry Admin., Norway.

Reindeer herders in Vågå selecting animals for slaughter.

Chapter 3

HISTORICAL PERSPECTIVE FOR CHERNOBYL: FROM TOP-DOWN DECISION MAKING TO STAKEHOLDER INVOLVEMENT

The Chernobyl accident was unprecedented. As such, it presented the authorities responsible for the most seriously affected regions with problems for which they could not, by definition, be fully prepared. Hundreds of thousands of people were involved in the clean-up operation. Millions of people were – and are – directly affected. The contamination is an ongoing and ever-present problem in their daily lives and will continue to be a significant problem for generations to come. The last twenty years, therefore, have been a period of *learning* for these authorities in general, and for radiation protection professionals in particular, as much as – and perhaps more than – they have been a period of carrying out pre-determined plans for post-accident rehabilitation. While it is certainly true that the regions most affected by the Chernobyl accident are different in many respects from areas, say, in Western Europe or North America that might be affected by a severe accident, those differences should not blind us to the lessons that are nevertheless transferable. In this chapter, the broad change in approach that is observable over the twenty-year history of rehabilitation in some of the areas affected by Chernobyl, as authorities and people learnt from experience what worked and what did not, is outlined. The contention is that this change – characterised here as being from *top-down* to *stakeholder involvement* – is not just a matter of interest to policy makers and the radiation protection community more generally as they contemplate their readiness to respond to serious contamination events, but a lesson that may be directly transferable to other situations.

Responding to a crisis of confidence

The most obvious impact of the Chernobyl accident, beyond acute effects and the physical contamination, was the problem for the affected populations of coming to terms with living with that contamination in the long term. The indefinite presence of this unprecedented factor in their lives changed, as it were, all of their traditional reference points. Now the basic elements of the environment, which formed the framework for daily life, could no longer be taken for granted. Beyond that, there was also the impact on public trust and confidence. This impact was felt not just by the authorities and operators directly responsible for the plant, but by the nuclear industry globally. When the accident occurred, it may be said that the confidence that the public felt in the industry (characterised by the fact that day-in, day-out they did not actively worry about it) was lost, indeed that there was even a crisis of confidence. In such circumstances, the authorities charged with recovering from the accident faced the considerable problem that the public now treated their information, guidance and instructions with suspicion. Why, the public wondered, should we believe what we are told now, when it is clear that all the assurances about safety prior to the accident were manifestly wrong? The irony was, then, that precisely when the authorities felt the need to have maximum cooperation from the public, they did not have it because of their perceived failings in allowing the accident to happen in the first place. In these circumstances, actions by the authorities that did not take account of the fact that there was a crisis of confidence, and which were not, accordingly, directed towards *building trust* and *restoring confidence*, were unlikely to succeed or, at the very least, were unlikely to make the most efficient use of resources. This is not to say, of course, that responding to the crisis of confidence was the sole solution to the problems the authorities and technical experts faced. The complexity of the unprecedented situation of long-lasting contamination facing them raised many rehabilitation challenges for which they (and indeed their counterparts in other countries) were ill equipped. The uncertainties associated with such a situation meant that they lacked the assurance they had possessed previously.

In the immediate aftermath of the accident, it is clear that drastic actions were required in many instances. For example, the creation of an exclusion zone in the most heavily contaminated area around the plant and the evacuation of other contaminated areas were decisions that had to be taken and implemented without delay. In such circumstances, a top-down or prescriptive approach – with people simply ordered what to do – was indispensable. The obvious appropriateness of that approach in the early phase of the accident – and perhaps especially in the

context of an accident involving radiation where the threat to health is not immediately tangible to the population – can, however, blind us to the potential problems inherent in top-down responses to contamination events. These problems can be identified in two distinct phases of the response.

The first is in the early phase of the accident itself. While for the authorities responding to the Chernobyl event there was no alternative but to react as they did – and note indeed that there has recently been fulsome praise for the emergency response by the Soviet authorities from the Chernobyl Forum (IAEA, 2006) – it is of importance to note that for authorities now considering their response to a contamination event there is an opportunity to involve stakeholders in planning for the early phase. Insofar as stakeholders have had this opportunity and thus have an awareness of what to expect, and insofar as authorities have had the benefit of input from stakeholders in developing emergency plans, the expectation must be that emergency response should be conducted with a higher degree of efficiency and effectiveness. This is a matter that will be considered further later in this report.

The second phase where the problems of a top-down or prescriptive approach are manifest is in the later phases of the accident including rehabilitation. And here there is much more information to be had from the experience over the past twenty years in the areas affected by the Chernobyl accident. The problems emerged in essence because there was a failure to adapt the approach to the nature of the issues arising in these later phases in contrast to those that characterised the early phase. In the following section, these problems will be considered and an indication given of how an appreciation of them led in some cases to a shift away from a top-down approach and towards stakeholder involvement.

Problems of a top-down approach in the later phases of an accident

The authorities confronted with the wide-ranging problem of contamination after Chernobyl naturally sought a global view and looked to make decisions based on broad-brush or average categories. This was an essential aspect of central or high-level decision making. This approach, however, was not complemented by sufficient flexibility at the local level to allow adaptation to the conditions in specific contexts. As a consequence, the implementation of decisions at the local level could lead to inefficiencies or even absurdities as officials sought to deal with a wide diversity of situations with a limited number of responses.

Responding to this situation from the centre with ever more elaborate schemes often served merely to exacerbate the situation insofar as such responses still failed to grasp the complexity and diversity of the problems on the ground. The result instead was often incoherence and inconsistency. Thus, increasingly complex social assistance schemes ended up in some cases providing more money for people in less-contaminated areas than for those in more contaminated ones. In other cases, people were effectively incentivised to increase their exposure. Similarly, the delivery of healthcare was sub-optimal where it was based on ill-defined risk rather than appropriately measured need. Schemes to send children to sanatoria in clean areas to reduce their doses had the opposite effect by taking them out of clean schools during term time (and thus also adversely affecting their education) while leaving them at home in summer when they played unwittingly in contaminated woods and lakes. And again, focusing on supply rather than demand allowed authorities to claim success in terms, for example, of the number of houses built for evacuated populations, without actually checking to see what the net result of such projects actually was.

These problems of centralised decision making and control were exacerbated by the fact that measurement and consultation at the local level were frequently inadequate. As a consequence, authorities at a higher level often lacked a clear view of the situation on the ground, whether in terms of the difficulties caused by the contamination or of the effects of the "solutions" being implemented. Lacking such a view, authorities remained focused on radiation protection criteria even some years after the event when it was already evident to people at the local level that the problems faced were much more complex, with such criteria only a part of the overall picture.

But that narrowness of focus was also a function of the bureaucratic divisions characteristic of centralised authorities and of the uni-dimensional expert models they not infrequently deploy. While the functional division of bureaucracy is traditionally viewed as a means of dealing efficiently and effectively with societal problems – through their compartmentalisation and treatment according to technocratic expert models – this approach reveals its limits when a complex array of interdependent problems, such as those emerging in the post-accident era in the contaminated territories, prove to transcend bureaucratic and expert divisional boundaries. Thus, for example, organising public health efforts, radiation measurement, agricultural countermeasures, and so on, without properly recognising their interdependency and integrating them appropriately for the improvement of living conditions, resulted in resources not being deployed as

effectively or as efficiently as possible, and indeed might even have produced unintended adverse consequences.

As a consequence, a highly problematical situation emerged even as the authorities and radiation protection professionals made significant and well-intentioned efforts to improve the situation for the affected populations. On the one hand, the top-down approach, by focusing on supply rather than demand, was prone to over-ambition with the result that many plans were effectively abandoned while only half-complete through want of resources. For example, relocation plans drawn up shortly after the accident were still not fulfilled after 10 years, by which time it was in many respects too late, because the money was not actually there to finance them and in any event these plans had been drawn up without taking account of the impact on the population of being threatened with removal from their familiar environment, which itself was now characterised as irretrievably lost. On the other hand, the lack of adequate links to the local level meant that the resources actually available there, in terms, for example, of local knowledge and the willingness of people to help themselves, were frequently under-utilised or left entirely untapped.

While in some cases, as in Norway, the central authorities quickly realised that they could not respond to the problems of contamination in the territories occupied by the Saami people in a traditional centralised, top-down way, in others cases, as in Belarus, local people in the contaminated territories were themselves the first to perceive the shortcomings of the top-down approach to rehabilitation. Most immediately they sensed that measurement and consultation processes that relied purely on expert models gave no real voice to the people most affected by contamination and thus produced an inadequate picture of the situation on the ground. In this regard, local people complained that experts visiting the contaminated areas (including those from abroad) made insufficient efforts to understand what actually concerned them. They also complained that those experts made insufficient efforts to explain themselves. This problem was particularly acute with regard to measurement. People were not infrequently confronted with inconsistent and even contradictory measurements emanating from different agencies or groups of experts, which there was no attempt to reconcile.

As a consequence, the feeling grew that measurement was for the sake of measurement or at best for technical, bureaucratic or research purposes without any necessary connection to the achievement of clear healthcare or environmental objectives.

With engagement between local people and authorities frequently restricted to this rather formalistic approach to measurement, people were concerned that the range and complexity of the problems facing them – social and economic, as well as purely technical in terms of radiation protection – were largely invisible. Thus, worries about the effects of the accident on health (and especially the health of children) and on the local environment were not addressed. People simply felt helpless and that their quality of life had been irreversibly reduced. This in turn had an impact on the ability of society as a whole to function to its full potential – not least economically, with all that this implied for the possible emergence of a vicious spiral of decline.

The problem confronting the authorities once this position had been reached was that people now profoundly distrusted them. With no effort having been made to build trust in the context of the crisis of confidence produced by the accident, the authorities now faced a frequently hostile population, even as they implemented strategies that they believed were best suited to coping with a problem on this scale. Beyond that, the response of the authorities was not well targeted to respond to the fact that the affected populations simply lacked the knowledge and experience of living with long lasting contamination.

Emergence of a stakeholder involvement approach

It was evident to some, however, that a profound shift in approach would be required if the vicious spiral of decline were to be avoided. For example, the ambitious schemes for relocation had faltered and it was clear that they were in many cases unworkable. These schemes were often based on broad-brush assessments of contamination that took inadequate account of the complex pattern of the fall-out. Furthermore, they were not able to address the impact on the population of having their familiar environment, a resource for livelihood and leisure, effectively taken away from them. If appropriate measurements were carried out and local knowledge utilised, areas earmarked for relocation could prove to be entirely habitable. Insofar as local resources, in terms, for example, of knowledge and manpower, were tapped, the difficulties confronting existing schemes in terms of over-reach (such as capital spending on infrastructure without consideration of ongoing running costs) would be avoided. This is in no way to imply that the problems confronted will be easily solved – only that the prospects for success may be improved by this more inclusive approach.

All of these potential practical benefits could, of course, be dismissed as being driven by a concern principally for efficiency. It was the belief, however, of those who saw these undoubted efficiency gains that they were in fact the *result* of a focus first and foremost upon the well being of the affected populations.

By recognising the crisis of confidence and self-confidence at the root of the post-accident situation and its consequences for top-down efforts at rehabilitation, those entering the field some ten years after the accident placed the engagement of the population and the local professionals in regaining control over the radiological situation at the heart of their efforts, believing that this, and the consequent re-establishment of trust and confidence, was the only way to make progress. Such progress would inevitably represent an advance over the* status quo *in terms both of well being and of the efficient use of scarce resources.

ETHOS Project – examples for successful stakeholder involvement (Lochard, 2004; NEA, 2004a)
(www.cepn.asso.fr/fr/ethos.html)

Surveys undertaken in the early 1990s by a joint EC-CIS programme to evaluate the consequences of Chernobyl identified social and psychological impacts of the accident on liquidators and amongst the population; this highlighted the effect the accident had on people's quality of life as well as health impacts. Yet, ten years after the accident, strategies implemented by the national authorities – focused on radiation protection criteria and centrally controlled interventions – did not appear to have addressed this area effectively.

The ETHOS Project was set up as an alternative approach that recognised the holistic nature of the post-accident situation for the local population. The project recognised that the many aspects of the situation called for an interdisciplinary approach. Importantly, it also recognised that real improvements in the quality of life for the people required an approach that built self-confidence and returned a sense of control to them.

The project's first phase (1996-1998), sponsored by the European Union, was carried out in the village of Olmany (Stolyn district) in the South of Belarus, around 200 km from Chernobyl. It gathered around 100 people, including teenagers, young mothers, farmers, teachers and foresters, and organised them into six working groups which each chose to address an aspect of their lives, such as management of the radiological quality of meat and milk and radiological protection of children. After three years, real improvements were seen. The work also demonstrated the feasibility of active participation of the local population in rehabilitation of living conditions.

The second phase (2000-2001), with additional sponsors, extended the area covered to four villages in the Stolyn district (with a total population of 90 000) and also, after the success of the first phase, placed a strong emphasis on knowledge transfer to allow local professionals and authorities with the support of Belarus Institutes to apply the approach developed during the first phase.

The final international seminar at the end of ETHOS returned some powerful conclusions: radiological protection is a goal that cannot be successfully pursued without consideration of the "bigger picture" and radiological quality is only meaningful in the context of renewal of quality of life, particularly health care and sustainable economic development. The delegates also believed that an ETHOS-type approach, especially the involvement of local people and professionals, was a necessary prerequisites for durably re-establishing living conditions in the affected territories.

The emergence of the stakeholder involvement approach to post-accident rehabilitation, accordingly, was marked by the priority accorded to local people regaining the feeling that they had control over their lives and that they were able to contribute to the achievement of an adequate level of protection in the context of the radioactive contamination they confronted. It should be stressed that this is by no means a "magic bullet" for the uncertainty the people still feel over the long-term future of the contaminated territories, but this approach does at least address this issue. It should also be stressed that this approach does not by any means imply that the people became solely responsible for their own protection or that the authorities and radiation protection professionals in any sense abdicated their responsibilities. It is only to say that the people were supported in developing the means to live their lives as safely as possible in the context of long-lasting contamination. The focus, accordingly, was on engaging people in the characterisation of their situation, in contrast to their being subject to an inevitably cruder centralised assessment; on the development of solutions that responded to local problems and were sensitive to the availability of local resources, rather than their being subject to inevitably less well-focused and often less efficient centrally determined strategies; and on an ongoing meaningful dialogue with stakeholders, rather than on the well-intentioned risk communication efforts whose apparent failure had so exasperated experts and authorities.

It is worthwhile noting that stakeholder involvement in the context of long term rehabilitation which emerged in the mid nineties in Belarus in the context of the ETHOS Project can be also illustrated in other socio-economic and cultural contexts affected by the Chernobyl accident in Europe. This was for example the

approach adopted relatively early in Norway where authorities established close contacts with local people and assisted them to become involved in measurement; and where they realised that entering into dialogue with people on a case-by-case basis about advice on consumption of reindeer meat and fish was far more effective than only distributing a centrally produced information booklet.

Similarly, in the United Kingdom, recognising that restrictions on sheep farming were not simply a matter of radiological effectiveness, the authorities involved a range of stakeholders to review the options. The finding was that considering regulatory techniques solely from the point of view of radiological effectiveness was inadequate and that factors such as direct cost, lost opportunity cost, building costs and planning permission, machinery cost and availability, time and trouble and preservation of the landscape and habitat were all important. A measure of success of this exercise is that a stakeholder working group was subsequently established to consider responses should a similar contamination event ever occur again. In turn, the success of this initiative may be gauged from the fact that this approach has also been taken forward at the international level through the European Commission sponsored "FARMING" network.

Vincent Baumont.

Typical homestead in the contaminated territories. (Belarus)

Chapter 4

PERSPECTIVES ON STAKEHOLDER INVOLVEMENT

As described in the foregoing chapter, the post-accident situation in the areas contaminated by the Chernobyl accident has been characterised by a growing awareness of the limitations of the top-down or prescriptive approach and the emergence of stakeholder involvement as a means of responding to these difficulties. Those who have helped to initiate this new approach are undoubtedly convinced of its efficacy. More importantly, however, the local people who have participated in these initiatives are similarly positive about the value of stakeholder involvement in the rehabilitation process and clear about its ability to respond to problems that the top-down approach was unable to touch. In this chapter, accordingly, the aim is to reflect the attitudes of people to stakeholder

CORE: the impact of contamination *(www.core-chernobyl.org)*

The Co-operation for Rehabilitation (CORE) Programme was built on experiences from ETHOS and other projects based on grass-roots level approaches to tackling complex issues. Its main objective is to facilitate the development and implementation of local initiatives in four contaminated districts of Belarus (Bragin, Chechersk, Slavgorod and Stolyn) to support rehabilitation of the living conditions, with a particular focus on engagement of the local population and professionals.

The CORE Programme addresses the complexity of the contamination situation by considering all the dimensions of life that are destabilised. The programme defines four priority areas for the projects: health care and surveillance, economic and social development in the rural contaminated areas, culture and education of children and youth and transmission of the memory of the Chernobyl disaster, and radiological quality.

The CORE Programme provides coordination mechanisms, and facilitation means in order to allow concerted and integrated action of local, national and international actors. It is not an administrative structure of project management: the projects are developed, funded and managed directly by the various partners of the programme on a voluntary basis.

The coordination structure of the CORE Programme consists of a series of committees based around a main committee with a broad membership, ranging from the local population and administration to international organisations. The committees examine proposed projects to ensure that they will lead to improvements in the quality of life for the local population. Although this central role is, for both the "end-users" and funders, a system of quality assurance, giving reassurance that the project will indeed be useful, because of the people involved, the CORE Programme also exerts a unifying, co-ordinating influence allowing a strategic view of projects and minimising duplication. It allows links to be made between ideas for projects, people involved in carrying them out, "end-users" and would-be project funders, thus promoting development of new projects. CORE is ongoing but first experiences suggest that the programme is successful at creating conditions for partnership, mobilising international donors and empowering and involving the local people.

involvement initiatives, mainly in Belarus in the context of the ETHOS Project, but also, by way of example of the situation further afield, in two of the Western European countries affected by the fallout, namely, Norway and the United Kingdom (both of whom are NEA member countries).

One of the perennial questions in any discussion of stakeholder involvement is "Who are the stakeholders?" And there are times when the answer to this question may be contentious. In the context of serious radioactive contamination, however, this is not the case. Everyone is affected. Everyone has a stake in the rehabilitation effort. Everyone is a stakeholder. In what follows, therefore, the views and attitudes of people from many parts of society – from senior government official to the ordinary citizen – are reflected, since in the case of post-accident rehabilitation in the territories affected by the Chernobyl accident, stakeholder involvement, when used as part of the process, has truly been an inclusive exercise, drawing in people from all walks of life to respond to the challenges which radioactive contamination presents in practically every aspect of daily life.

Radiation protection authorities

An accident on the scale of Chernobyl was the ultimate challenge for the national radiation protection authorities in the countries affected. Whatever scenarios had been envisaged and whatever responses had been planned were put to the severest test. What the authorities gradually learnt, however, was that their position was by no means as clear-cut as might have been imagined in advance. On the one hand,

> *The rehabilitation of living conditions in contaminated territories is as much as important as the issue of the reestablishment of the peace in other countries… We consider that the direct involvement of local population is the only way to succeed in the strategic problem of rehabilitating the living conditions in contaminated territories. This problem can't be solved without taking into account the complexity of the situation. It is far beyond the radiological consideration…*
> President of the Belarussian Chernobyl Committee, Ethos Seminar 2001.
>
> *I have to acknowledge that rehabilitation programme is a complex issue and a long-term strategy. The only way to deal with is to join the efforts of both the inhabitants of affected territories but also of the stakeholders at the national and international levels.*
> Vice President of the Belarussian Chernobyl Committee – Ethos Seminar 2001.
>
> *…close contact [with farmers] was essential for making the monitoring system work. We had good experience in getting away from the office, by listening to common problems, and also having to admit that we did not know everything. As authorities, we had to be humble. We knew a lot about radiology, but very little about practical conditions at the farms. Only by joint discussions and exchange of experiences, could we arrive at practical solutions that worked.*
> Member of staff involved in reindeer monitoring, Norwegian Radiation Protection Authority.

both they and the people they served clearly understood that they had a key role to play in the response to the accident in terms of characterising the situation and in offering advice on countermeasures. On the other hand, however, it became clear that in the context of such an event these authorities did not, and indeed could not, have all the answers to the complex range of problems to which it gave rise.

The recognition of these issues led in turn to the realisation that the relationship between the authorities and the people they served had to change. It could not

be the top down relationship that might have been assumed in advance, with the experts simply handing down information and solutions to the population. It had instead to become much more of a partnership, with the authorities recognising that they did not have all the answers and that they needed to engage stakeholders in order both to understand the scale and scope of problems and to develop workable solutions. People's confidence in authorities was profoundly shaken by the Chernobyl accident, and as a consequence reassurances that the experts knew what they were doing or that people should not be concerned were met with scepticism. In these circumstances, experts had to make an effort to build trust.

The experience for the authorities post-Chernobyl has been that such an accident does not simply give rise to technical problems with straightforward technical solutions. The technical dimension is only one that needs to be articulated with other social and political dimensions. There can be technical input to decisions, but rarely purely technical answers. Informing people is less likely to succeed than entering into dialogue with them. Where radiation protection authorities have been most successful in responding to the challenge of Chernobyl it has been where they have learnt their limitations as well as knowing where their contribution is most valuable, and where they have recognised the necessity and the value of developing a partnership approach with stakeholders.

Skuterud-NRPA and Reindeer Husbandry Admin., Norway.

Live monitoring of reindeer before slaughter in Norway, December 2005. These animals were not slaughtered in September 2005 because concentration values were above the intervention limit of 3000 Bq/kg (the maximum value reaching 7 000 Bq/kg).

View from the United Kingdom authorities

A key response from the Ministry of Agriculture, Fisheries and Food in the United Kingdom has been the monitoring of sheep on farms in the upland areas most affected by the Chernobyl accident. This so-called "Mark and Release" scheme ensures no meat with more than 1 000 $Bqkg^{-1}$ radiocaesium enters the human food chain.

Beresford-CEH, Lancaster, United Kingdom.

Monitoring a sheep for radiocaesium in the United Kingdom.

During the early 1990s, the Ministry commissioned the National Radiological Protection Board, the national expert body in radiation protection, to investigate alternatives to the scheme and assess their costs and benefits. In the course of this work, the researchers contacted various people they thought would be knowledgeable about the alternatives, including academic experts but also farmers. From the disparity in the responses to their queries, the researchers realised that technical effectiveness and direct cost were far from being the only important factors in selecting an alternative; indeed some technically attractive options were seen to have serious disadvantages when put to, for example, the farmers themselves.

A key conclusion for the Ministry was that, whatever its drawbacks, people generally wanted to keep the current scheme in place since it offered some advantages; in particular, it had avoided damage to the reputation of the farmer's saleable product, lamb.

Local radiation monitoring professionals

The fallout from the Chernobyl accident, especially beyond the immediate environs of the plant, was especially associated with rainfall patterns in the days following the disaster. As a consequence, while it was certainly possible for central authorities to produce quite detailed maps of the location of varying degrees of contamination, at the local level areas in even quite close proximity can show significant differences in levels of contamination. Thus, an area described at the macro level as severely contaminated can, at the micro level, reveal significant zones where contamination is light or even non-existent. This in turn can lead to

situations where people's exposure – both internal and external – can vary widely even within the same village. Knowledge of this local variation is vital if people are to be able to take steps to reduce exposures. For example, such knowledge can inform decisions about where livestock is pastured, where children play, where food is gathered, and so on.

Local measurement increased and widened awareness of radiological issues. It also increased trust and confidence in measurement because an effort was made to involve people.
Local measurement official, Belarus.

Through local measurement, people now know that just because you live in a contaminated zone doesn't mean that everything is dirty…It helped us to sort out the confusion of the information that we had before, which was too technical or expressed in different units.
Local measurement official, Belarus.

When dealing with advice to people, the average person does not exist! Each of us is a distinct individual. We deserve to be advised separately and to receive information adapted for each of us. At the local level, we did as much as we could to adapt our advice to the individuals.
Member of staff at local analysis laboratory, Norway.

Local measurement and mapping is therefore important, as is an *ongoing* measurement capability at the local level so that, for example, changes can be detected and foodstuffs assessed. It is also the case that having such a local monitoring capability goes a long way to addressing the trust problems that beset the top-down approach. Such a monitoring capability is, accordingly, a fundamental resource for all the other efforts made in rehabilitation and developing a radiation protection culture. In some areas of Belarus and Norway, for example, simple and robust monitoring equipment in the hands of appropriately trained local people has been a key component in transforming the lives of communities, which now have ready access to reliable, accurate and trusted information with which to inform their decisions. They are no longer passive recipients of data emerging from processes they frequently found opaque, but rather active participants in a transparent measurement process where they can, for example, witness the measurement of foodstuffs they have grown or gathered and relate the results to their own experience.

The benefits of adopting such an approach can be observed on a number of fronts. It is certainly the case that it is an important part of people regaining a sense of control over their lives, as they are empowered to make a valuable contribution to local decision making. But it is equally true that limited radiation protection resources can be used very efficiently by this local involvement. Local monitors can become part of the official structure and serve central data and information needs as well as local ones.

While the return in terms of trust, effectiveness and efficiency can therefore be significant, careful initial investment is needed in terms both of appropriate equipment and training that is adapted to local circumstances, and of careful selection of personnel who enjoy the confidence of those they will serve. Equally, if local monitors are to fulfil their undoubted potential, then they will need ongoing support. All of this certainly faces the radiation protection community with new challenges in terms of its relationships with those whom it serves. But, as the post-Chernobyl experience shows, if these challenges are met, then the rewards can be significant.

Mapping contamination in Belarus.

ETHOS Project.

Local physicians

Among the main beneficiaries of the local measurement capability in affected territories close to Chernobyl were the physicians. Health has naturally been one of the key concerns and there has been a widespread recognition that improvements in public health are urgently required. Having access to reliable information, and knowing that the populations they serve also have such access and actively utilise it in making decisions about how they live their lives, means that doctors have been able to transform their approach to healthcare in those areas of the contaminated zones where stakeholder involvement is a factor, and thus to make a more significant contribution to the overall public health picture.

Under the top-down approach doctors found themselves essentially telling patients what they were forbidden to eat, based on the centrally published lists of the most seriously contaminated products. The problem with these lists was that while the information they contained was not wrong, they could take no account of local conditions, for example the inability of a population to afford alternatives. Under the stakeholder involvement approach, doctors find themselves as an integral part of a comprehensive effort to engage the local population in the development of a radiation protection culture, all of which has the potential to have a positive impact on public health. They are able, for example, to monitor individual doses and to assist mothers in developing strategies to reduce the dose received by children. And the fact that mothers are able to see the tangible results of their efforts greatly enhances the efficacy of the doctors' interventions.

There are many problems on different levels in the contaminated areas and you need to systematise your approach…The integrated nature of the stakeholder involvement approach is important. Improved healthcare is not enough by itself. Clean food promotes health and social development.
Medical doctor, Belarus.

Data from the centre is not always of practical use. It is oriented towards the higher, national level. What is needed at the local level is what is tangible.
Medical doctor, Belarus.

Previously, in terms of material and personnel, we did not work effectively to address individual families. Education was on a collective rather than an individual basis. This was something new that the stakeholder involvement approach brought. We had always provided expertise and information, but we needed a different form of organisation to make it effective.
Medical doctor, Belarus.

CORE Programme.

Full body monitoring at a local clinic in Belarus.

These advances required an effort on the part of all concerned – radiation protection professionals, doctors and the communities they serve – to develop the conditions for dialogue and interaction beyond the confines of a doctor's office. The impact of the doctors' role is maximised where they are able to engage with radiation protection professionals and communities in decisions affecting agriculture, education, and every other aspect of daily life that is affected by the presence of contamination – in other words, a multidisciplinary and integrated approach is key to success in responding to the challenges of contamination. Insofar as radiation protection professionals have been able to assist in the creation of these conditions, they have helped to develop a framework within which medical professionals are able to assist the communities they serve optimise their responses to radiation so as to reduce their risk of illness in the first place, as well as to adopt a precautionary approach to unknown health effects.

Farmers

As may be seen from the discussion above regarding local physicians, food production plays a vital role in the overall picture of rehabilitation in the areas affected by the Chernobyl accident. As a consequence, farmers are intimately involved in ensuring that people have access to clean food. But this is only one dimension of the role of farmers in post-accident rehabilitation. Health must be the top priority, but farmers also have another incentive to produce clean food: the economic viability of the land and their ability to re-enter the market. Once again, experience has shown that there are significant benefits to be had from involving farmers directly in processes of measurement and decision-making at the local level.

Insofar as the top-down approach to rehabilitation tended simply to zone land as contaminated and therefore incapable of producing marketable food, this broad-brush approach failed to recognise local particularities in terms of varying degrees of contamination, the varying effects of different production strategies

Previously, we knew that we had clean milk and dirty milk in the same village, but we had no way of knowing why. With local measurement and stakeholder involvement we were able to map contamination in detail and discover that herds grazed on forest grass were the problem. With this information we were able to approach the local authorities and gain access to clean pastures.
Farmer, Belarus.

We have adopted an integrated approach-looking at the radiological position together with improvements in agricultural techniques…The main change brought about by stakeholder involvement is that it has inspired people. We always had the potential, we just didn't think about it.
Farmer, Belarus.

It took some weeks before we could assess how badly the radioactive fallout had affected us. Research has shown that if reindeer are fed with [the most] radioactive food [collected in Norway], it is difficult to obtain higher values than that which was measured in individual animals in Vaga… We quickly contacted the research department… they were familiar with current methods and the co-operation with the reindeer Administration had a decisive impact on the outcome.
Reindeer herder, Vaga, Norway.

After a while, there were restrictions on the information because there was an order from above that all the measuring results should first be approved before being made public. This gave rise to strong reactions…[leading to] lifting of the restrictions. Qualities such as humanity, openness and trust are very important keywords in such a situation.
Sheep farmer speaking of different handling of monitoring results, Valdres mountains, Norway.

given the same level of contamination and, indeed, the absence of realistic alternative sources of food. As a consequence, farmers simply adopted a fatalistic attitude that their produce could not be improved and could not be marketed, but that they and their families would nevertheless have to eat it themselves.

The stakeholder involvement approach, on the other hand, allowed farmers to understand the radiological condition of their land in finer detail and the radiological quality of their produce. They could thus make informed decisions about where to plant and which fields to leave fallow, and in due course see the tangible results of such countermeasures.

If contaminated territories are to be rehabilitated, if the environmental and cultural heritage is to be passed down to succeeding generations – in short, if life there is to be sustainable in the long term – then efforts need to be made to

Vincent Baumont.

Agricultural workers in their fields, Belarus.

ensure that those responsible for the land, especially farmers, are given the information and the skills to operate in the new environment they find themselves in. In this regard, radiation protection professionals will need to move beyond a role of pure measurement and information giving and towards a position where they engage actively with farmers in defining the problems they face and developing workable solutions which respect local constraints.

Mothers

The idea of rehabilitating contaminated territory loses its meaning if there is no future generation to hand it on to. The health of children is therefore of paramount importance and this in turn means that mothers in particular have a key role to play. One of the most distressing problems of the post-Chernobyl situation in the contaminated territories affects mothers and their ability to provide clean food for their children. They were aware that they might be feeding their children dirty milk or other contaminated food but, due to lack of resources, were unable to buy clean products from outside. The top-down approach certainly informed mothers of the need to avoid certain foods, but did not check to see whether that advice was actually meaningful at the local level. Similarly, mothers were aware that the places where their children played, including forests and lakes, might increase the dose of radiation to which they were exposed, but had no way of checking to see what was actually happening. In this context, mothers frequently expressed despair at their helplessness to do the best for their children.

> *"Before, we had no information… The stakeholder involvement approach produced very accessible information… and helped me because I was able to check milk and other products to see what I could use and what I couldn't…I didn't know about Becquerels before, but now I'm very interested – especially for the children".*
> Young mother, Belarus

One of the first problems, therefore, that local people identified when their views were sought in the context of the stakeholder involvement approach was the

need to be able to provide children with clean milk and other food and to know whether the environment in which they were growing up was healthy. Mothers were accordingly enthusiastic to take part in measurement and mapping activities, deriving a clearer picture of their immediate environs – from house and garden, through fields to surrounding countryside. They were also keen to be involved in initiatives bringing together doctors and other professionals with the aim of ensuring that children minimised their intake of more contaminated foodstuffs and avoided more contaminated areas. Because of the ability of this approach to focus down to the level of individual families, it was possible for parents to see the tangible effects of these efforts in the form of reduced dose readings for their children. The net effect of this approach was that families felt they had regained some control over their lives and were in a position to play a role in managing their exposure to radiation.

The success of this approach depends in no small measure on the ability of radiation protection professionals, as part of a multi-disciplinary team, to create the conditions within which ongoing engagement with mothers and families generally may take place. This marks a step change from simple information giving – something that had characterised the top-down approach and which was widely acknowledged to have had, at best, only a very limited impact. Radiation protection professionals certainly have knowledge to contribute, but this is in the setting of a joint effort with other stakeholders, including other professionals, where all are playing a role in defining the problems and developing solutions in a specific context.

ETHOS Project.

Monitoring for radioactivity in an oven.

ETHOS Project.

Mothers planning their children's diet to reduce radiation exposure.

Teachers and pupils

For those people in their mid-twenties and older, who can remember the Chernobyl accident and its consequences, it is easy to forget that for those who are younger their only experience of it will be what they are told or what they read. The unprecedented nature of the accident means that parents are not in a strong position, however, to provide children with more than an account of their own experiences and not the knowledge and skills required to cope with long lasting contamination. For the children and young people living in the contaminated territories this accordingly means that what they learn in school about the accident and its consequences for their daily lives will have a significant impact upon their ability to improve their quality of life. For these individuals, then, radiation protection is not something that can be learnt in theory alone, but

"I used practical examples and also had the children carry out practical exercises, such as collecting samples, making measurements of grass and milk, making comparisons. The pupils could then see how to achieve improvements and that they could still live in this area… It is a problem, however, that we need to follow the national curriculum. This means that we don't have materials that are relevant to villages like ours. It also means that there is pressure on how much time we can devote to radiological issues".

Teacher, Belarus.

"By the end of the year you can see results. The kids are much more aware of the situation and their behaviour with regard to radiological safety improvements…It is important also to work with parents. I organise meetings with them. They are a bit passive to begin with, but over the year you can begin to see them taking a more active interest in what we are doing with the children".

Teacher, Belarus.

"We organised trips, practical exercises, measuring, and so on. If the children can actually see and do the measuring it makes a big difference. Then they influence their parents and pass on the information they get at school…Stakeholder involvement showed us that we had choices. It let us do what we should have done before".

Teacher, Belarus.

"I like the approach we have adopted: it is scientific. We have learnt a lot about radiation. It is invisible, but it impacts one's health".

Secondary school pupil, Belarus.

"Now we have seen how different food products can be contaminated. Now we can control the food we eat, whether it comes from the forest or from the farm".

Secondary school pupil, Belarus.

rather something that must be learnt also in terms of the practical measures one must take in going about the daily activities that most people take for granted. The challenge for teachers in the contaminated areas is therefore considerable, but the opportunity that education offers in terms of advancing the rehabilitation process should not be underestimated. Not only can education have an impact on children, but can also help to engage parents as well in the development of a radiation protection culture.

For many years, however, the curriculum in the countries affected was perceived to be missing this opportunity. Whereas there might be discussion of the accident itself, there was an absence of any discussion of radiological issues except from a theoretical point of view – a symptom perhaps of a scientific approach to and the central management of the curriculum and its top-down imposition, rather than its development so as to meet the particular needs of those areas having to deal with contamination. Where stakeholder involvement approaches have been introduced, however, local people have identified education as a priority concern and it has been possible for radiation protection professionals to respond. There has thus been engagement with teachers to assist in the preparation of materials that are meaningful for the age of the children concerned (from kindergarten to secondary school) and for the local area in which they live. Teachers have been particularly keen to involve children in practical exercises (for example, measurement) and to incorporate these lessons into appropriate subjects (for example, mathematics, computing, physics and biology) rather than having them as standalone items and without any concrete connection to the children's environment.

Vincent Baumont.

Children at school in an area of Belarus directly affected by the accident.

Radiation protection professionals have, therefore, had to consider not only the question of how to assist teachers with knowledge and skills appropriate to the radiation protection lessons they wish to convey, but also the practical difficulties

those teachers have to face, for example, in terms of limited resources and the time and space constraints of a nationally mandated curriculum.

Local administration officers

Perhaps no one has been more aware of the problems caused by the top-down approach than those local officials who could see its limitations but who at the same time felt its constraints preventing them from doing anything about it. These officials thus felt pressure from above to implement higher-level decisions and pressure from below with regard to the mismatch between those decisions and local problems.

> *Stakeholder involvement has been very successful. Adaptation and rehabilitation was already going on, but this approach has enhanced our efforts…Sustainability requires that we bring up a whole generation who understand what needs to be done and think about things in a different way. This means engagement with a radiological culture from the kindergarten onwards…Development would have taken place without stakeholder involvement, but it has provided a real impetus.*
> Local administration officer, Belarus.
>
> *It has always been hard to motivate local people, but it has been impressive to observe what stakeholder involvement can achieve. People really make great efforts to make it a success. As a consequence, the Ministry now begins to use the same sort of approach…Information is fundamental, but the most important thing after that is to inspire people.*
> Local administration officer, Belarus.

As experience of stakeholder involvement in the areas affected by the Chernobyl accident has shown, however, shifting away from the top-down approach can produce real benefits for local authorities. Whereas before they frequently met with a hostile or indifferent attitude to what they were doing, and whereas people frequently complained about the lack of connection between what the local authorities were doing and what they actually felt needed to be done, stakeholder involvement has allowed a much more productive relationship to develop between local officials and the communities they serve. Trust is being built where previously both sides reported a lack of trust. Resources are being used more efficiently and tangible results are being achieved where previously both officials and communities expressed despair at the lack of progress. Local

officials freely admit that positive experiences with stakeholder involvement have led them to copy this approach and to change their assessment of the willingness and ability of local people to help themselves – not just in relation to radiation protection issues, but also in relation to other issues of interest and concern to the community. Officials who despaired of being able to motivate people have been impressed by the results that have been achieved by stakeholder involvement initiatives.

Stakeholder involvement accordingly has the potential to allow local authorities to make decisions that are sustainable in the sense of making a positive contribution to the local economy and local public health, and in the sense of being acceptable to and indeed having the active support of local communities – precisely because they have had an opportunity to participate in the framing of problems and the development of solutions. To realise this potential to the full, however, requires a change in the structures within which local administrations operate, allowing them sufficient flexibility and freedom to engage stakeholders while at the same time ensuring that they play their role as part of the bigger picture and contribute to higher level goals.

ETHOS Project.

Monitoring radiation in a local centre for radiological control in an area of Belarus directly affected by the accident.

Part of the process in achieving this change in the overarching structure, of course, lies precisely in helping central authorities realise that these two objectives are by no means contradictory: as much of the experience detailed in this report reveals, when it comes the attainment of national goals in terms of improved public health and boosting the economy, greater freedom and flexibility for local officials in terms of their ability to work with stakeholders does not necessarily produce added costs, but frequently does produce added benefits.

Radiation protection professionals have been able to assist local officials in this regard by involving them with local measurement initiatives and facilitating common approaches to the production of information and hence of decisions.

Chapter 5

LESSONS LEARNT

The Chernobyl accident represented, in many respects, the realisation of many people's worst nightmare. It resulted in a worldwide crisis of confidence in the nuclear industry. More than that, it represented a significant challenge for national and international radiation protection authorities and raised profound questions about the interaction of science and society. Most significantly, for the people directly affected by the contamination caused by the accident its effects are still intimately felt in their daily lives – a situation that will continue for generations to come. It is accordingly only with great care that one seeks to identify lessons learnt from this event to enhance national and international preparedness. As the preceding chapter reveals, however, faced with the need to go on with life and to rehabilitate living conditions in the contaminated territory, there are clear and valuable lessons to be learnt from the experience that has been gained. In a world situation where future contamination events may essentially arise anywhere, it surely behoves national authorities, international organisations and the radiation protection community to study closely that experience and to learn both what has worked in such a context and what has been less successful than might have been expected.

This chapter presents an overview of the key lessons for the radiation protection community and others with regard to stakeholder involvement to emerge from the post-accident rehabilitation effort in some of the territories affected by Chernobyl. It begins by listing the key lessons identified by radiation protection professionals with experience of stakeholder involvement processes.

It then lists those aspects of stakeholder involvement particularly valued by other stakeholders.

Stakeholder involvement: key lessons for radiation protection professionals

Especially where radiation protection professionals found themselves both unprepared for the complexity of the situation they confronted, where technical or scientific input represented only one dimension, and dealing with a mistrustful population, who had grown sceptical of the ability of central authorities to effect meaningful change in the aftermath of the accident, certain basic principles may be identified as guiding successful interventions. The following principles must, however, be understood appropriately. First of all, while they have been listed individually for ease of discussion, they should be seen not as stand alone items but rather as mutually supportive elements in an overall approach. Secondly, this fact should not be taken to imply that every principle would always be present to the same extent. It is important to note that in any future case the precise circumstances will be unique and they will change over time. As a consequence, the principles may have more or less importance according to the situation at any given moment.

Engagement and trust

First among these principles was a concern to engage the local people most directly affected by the accident, those who had to deal with contamination on a daily basis, in the processes of identifying problems and working out responses. This was most effective where the specialists not only addressed technical issues – although this was undoubtedly important – but also addressed the concerns of those affected. Listening carefully to these concerns and developing practical responses is certainly the best way to build trust between themselves and stakeholders with a view to restoring confidence. This sort of concern can at first sight appear alien to the technical specialist who has been trained to set greatest store by his or her scientific knowledge and skills – and perhaps, indeed, to be suspicious of personal involvement while promoting a dispassionate and professional approach. The lesson of post-accident rehabilitation has been, however, that precisely that professional detachment and that focus on the scientific and technical can serve to alienate the very people that the radiation protection professional seeks to assist. As experience in Chapter 3 has shown, there need be no conflict between professionalism and engagement, and, indeed, many good reasons for seeking a close working relationship with other stakeholders, and not least other professions.

Multidisciplinary approach

While this report naturally focuses on the role of the radiation protection professional, this should not be misread as giving the impression that post-accident rehabilitation is only or primarily in their hands. Each of the examples discussed here is testament to the fact that such rehabilitation produces problems that transcend the boundaries of radiation protection and enter realms as diverse as agriculture and medicine, but also ethical, cultural, social, economic, environmental, educational or patrimonial dimensions. This raises further challenges for radiation protection insofar as not only is it a question of engaging, for example, local populations, but of doing so potentially in collaboration with other specialists where all are working together to define problems in an adequately complex way and to produce solutions which respect that complexity, as well as the constraints of locally available resources.

Integrating radiation protection into everyday life

A corollary of the foregoing principles is the recognition that successful rehabilitation is dependent upon a shift beyond radiation protection as a source of information and towards its integration into concrete issues of everyday life. This is important because of the potentially long-lasting nature of contamination. Prior to the emergence of a stakeholder involvement approach, for example, in Belarus, local people were bombarded with information, but they readily admitted that they did not understand and could not see how it related to their concerns. The benefit of the shift in approach is that radiation protection becomes something that everyone must be concerned with rather than someone else's responsibility, and especially the responsibility of government. Integrating radiation protection in this way empowers people to take care of themselves rather than waiting in vain for help from central authorities who, in the context of contamination on this scale, cannot provide that degree of assistance.

Voluntary involvement

A further dimension of the stakeholder involvement approach is its voluntary nature. Accordingly, another important guiding principle for successful interventions is that local people must be willing to be involved. Indeed, the readiness with which stakeholders take up the offer to participate in the rehabilitation effort is a good test of the extent to which radiation protection professionals and other members of the multidisciplinary team are succeeding in their initial efforts to tackle the real problems. Nor is this willingness something that can be taken for

granted. Experience shows that, especially in the early stages, a wrong step on the part of specialists, a failure to continue to work at the key issues, can rupture the evolving relationship and impair trust.

Recognising the limits of pre-existing models

These guiding principles together indicate the extent to which the experience of Chernobyl reveals the need for a step change in planning for and responding to major contamination events, whatever their cause and wherever their location. The magnitude of the problems confronted exposed in many cases the limitations of pre-existing ideas and assumptions on the part of the authorities about how best to respond. In particular, top-down approaches based on bureaucratic and technocratic models turned out often to be efficient and effective only in their own terms rather than in terms of the benefits felt by the people they were designed to serve. Furthermore, the ongoing uncertainty surrounding the effects of long-lasting contamination and the recognised complexity of the radiological situation in such contexts are further drivers for a change in attitudes to the robustness of models and approaches.

Bottom-up approach

In their place, stakeholder involvement approaches have emerged which assume nothing in advance, but rather see it as essential to build a picture of the problems facing a local community from the bottom up in an exercise which places the members of that community in a constructive partnership with radiation protection and other professionals. Thus, the local community is not subject to a technical assessment of their condition and needs, which post-Chernobyl rehabilitation has shown can bear little or no relation to its experience of contamination, but rather is intimately engaged in the effort to understand the local situation and respond to it. It is worth stressing that while there is also clearly merit in stakeholder involvement in emergency planning, it is recognised that in the event of an emergency itself the case for retaining a top-down approach for the early response has certainly been made.

Collective learning

In this new approach, there is no imposition of the agenda from the centre or from outside. Instead, it may be said that radiation protection and other professionals together with local stakeholders are engaged in a process of collective learning.

In this way, stakeholders gain knowledge of their situation, in terms for example of the nature and consequences of contamination, in a way which the top-down approach, focused as it is on the provision of information and instructions which people are then expected to act on, seems to have been singularly ineffective in achieving. By the same token, radiation protection and other professionals learn about the realities of the effects of contamination on the local community and about the potential that exists in the community to respond to them or to participate in the decision framing process.

An adequately complex response

In terms of the implementation of this stakeholder involvement approach, it is interesting to note that just as bureaucratic and technocratic approaches divide problems among disciplinary domains (health, agriculture, etc.), so it transpires that as the process of collective learning evolves local communities identify distinct ways in which they are affected by contamination, distinct problems which call for particular solutions. It is accordingly possible to observe that different responses emerge to tackle these challenges. Thus, just as the division of problems among bureaucratic departments or technocratic disciplines has proved to be efficient at the societal level, so this division of locally identified issues among, for example, emergent groups or activities, turns out to be an efficient and effective response to the challenges thrown up by radioactive contamination. These groups or activities (focusing on such issues as clean milk for children, the disposal of ash from contaminated firewood, clean feed for livestock, local measurement, agricultural countermeasures, and so on) represent the local response to the local manifestation of more global problems of public health. To this extent, they are no more and no less than an adequately complex response to the problems of contamination.

Sound science

It is important to bear in mind, therefore, that while stakeholder involvement, by definition, implies a partnership between radiation protection and other professionals, on the one hand, and often diverse members of the local community, on the other, the basis for any of their activities remains sound science. Experience shows that there is no reason why the implementation of such an approach should in any way diminish or denigrate the role and place of science in responding to the natural

and technical challenges of radioactive contamination. To the contrary, science is fundamental to stakeholder involvement: the only difference is that in utilising scientific knowledge and technical expertise, the partnership now has the advantage of local knowledge, both in terms of the precise nature of the problems confronted and in terms of the potential that exists locally in the construction of solutions.

Openness to engagement at every stage

The lesson of Chernobyl accordingly is first of all, that if there is to be an adequate response to the complexity of such situations and, secondly, if a self-help approach is to be built and confidence restored, then stakeholders must be involved at any stage and at any point where they express a need. The apparent technical nature or complexity of the issues in question manifestly should not preclude any such involvement. Insofar as these issues bear on the concerns of the local community, then success in responding to them will depend on the willingness and ability of experts to meet its needs to be directly engaged.

From abstract ideas to effective action: the example of measurement

The problems encountered with measurement, as described for example in Chapter 3, are good examples of how radiation protection can be made directly usable by a local population. Despite a decade of providing local people with information about the contamination they confronted, they readily admitted that they did not understand what they were being told. The response of experts and authorities was not infrequently exasperation and an assumption that the people were simply incapable of understanding.

By contrast, providing local people with simple equipment and basic training transformed their knowledge and understanding of local conditions and, in addition, in many cases provided the means by which accurate and adequately complex characterisations of those local conditions could finally be produced. In other words, responding to the needs of stakeholders to be involved and to understand has the added advantage of effectively utilising the radiation protection resources that are inevitably in short supply and thinly spread in the context of a major contamination event.

Thus, with comparatively little effort or expense, a very significant step had been taken in the rehabilitation effort. Whereas a lack of understanding of local conditions served essentially to stall the process of recovery, a clearer understanding of the contamination effectively laid the foundations for the practical rehabilitation tasks that stakeholders could then quite rapidly identify.

Pluralistic validation and feedback

Whatever the undoubted successes that have been achieved, for example in Belarus and Norway, with regard to the involvement of local people in measurement, it is important to realise that there may be times when it is simply unreasonable to rely on such local involvement both to assist the radiation protection authorities in gathering data and in building trust between the authorities and the population. Sometimes, for example, the sort of measurement and analysis involved will require very specialised equipment and skills. In such circumstances, however, the need for alternative sources of information does not disappear. Indeed, it may actually be greater. It is accordingly important to realise that making provision for pluralistic measurement and analysis can be a vital aspect of ensuring an adequately complex understanding of a situation and of providing reassurance to affected populations that the relevant systems are robust and subject to scrutiny.

Re-emergence of self-reliance

The net effect of such steps is that people begin to feel a return of a sense of self-reliance and control over their lives. The experience of the accident and the subsequent contamination, without being able to understand it or have an adequate sense of its impact on their environment and daily lives contributed to the sense of helpless and hopelessness which has been such a feature of the contaminated territories. Whereas the response of authorities and experts had been in some places to bemoan the irrationality of such an attitude or in others to persevere with the provision of information despite the lack of success of such an approach, taking stakeholders more seriously and giving them more credit in terms of their ability to understand and be involved has paid dividends in terms of the return of feelings of control and confidence.

Sustainability

It is also worth emphasising the extent to which successful stakeholder involvement can be effectively self-reinforcing and self-sustaining. Experience in Belarus, for example, indicates that even where there can be continuing scepticism on the part of some members of the community, the fact that such an approach is visible and can quickly produce tangible results (for example, in terms of involving local people in measurement and the production of more detailed local maps) means that such scepticism can quickly be dissipated. Nor is it only local people who

can be won over by the perhaps small but nevertheless significant successes that stakeholder involvement can produce: authorities and experts too can rapidly come to see the advantages in moving in the direction both of greater engagement with populations they may previously have seen as merely passive recipients of the services and expertise they had to offer, and of greater multi-disciplinarity. As a consequence, the stakeholder involvement approach also has the advantage that it can essentially grow and adapt organically, producing a greater return on the initial investment than may have been anticipated. None of this should, of course, be taken as indicating that stakeholder involvement will necessarily be cheap or easy: only that where it is successfully implemented it can allow both for the more effective and efficient use of scarce resources in achieving the aims of radiation protection and for the sustainability of that protection in the long-term.

Assessments of the inclusive approach from other stakeholders

Taking this approach seriously, it is valuable to recall the lessons learnt from stakeholder involvement, *which the affected populations themselves have particularly identified*. These are after all the people whom radiation protection professionals and other experts and authorities exist to serve, and their assessment of the success or failure of what it is that these actors do for them is surely of particular significance.

Valuing involvement

In this regard, it is important to note at the outset that, where attempts have been made to move beyond the top-down approach to post-accident rehabilitation, stakeholders have frequently identified inclusion or involvement as the main reason for the success of such initiatives. People have welcomed the chance to contribute to the clarification of problems and the development of solutions, often feeling at last that their experience of contamination and of life in these territories is being taken seriously and that they have the chance to understand better the situation they are in. People have also reported that stakeholder involvement has revealed that they in fact have choices (whereas before they often felt helpless) and has given them the opportunity to exercise them (whereas before there was a sense that things were done for them and that they had nothing to contribute). The net effect has frequently been that people feel that they are being helped to help themselves rather than being the passive recipients of aid. This in turn leads people to report that, in contrast to the feelings of helplessness that living with contamination can engender, they have felt inspired and have realised that they have the potential to make a difference to the situation in which they find themselves.

Closer and more productive relationships

In terms of the relationship that exists between radiation protection professionals and the communities they serve, stakeholder involvement clearly makes a difference, not least to the perceptions of local people. Thus, it is very striking to observe the change in attitude of people between the top-down approach and the stakeholder involvement approach from one of a perceived remoteness of experts to one where they are seen as themselves having a stake in and a commitment to the community. The consequences for trust and confidence of such a shift in the way that radiation protection professionals are viewed are clearly positive.

Tangible objectives

It is also important to note the value recognised by local people in the fact that stakeholder involvement focused on the identification of tangible objectives and the means to achieve them. People perceived that whereas previously there could be a disjunction between the objectives of the authorities and the experts on the one hand and their concerns on the other, stakeholder involvement forced everyone to be clear about what the problems were and what could reasonably and realistically be done about them. It is not insignificant that long-struggling local authorities in the contaminated areas also identified this feature of the approach as a key means of overcoming a lack of trust and thus unblocking the road towards meaningful change.

A contextual approach

Linked to this emphasis on tangible objectives, is the fact that stakeholder involvement is concerned with the local context and ensuring that the identification of problems and the development of solutions are well adapted to local conditions. Aspects of this context-specific engagement which were perceived to have made a particular difference included: taking systematic local measurements and establishing criteria at even the level of individual households; developing practical exercises as a means of linking school lessons to local radiological protection issues; producing detailed maps of the local area in conjunction with local people as a means of gaining a more nuanced picture of contamination; utilising such maps to inform local agriculture, as well as people's decisions on where to gather food and where to allow children to play; producing individual dose charts for children so that the impact of strategies for dose reduction can be readily seen by children and parents. Initiatives such as these represented a step change from the broad-brush nature of the top-down approach, which by seeking global solutions

often produced sub-optimal strategies that were neither effective nor efficient. Almost counter-intuitively in the terms of the top-down approach, it turns out that lower level interventions that engage stakeholders can effectively leverage expert and material resources.

Building on experience

The unprecedented nature of the Chernobyl accident and its long-term consequences has focused much attention on rehabilitation efforts, where stakeholder involvement has emerged as a central theme. But insofar as experience has revealed local stakeholders to be an indispensable part of the success of the rehabilitation effort, so it is increasingly recognised that they have an important contribution to make to planning and implementation of protective actions during all stages of any future contamination event, whether associated with an industrial accident or a deliberate release, and whether in a rural or an urban setting.

Urgent response during the early stages of an accident situation will require pre-planned, centrally driven population protective actions. To optimise the effectiveness of protective actions, the co-operation of relevant stakeholders (such as the public, local officials, and potentially affected industry, etc.) will be essential. As such, insofar as possible, it will be important to involve such stakeholders in the planning of urgent protective actions. The NEA has for a number of years been running international nuclear emergency exercises, the INEX exercises, to assist its member countries in their planning for such events. Its first two series ("INEX 1" and "INEX 2") explored the urgent response phases, where stakeholder participation in planning was a key lesson learnt. Appendix 2 explains all the INEX exercises in more detail.

As the source of radioactive material release is brought increasingly under control, the extent of contamination is increasingly well characterised, and exposure pathways are increasingly managed, the nature of population protective actions will begin to shift. Urgent measures (e.g. evacuation, use of stable iodine prophylaxis, some food interdictions) may be lifted or modified. Other measures to reduce exposures (e.g. decontamination, longer term relocation, shifts in agricultural land use, longer-term food interdiction issues) may be implemented. Although the details of implementation will depend on the precise circumstances at hand, pre-planning to appropriately implement such measures will be necessary. Both pre-planning and implementation will need the participation of relevant stakeholders, such as local populations, officials and industry (e.g. food,

other large employers, etc.) to be effective and optimised. This challenging, yet relatively unexplored area was the subject of a further series of INEX exercises, INEX 3, which took place in 2005 and will be fully analysed in 2006.

The involvement of stakeholders has thus emerged as a central theme to the planning and implementation of protective actions, common to all stages of accident management (as well as to the management of possible terrorist attacks). One clearly emerging lesson from stakeholder involvement is that early decisions can impose links and constraints on later decisions. This lesson emphasises the importance of well-though out planning involving stakeholders and is one of the new areas that the NEA Working Party on Nuclear Emergency Management (which manages the INEX exercises) will develop.

Chapter 6

THE EVOLVING ROLE OF THE RADIATION PROTECTION PROFESSIONAL

The lessons learnt from working with the stakeholders involved in the rehabilitation efforts resulting from the Chernobyl accident demonstrate that a key role of the radiation protection professional is to engage with the affected people, using processes such as stakeholder involvement, to identify and assist them in implementing actions that enhance their quality of life. This role of bringing radiation protection professionals' knowledge and skills to the aid of people living in a radioactively contaminated environment is a valuable public health contribution by these professionals and a service to society.

The results of the Villigen Workshops (see Appendix 1) conducted by the Nuclear Energy Agency (NEA) Committee on Radiation Protection and Public Heath (NEA, 1998; NEA, 2002b; NEA, 2004a; NEA, 2004b), and of the NEA International Nuclear Emergency Exercises Programme (INEX) further support the view that a key role of the radiation protection professional is to engage with the affected people and establish a transparent, open, inclusive and participatory decision process. By employing such a decision process, an environment of trust can be established that empowers affected people to work with professionals to address their issues and establish some control and optimism about their future.

The role of the radiation protection professional continues to evolve. Today the profession is moving into a more public health role, based upon science, where broader societal issues are also to be considered. The profession is also dealing with the societal dynamic where the public today expects to have a greater role in decisions affecting their health, safety and the environment. As demonstrated

by the Chernobyl accident, subsequent inclusive actions and Villigen Workshops (see Appendix 1), processes such as stakeholder involvement can assist the professional to create more sustainable decisions in today's world. There are also other opportunities for the radiation protection profession to consider for the future.

Some of these are:

- The implementation of lessons learnt to enhance relationships between stakeholders, policy makers, and radiation protection and other professionals could be particularly timely as nations enhance their national security. The experiences gained from the Chernobyl accident in building trusting relationships between the radiation protection professionals, stakeholders, and government officials could also potentially be expanded to a more multidisciplinary approach to broader, participatory governance in dealing with the stakeholders' issues beyond radiation protection. Some of the other critically important issues to be addressed could include dealing with the economic, legal, legislative, and social impact of such an accident.
- The more open decision-making process established between these groups would allow stakeholders to identify and express their concerns and work with appropriate professionals to address their broader societal concerns. This process could also enhance the ability of the policy maker to consider all positions and solutions in creating balanced, informed, transparent, and sustainable decisions. This process would not replace or usurp the authority of the policy maker to make decisions. While the responsibility for the final decision lies with the government and or regulatory authority, the process of reaching a decision could be shared more appropriately amongst stakeholders.
- Such a proactive approach to planning and engagement with stakeholders could greatly enhance the probability of a successful response, a better control of costs and uncertainties, build more efficient response regarding stakeholders concerns and could also favour understanding between decision makers, authorities, experts, professionals and the public.

Decisions concerning other issues with radiological implications, such as waste disposal and discharges from current operations, could possibly benefit from the implementation of the lessons learnt in stakeholder involvement from

the Chernobyl accident. Implementation of these lessons learnt could result in a process that leads to sustainable decisions concerning current day issues having radiation protection implications.

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Appendix 1

THE VILLIGEN WORKSHOPS

Background

In its collective opinion paper entitled *Radiation Protection Today and Tomorrow* (NEA, 1994), published in 1994, the CRPPH significantly observed that the social dimension would play an increasing role in the work of radiological protection specialists – in other words, that the field would come to be seen less as a purely technical domain, and rather one that was ever more aware of and responsive to societal concerns. Nor was this a shift that affected only radiological protection: the mid-1990s saw a growing expectation on the part of the public that it would be more directly involved in decision making about technology in general. This, of course, represented a clear challenge to the way in which such decisions had traditionally been taken. In liberal democracies, duly elected governments had been understood to have a mandate to take those decisions and to delegate authority to a whole range of expert bodies to oversee the implementation and operation of technologies. Consultation with interested parties was always a part of this overall process, but the complex nature of many of the issues at stake made it natural that much would remain the preserve of the experts in the various fields. The notion, therefore, that a broad range of "stakeholders", many perhaps without any expertise in the field in question, should be involved in decision making raised apparently difficult questions. The Villigen Workshops set out to explore these in the context of radiological protection.

Villigen 1

The first Villigen workshop in 1998, entitled *The Societal Aspects of Decision Making in Complex Radiological Situations* (NEA, 1998), focused on the particularly difficult question of contaminated areas and their restoration to a

point were people could continue to live there. The broad, and influential, conclusion emerging from the discussions was that radiological protection must adapt to meet the needs of society and not the reverse. In other words, however content radiological protection specialists might be with the procedures and practices within their field, they could no longer expect to continue with them if it was evident that society more generally was demanding change. Quite what sort of change might be required and what could be regarded as feasible remained to be seen.

Villigen 2

The second workshop in 2001, entitled *Better Integration of Radiation Protection in Modern Society* (NEA, 2002), sought to make some preliminary suggestions in this regard. The Workshop considered a range of initiatives in a number of countries which exemplified a desire to change the way that radiological protection policy was developed and implemented. The examples examined, ranging from high-level priority setting down to mechanisms to address specific local level issues, shared a common characteristic of involving a wide range of stakeholders. The workshop demonstrated, therefore, that the radiological protection community was indeed sensitive to the shift in societal expectations and had begun to develop responses. While these responses dealt with different issues and different levels and in different parts of the world, it was possible to draw some conclusions at the end of the second workshop.

These addressed the need:

- to foster mutual trust between the radiological protection community and society as a whole;
- to develop approaches to interacting with stakeholders that are sensitive to specific contexts but which share features of openness, inclusiveness and agreed procedures;
- to clarify the respective roles of the various actors involved; and
- to understand interactions with stakeholders as opportunities for mutual learning.

Villigen 3

The second workshop was useful in demonstrating the way in which the radiological protection community had responded to changing societal expectations and in sharing experiences and best practice. The conclusions drawn, however,

remained at a rather conceptual level. The need was felt to move forward further and develop practical guidance for stakeholder involvement in radiological protection decision making. The third Villigen workshop, *Stakeholder Participation in Decision Making Involving Radiation: Exploring Processes and Implications* (NEA, 2004a; NEA, 2004b), accordingly had as its aim a much broader understanding of how stakeholder participation in decision-making can be appropriately integrated in national and international radiological protection decision-making. In preparation for this, three in-depth analyses of specific case studies were conducted with a view to providing a vehicle for the Workshop to identify commonalities in stakeholder involvement processes and their possible implications, and to facilitate discussion of the key issues. Furthermore, insight was sought from outside the radiation protection field on factors of success in organising public participation in environmental decision-making, relying on a published analysis of 239 initiatives (Beierle, 2002). The co-author of that study served as discussant of the Workshop case studies, thereby providing access to a broader, systematised context in which the radiation protection case findings could be evaluated.

A key message of the third workshop is that while there is no one-size-fits-all blueprint for such processes – given the sheer range and diversity of the situations where they may be appropriate – it is nevertheless possible to identify common themes and features. These should be of assistance to professionals in developing participation processes, and not detract from the flexibility needed to remain responsive to the particular demands and expectations of any given situation.

The presentation thus covered questions such as: When is stakeholder involvement appropriate? Who should be included? How do such processes differ from the sort of consultation that has been a feature of regulation for decades? What is the duration and extent of stakeholder involvement processes? What sort of issues might properly be included? What is the impact of stakeholder involvement on responsibility for decisions? What are the conditions for success? What should be avoided? What are the costs and benefits?

The guidance offered in this regard should be understood as flexible rather than rigid, and for use as appropriate rather than on an all or nothing basis. Provided that it is accepted as such, then it should hopefully go some way towards meeting the felt need of radiation protection professionals for more practical information on the design and implementation of stakeholder involvement processes that can enhance their ability to serve society.

Some of the key lessons and knowledge extracted from the case studies, or emerging from discussions, are:

- Case Studies showed that focusing on the problems identified by stakeholders could lead to accepted decisions, however this requires sensitive authorities, a flexible process, and the possibility of an evolutionary process focus.
- Identification of "Common Values" is a stakeholder process that can define a shared decisional framework in which it is possible to reach an agreed solution. The mandate to stakeholders must be flexible to allow the process objectives to grow or to shrink to fit the workable framework.
- There will be a need to frame the decision-making process to balance national policy needs and local stakeholder needs.
- Sustainability of a decision is a key aspect and this will require evolving processes, a long term commitment by government and regulatory authorities, and some flexibility in process goals.
- The question of "Who has the mandate to decide" is key to decision framing, problem identification and process development. Competence will be required in both technical and social aspects of the situation.
- While, in general, the responsibility for the "final decision" lies with the government and/or the regulatory authority, the process of "reaching a decision" is shared among all involved stakeholders.
- In a practical sense, it should be noted that:
  - Some issues may have to be left off the table in order to reach an accepted solution.
  - However, it should also be remembered that significant, unsolved issues may come back at a later date, and may need to be resolved before a complete, accepted solution can be identified.
  - A good decision-making process can overcome a bad situation, however success will still rely on the identification of a common goal.

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Appendix 2

THE NEA INTERNATIONAL NUCLEAR EMERGENCY EXERCISES (INEX) PROGRAMME

History of the NEA International Nuclear Emergency Exercises (INEX) Programme

Responding to member countries' post-Chernobyl concerns, the NEA created in 1990 the Expert Group on Emergency Exercises (now the Working Party on Nuclear Emergency Matters) to initiate and coordinate the conduct of International Nuclear Emergency Exercises (INEX) to improve the quality and coordination of emergency response systems and facilitate consensus on nuclear emergency management approaches between countries. Thus from its inception, the concept of stakeholder involvement, while initially focused on inter-governmental interactions, has been a central part of the INEX Programme. The following history describes some of the important outcomes of INEX in the areas of stakeholder involvement, integration of technical and social issues in emergency management, and post-accident recovery, and highlights some of the positive changes that the programme has led to in member countries. More information on the INEX experience can be found in the accompanying list of references.

INEX 1

To accomplish the Expert Group's objective to identify those aspects of off-site emergency response which could benefit from improved international coordination and consensus, the first NEA International Nuclear Emergency Exercise (INEX 1) was developed to identify possible areas of improvement in

trans-boundary communication and coordination, and to increase understanding between countries regarding national nuclear emergency response approaches. Important issues in this context were the intervention levels adopted by various countries, and the implementation and coordination of countermeasures, particularly in border regions.

INEX 1 was conducted in 1993 as a series of national table-top exercises using a fictitious location and scenario. It was carried out in each participating country by key decision makers and experts responsible for emergency matters (NEA, 1995a). It was followed by an international meeting of representatives from the 16 participating countries to review results and recommend next steps, particularly in the areas of communications, data management, countermeasures and decision making. Three follow-up workshops addressed the topics of:

- *The implementation of short-term countermeasures after a nuclear accident* (NEA, 1995b).
- *Agricultural aspects of nuclear and/or radiological emergency situations* (NEA, 1997).
- *Nuclear emergency data management* (NEA, 1998a).

Outcomes of these works were documented and provided as resources for use by national emergency management authorities.

INEX 2

The positive experience of member countries to INEX 1 and its follow up workshops lead directly to the launching of a second, more realistic international emergency exercise. In order to test existing response systems and examine specific issues within national emergency arrangements, INEX 2 was developed and conducted as a series of regional, command-post exercises with the simultaneous real-time participation of many NEA and non-NEA member countries. Exercise objectives focused on the real time exchange of technical information, public information and media interaction, and decision making based on limited data. The aim of INEX 2 was to characterise how concepts and systems within national emergency arrangements worked under realistic conditions, and to address public and media information aspects within these arrangements.

Between 1996 and 1999, four regional, large-scale exercises were conducted in Switzerland, Finland, Hungary and Canada, each with participation of about 30-35 countries and 3-5 international organisations (NEA, 1998b; NEA, 2000a; NEA, 2001a; NEA, 2001b). Early in the series, it was recognised that more information than currently available would be necessary to ensure that emergency decisions and public information are based on appropriate knowledge. Therefore, the INEX working groups developed a coherent strategy to better identify key emergency data, and improve emergency communication, information management, and monitoring strategies. These outcomes were developed and documented (NEA, 2000b), and many NEA member countries and international organisations have implemented the recommendations.

An overall follow up evaluation workshop (NEA, 2001c) identified areas of interest including lessons learnt for decision making, information exchange, emergency exercise preparations, and public and media communications. A key finding was that public information and media cooperation must be dealt with in parallel with other types of countermeasures undertaken as part of the initial top-down response. However, it was recognised that mistakes made in this area at the beginning of an event could lead to an early loss of confidence from which it would be difficult or impossible to recover. Thus, there is a need to engage the public and media during the emergency planning stage in order to build confidence and improve emergency response effectiveness.

INEX 2000

The INEX 2000 exercise (NEA, 2005) was developed by the NEA in response to the INEX 2 findings, and co-organised through the Inter-Agency Committee on the Response to Nuclear Accidents (IACRNA). Similar to INEX 2, additional objectives included the testing of new data management and monitoring strategies and the coordination of media information. This exercise also addressed for the first time questions of civil liability following a nuclear emergency. Using the exercise results, the follow up workshop aimed to test the mechanisms by which potential victims of this simulated accident would be compensated (NEA, 2003).

INEX 2000 represented a further expansion in the scope of stakeholder involvement and social issues in emergency management, particularly through the examination of the topic of compensation as part of post-accident remediation.

INEX 3

Following the experiences of the previous INEX exercise series, and recognising the expanded focus of many national emergency management programmes following the 2001 terrorist attacks the NEA developed the INEX 3 exercise to address the growing desire in the nuclear emergency management community to better master response in the later phases following a nuclear or radiological event. During this period, the involvement of stakeholders in decision-making processes will be significant, and confidence in response authorities could well be compromised should responses not appropriately address the needs of stakeholders.

INEX 3 was developed as a table-top consequence management exercise to identify the details of the issues that will arise in the medium and late phase after a nuclear or radiological incident causing serious contamination, and on developing effective implementation processes and structures for their resolution. Exercise objectives covered agricultural and food countermeasures, decisions on "soft" countermeasures such as travel and trade, recovery management, and public information.

This exercise, conducted during 2005, has involved a broader range of participating organisations and representatives in the exercise planning and conduct than in previous exercises. This has expanded the scope of stakeholder involvement in emergency management, helping to identify issues affecting early phase and intermediate phase management that must be resolved as part of the planning phase through appropriate stakeholder involvement. As such, it will facilitate the development of mechanisms for incorporating these processes into emergency planning and response. Follow-up workshops and analyses will focus on issues relevant to the management of large contamination events, and the role of a broad range of stakeholders in this process, including the investigation of mechanisms for incorporating stakeholder involvement processes into emergency management arrangements.

Next steps

The INEX experience, amongst other national and international post-Chernobyl initiatives, has shown that radiation protection is one aspect of the

broader range of emergency management issues and risk governance, particularly as the scope of planning arrangements expands to more fully encompass intentional events such as the malicious use of radiological sources. The INEX experience is providing increased insight into how sound radiation protection aspects fit into a larger integrated emergency management framework. As a result of the experiences of member countries following Chernobyl, the NEA is now addressing this convergence as it moves towards an integrated understanding of relevant technical and social issues in emergency management, from early phase planning preparedness and response, through the planning, preparedness and response of the intermediate and late rehabilitation phases.

Evidence of change

The following list highlights some of the key changes in national and international emergency management that have taken place in the years following the Chernobyl accident. These enhancements include:

- Increased willingness to discuss and investigate nuclear emergency preparedness and response issues.
- Increased recognition of the role of international communications and co-operation within national and international nuclear emergency management programmes, and corresponding improvements in arrangements.
- Increased realisation of the need to test actual response systems, including linkages to the public, to identify strengths, weaknesses.
- Exchange of new and practical experiences, substantially contributing to the development of national response systems. In many cases, the INEX exercises provided the first systematic approach to increase the level of emergency preparedness in areas such as alert and notification, technical assessment, decision making, and international communications.
- Increased national efforts towards harmonisation of countermeasures.
- Improved coordination between relevant international organisations.
- Implementation of decision-support tools to rapidly share information and inform decisions.
- Increasing recognition of the link between emergency preparedness arrangements and emergency management in the real world.

In addition to the specific lessons cited above, one of the most important and lasting outcomes of the NEA INEX exercises programme has been the establishment of an international exercise culture. The routine involvement of a broad range of countries in the preparation and conduct of ongoing emergency exercises hosted by various international organisations, as well as nationally arranged bi- and multi-lateral exercises has lead to an advance in the global state of preparedness. This has additionally provided countries with the experience and confidence to move towards more inclusive emergency management arrangements. Given national and international interest in this issue, this process is expected to continue.

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