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**NUCLEAR ENERGY AGENCY
COMMITTEE ON RADIOLOGICAL PROTECTION AND PUBLIC HEALTH**

**Post-Accident Recovery Planning and Management:
Stakeholder-Involvement Lessons from Fukushima**

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FOREWORD

The Organisation for Economic Co-Operation and Development (OECD) Nuclear Energy Agency's (NEA) Committee on Radiological Protection and Public Health (CRPPH) has for some time studied the processes of radiological protection decision-making, and the roles of stakeholders (e.g. radiological protection experts, members of the public, elected and government officials, etc.) in such processes. A chronological description of the learning pathway the CRPPH has followed to reach its current level of decision-making and stakeholder involvement understanding is given in annex as a framework that characterises the Committee's viewpoint as the consequences of the Fukushima Daiichi nuclear power plant (NPP) accident unfolded. The 11 March 2011 great east Japan earthquake and tsunami, resulting in the loss of an estimated 20 000 lives, and in major damage to the TEPCO NPP at the Fukushima Daiichi site, graphically demonstrated the crucial nature of stakeholder involvement in resolving issues as complex as post-accident consequence management. These tragic circumstances have allowed the CRPPH to draw some lessons, and to revisit its work on post-accident recovery and stakeholder involvement and to enhance its practical understanding in the context of decision-making

In its recommendations for the protection of people from exposure to radiation, the International Commission on Radiological Protection (ICRP) emphasises the effectiveness of directly involving the affected population and local professionals in the management of post-accident situations, and the responsibility of authorities at both national and local levels to create conditions and provide means favouring the involvement and empowerment of the population in the aftermath of a radiological event. Addressing a request for assistance from Japanese authorities, the ICRP initiated a series of 12 stakeholder dialogue meetings between November 2011 and September 2015 in different areas of Fukushima Prefecture. The objective of these meetings was to find ways to respond to the challenges of the long term rehabilitation of living conditions in the areas affected by the Fukushima nuclear power plant accident by actively involving the local population. The CRPPH was invited by the ICRP to participate in these dialogue meetings to provide, as appropriate, its international experience to dialogue participants, and to gain first-hand understanding of recovery issues.

It should be noted that following the first 12 dialogue meetings, the ICRP and the Nippon Foundation have continued to organise dialogue meetings to give voice to affected individuals. These "phase II" dialogue meetings are increasingly organised and managed by the Japanese, but have broadly maintained the flavour and structure of the first 12 "phase I" dialogue meetings. Between March 2016 and February 2018 there have been 7 additional dialogue meetings, which have also contributed to the development of this report.

The CRPPH agreed that the NEA Secretariat should participate in these dialogue meetings on behalf of the Committee, and should report results to the Committee at its annual meetings. The ICRP organised, in December 2015, an international workshop to summarise the experience of the first 12 dialogue

meetings. It should also be noted that the local participants in the dialogue meetings have themselves filmed the dialogue meetings and collected all powerpoint presentations, and have posted this meeting documentation on the web site of “Ethos in Fukushima”, a local NGO strongly involved in dialogue organisation and management. The ICRP is using experience from the dialogue meetings to update its recommendations relating to emergency and recovery management, Publications 109 and 111 respectively.

The NEA Secretariat has used experience from the dialogue meetings to identify lessons felt to be of international value to the CRPPH community. For each dialogue meeting since the second, the NEA Secretariat has provided short summary presentations of lessons of relevance to Japan and beyond. Although not formally approved by dialogue participants, these lessons informally and surely incompletely reflect the recovery experience of post-accident Fukushima prefecture dialogue participants, and are documented in this report.

PUBLIC AND POLICY OVERVIEW

In its recommendations for the protection of people from exposure to radiation, the International Commission on Radiological Protection (ICRP) emphasises the effectiveness of directly involving the affected population and local professionals in the management of post-accident situations, and the responsibility of authorities at both national and local levels to create conditions and provide means favouring the involvement and empowerment of the population in the aftermath of a radiological event. Addressing a request for assistance from Japanese authorities, the ICRP initiated a series of 12 stakeholder dialogue meetings between November 2011 and September 2015 in different areas of Fukushima Prefecture. The objective of these meetings was to find ways to respond to the challenges of the long term rehabilitation of living conditions in the areas affected by the Fukushima nuclear power plant accident by actively involving the local population. These dialogues have helped to build a practical radiological protection culture in dialogue participants, which in turn has, for some, supported their taking informed decision for their future. This encourages the development of a process to reach more people through this level of discussion.

This report is neither intended to evaluate the process of the dialogue nor to assess the Japanese government's policy for managing the Fukushima accident. Rather, it summarises the recovery lessons learned by the Nuclear Energy Agency's Committee on Radiological Protection and Public Health (CRPPH).

Within the community of radiological protection experts, over the past 25 years the CRPPH has been a pioneer: in terms of highlighting the importance of stakeholder involvement in any decision processes addressing situations where radioactivity and/or exposure to radiation are of concern; studying and publicising ways to effectively address stakeholder concerns; and characterising the different aspects that are considered when individuals make decisions. The lessons learned by the CRPPH can be broadly summarised as follows:

- integrate RP aspects into societal decisions, rather than integrating societal values into RP decisions;
- the RP expert should be at the service of stakeholders; and
- decisions are informed by science, but are driven by social values.

With this as background, participation in the ICRP Dialogues has added the following accident-recovery management lessons to the CRPPH's understanding of stakeholder involvement:

In terms of lessons about affected people:

- people generally have no or little understanding of risks from radiation exposure before an accident, which puts affected people in a situation where they need and want to learn rapidly;
- The dialogues showed that local people, whether they left or stayed, suffered enormously. The complexity and difficult presentation of ICRP exposure situation criteria (1 mSv limit for planned, and 20 – 100 mSv reference level for emergencies) certainly did not assist affected people to understand their circumstances or address their concerns, thus did not contribute to alleviating their uncertainty and psychological suffering;
- the situations caused by large-scale accidents are extremely complex for affected people, and can include inter-related aspects such as: radiation risks; personal financial and employment concerns; family issues; local infrastructure and economic issues; psychological concerns; compensation issues; social structure issues, etc.;
- there is no “average individual”, so the average values of officially-collected data do not represent the situation faced by any individual – each situation must be addressed as being unique;
- if trusted information is not supplied to address people’s concerns, often people will spontaneously, individually and socially, collect answers to their questions, and work, individually and socially, to help adjust their lives to account for the post-accident circumstances, not forgetting the accident but dealing with its consequences.

In terms of lessons for RP specialists

- the RP focus for stakeholder involvement in recovery should be on long-term technical support;
- this support is generally very resource intensive;
- trust is a necessary and central component of successful stakeholder involvement;
- a positive vision of future will help an individual to choose to stay or to go; and
- individual decisions, whether to stay or to go, are all valid.

In terms of lessons in accident recovery planning:

- trust needs to be built before accidents occur
- a flexible regulatory framework is needed to best address the accident conditions that occur
- health professional-community networks should be identified around known hazardous installations, and relevant plain-language radiological information should be ready to send so that they can address affected stakeholder concerns
- governmental decisions should actively reflect that stakeholder concerns have been taken into account
- expert resources needed to address affected stakeholder concerns can be extensive, and should be planned in an all-hazards framework
- personal dosimetry and area monitoring equipment should be available

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LIST OF ABBREVIATIONS AND ACRONYMS

ASN	French Nuclear Safety Authority
CRPPH	Committee on Radiological Protection and Public Health (previously Committee on Radiation Protection and Public Health)
HSK	Swiss Federal Nuclear Safety Inspectorate
ICRP	International Commission on Radiological Protection
IRSN	French Institute of Radiological Protection and Nuclear Safety
NEA	Nuclear Energy Agency
NGOs	Non-governmental Organisations
NPP	Nuclear power plant
NRPA	Norwegian Radiological Protection Authority
OECD	Organisation for Economic Co-Operation and Development
RP	Radiological protection
TEPCO	Tokyo Electric Power Company

EXECUTIVE SUMMARY

In its recommendations for the protection of people living in long term contaminated territories, the International Commission on Radiological Protection (ICRP) emphasises the effectiveness of directly involving the affected population and local professionals in the management of post-accident situations, and the responsibility of authorities at both national and local levels to create conditions and provide means favouring the involvement and empowerment of the population in the aftermath of a radiological event. Addressing a request for assistance from Japanese authorities, the ICRP initiated a series of 12 stakeholder dialogue meetings between November 2011 and September 2015 in different areas of Fukushima Prefecture. The objective of these meetings was, broadly, to find ways to respond to the challenges of the long term rehabilitation of living conditions in the areas affected by the Fukushima nuclear power plant accident by actively involving the local population. This report is neither intended to evaluate the process of the dialogue nor to assess the Japanese government's policy for managing the Fukushima accident. Rather, it summarises the recovery lessons learned from these dialogue meetings, effectively from the people affected by the Fukushima accident. These lessons are interpreted by the CRPPH in the context of the experience of and lessons learned over the past 25 years or so.

Recovery management: Lessons from Fukushima

In terms of governmental actions, before any accident relevant governmental organisations, at all levels, should establish active stakeholder-interaction presence around hazardous sites, and generic criteria for starting and ending countermeasures. After an accident, government should use local knowledge as key input for decisions, and engage with stakeholders and provide them with information to rapidly allow them to make personal decisions (for example whether or not to leave, or if evacuated whether or not to return home). Support by experts to address stakeholder questions was influential in helping people to make personal decisions, and encouraging stakeholders to share experience helped them to access and understand data, and establish health follow-up processes in a holistic manner. These lessons imply that affected people will with time assume responsibility for personal protective actions, and central government responsibility will with time focus on the need to support protective actions such as: management of food (acceptance criteria, monitoring stations, operator training, etc.) individual dosimetry (equipment, training, meaning, database creation and accessibility, data interpretation, etc.); whole-body counting (equipment, operators, training, meaning, database creation and accessibility, etc.); environmental monitoring (equipment, training, meaning, mapping, availability and accessibility of data to the general public, etc.); and addressing concerns (process/venue for all parties to ask questions and receive honest, factual information and answers, generally best accomplished through trained staff who are physically present or easily accessible). The resources – human and financial – needed to address these lessons are extremely significant and need to be planned in advance. For this a multi-risk, multi-stakeholder participation, integrated national approach can be effective. These dialogues have helped to build a

practical level of radiological protection understanding, a sort of radiological protection culture in dialogue participants, which in turn has, for some, brought a positive future supported their taking allowed to take informed decision for their future. This encourages the development of a process to reach more people through this level of discussion.

In terms of recovery decision-making, radiological protection experts are rarely decision-makers, but advise taking into account “practical” considerations of social and economic aspects. In this context, individuals make no wrong protection decisions, only personal decisions. Any individual’s decision must be respected and appropriately supported, and protection decisions should be well informed. For example, the sooner decisions regarding returning home can be taken, the better it is. Because of the extreme complexity of such situations, the soonest such decisions can be taken may be some time after an accident. However in any such situation, expert advice can put data and understanding into people’s hands to help them regain “control” of their circumstances, and can help individuals develop their vision of the future, for which understanding of Radiological protection (RP) science and circumstances is important. Socio-cultural aspects will need to be taken into account in planning and implementation of protective actions. These lessons imply that there is no “average person” or “average concern”, and that concerns should be addressed in the socio-cultural context and as individually as possible. Also, a huge effort may be needed from experts to appropriately interact with affected individuals to address their concerns, and for this resources should be pre-planned and, revisited regularly during the recovery phase to help assure adaptation to the actual situation. This should include planning of an ethical framework for experts to engage with stakeholders, and the training of experts in public interactions, to facilitate effective, constructive, non-confrontational exchanges.

In terms of behaviour of affected people, it should be recognised that affected stakeholders will address their situations themselves, with or without expert assistance (e.g. dose and dose-rate measurements, clean-up, etc.). Stakeholders trust in government can strongly influence confidence in government actions (e.g. farmers worked with university volunteers rather than government experts to clean fruit trees, to prevent Cs uptake in rice, etc.), and stakeholders will inform their protection choices with whatever science is readily available from a believable source. This implies that while radiological measurements are easy to achieve, understanding of measurements needs qualified scientific input. The dialogues showed that local people, whether they left or stayed, suffered enormously. The complexity and difficult presentation of ICRP exposure situation criteria (1 mSv limit for planned, and 20 – 100 mSv reference level for emergencies) certainly did not assist affected people to understand their circumstances or address their concerns, thus did not contribute to alleviating their uncertainty and psychological suffering. Radiological context and judgement, that is, an effective radiological protection culture, takes time to develop (e.g. clean-up should prioritise contribution to annual dose over hot spot dose rates).

Trust is also a key issue, as information will not be, or will be less believed if the provider of the information is not trusted. Trust and acceptance must be earned, and for this, providers of expertise should become and remain locally connected. In terms of government-collected data, independent (e.g. not financially or managerially involved, such as NGOs, university volunteers, local individuals, etc.) verification of information, measurements and data can be an important element of trust. Unaffected populations will be concerned about food from and travel to affected area, and will need to establish trust in producers and in governmental decisions. These observations imply that trust is easy to lose and difficult to build, and that building or maintaining trust is a long-term process. In general following an

accident, experts may emerge from many organisations, e.g. universities, laboratories, hospitals, government organisations and NGOs. Not all so-called experts will be experts, which is why trust is such an important element. But for stakeholders to build trust in government, government must have trust in stakeholders: i.e. affected populations are generally ignorant of radiation and its effects, but are intelligent, have excellent “local knowledge”, and have legitimate questions and concerns.

Achieving recovery is a step-by-step process, and radiological recovery is only one part of the accident recovery. As part of this process, radiological protection criteria, short- and long-term, are important government choices for which stakeholder input should be transparently considered and reflected. Recovery is “achieved” when the post-accident circumstances become “just the way things are”. Affected individuals recognise that the situation is new, but new behaviours become “habits of daily life” and no longer cause significant stress. Achieving this needs understanding of all aspects of an individual’s circumstances (e.g. RP, economic, social, political, physical, etc.). Recovery is then a state of mind, and cannot be reduced to a specific set of criteria. Achieving such a state will take time, and will need social and technical support and resources.

Thus in support of recovery, the radiological protection focus for stakeholder involvement should be on long-term technical effort. This is generally very resource intensive, and to successfully contribute to effective stakeholder involvement trust is a necessary and central component. Such support should help individuals to regain control of their circumstances, and positive vision of their future, whether they choose to stay or to go. Any individual decision must be accepted as valid.

Recovery planning: Lessons from Fukushima

One of the key messages learned from the Fukushima Daiichi NPP accident is that recovery is a long process that is socially and technically complex, and that is extremely resource intensive. Because of the magnitude and diversity of resource needs, it will not be possible to have such resources in pre-accident “stand-by” mode. Rather, it will be necessary to have established networks in place to mobilise relevant expertise, and to have processes and procedures in place to create and assemble the resources needed to support recovery efforts at all levels. The following overview provides brief descriptions of the more important specific aspects that should be integrated into large-scale radiological accident recovery planning.

Trust

Large-scale radiological accidents tend to erode public trust in government authorities responsible for radiological safety regulation and technical assessment. Data and information for the public from the accident facility owner/operator is often discounted as being unreliable or as covering up the truth.

Radiological protection system

The system of radiological protection developed by the ICRP is used by regulatory authorities and by radiological protection practitioners around the world for the protection of the public, workers and the environment from the effects of ionising radiation. Publication 103, the latest ICRP General Recommendations (2007) and written prior to the Fukushima accident, is a well-polished radiological protection framework. However post-Fukushima experience suggests that the nuances of “exposure situations” could better address post-accident situations. The RP system could focus more, for example, on

providing a framework of processes and tools to specifically address the prevailing circumstances, using the most relevant radiological protection tools available.

Regulation

Recovery is a long term process for which a regulatory framework can be planned and put in place in advance. However, because the nature of recovery issues depends on the actual, long-term, post-accident prevailing circumstances, some flexibility in the regulatory framework is necessary.

Radiological science and protection expertise

Should a large-scale radiological accident occur in the future, it is likely that affected stakeholders would not be in a position to judge their levels of radiological risk based on valid scientific understanding. As such, it would be extremely important to assure access to information to address concerns. The health professional community (e.g. family doctors, local nurses, pharmacists, etc.) is traditionally a trusted source of health advice for individuals, and should be well informed, including radiological science, risk basics, and local “radiological status” information.

Decision-making

In recovery situations, many decisions are “behaviour” and “lifestyle” choices made by individuals remaining in or having left affected areas. Such decisions are generally based on an individual’s judgement, which is hopefully supported by a reasonable level of scientifically-sound radiological understanding. Planning should assure the availability of such information. Central, regional or local government officials also make protection decisions. These should be expressed such that stakeholders can see their concerns taken into account in process and decision.

Resource management: An integrated approach

Each affected stakeholder judge, based on their own prevailing circumstances, what actions and choices best serve their well-being. Everyone needs to understand the complexity of their own situation in their own fashion, and need somewhat “custom” information to address their concerns. To achieve this can be very resource intensive and requires integrated planning.

Practical aspects

Affected stakeholders need access to radiological data, and have wanted to make their own measurements. Planning should address this need for radiation detectors and of personal dosimeters. Planning should establish, pre-accident, approaches to and criteria for ending countermeasures.

Annex: CRPPH stakeholder involvement history

By 1992 the CRPPH had done considerable work on characterising the radiological impacts of the Chernobyl accident, and of the radiological protection actions taken and implications identified by the NEA member countries. Adding to this environment of evolution and change, the ICRP had issued new general recommendations in 1990 (ICRP Publication 60). Looking forward, the CRPPH organised a workshop on “Radiation Protection on the Threshold of the 21st Century” in 1992 to address the direction that aspects and applications of radiological protection was taking. This workshop addressed stakeholder involvement in radiological protection decision-making for the first time, but focused more on explaining science than on addressing stakeholder concerns.

From 1992 to 1998 the Committee's discussion on stakeholder involvement in radiological protection decision-making continued, mostly in the context of optimisation. These discussions resulted in the CRPPH holding three workshops in Villigen, Switzerland (1998, 2001, 2003), on "The Societal Aspects of Decision Making in Complex Radiological Situations". Broadly, these workshops concluded that in complex radiological situations, radiological protection aspects should be integrated into societal decisions, rather than integrating societal values into radiological protection decisions.

In parallel with and building on the Villigen workshops, the CRPPH continued to discuss stakeholders in the context of Chernobyl recovery efforts. These discussions culminated in 2006 with the publication of the report "Stakeholders & Radiological Protection – Lessons from Chernobyl 20 Year After". This report concluded that radiological protection experts are in general advisors rather than decision-makers, and as such they should be at the service of stakeholders.

Beyond recovery aspects, studies took the CRPPH towards the realisation that radiological protection decisions take both "radiological protection science" and "social values" into account, but should more transparently express their drivers. To address this, the CRPPH began work to better understand the elements that are considered when making radiological protection decisions, and organised four workshops on "Science and Values in Radiological Protection Decision Making" in 2008, 2009, 2011 and 2012. These workshops concluded that radiological protection decisions are informed by science, but are driven by social values.

1. INTRODUCTION

As part of the significant response to the Fukushima Daiichi nuclear power plant (NPP) accident, the Japanese government sought the views and advice of many experts from foreign governments, from international organisations, and from the International Commission on Radiological Protection (ICRP).

In its recommendations for the protection of people living in long term contaminated territories, the ICRP emphasises the effectiveness of directly involving the affected population and local professionals in the management of the post-accident situation, and the responsibility of authorities at both national and local levels to create conditions and provide means favouring the involvement and empowerment of the population in the aftermath of a radiological event. Addressing a request for assistance from Japanese authorities, the ICRP initiated a series of stakeholder dialogue meetings, beginning in the fall of 2011. Participants included representatives of Fukushima Prefecture, local professionals, local communities, representatives of Belarusian, Norwegian and French organisations with direct experience in managing long-term consequences of the Chernobyl accident, and the Secretariat of the Committee on Radiological Protection and Public Health (CRPPH) of the Economic Co-Operation and Development (OECD) Nuclear Energy Agency (NEA).

The objective of these meetings was, broadly, to find ways to respond to the challenges of the long term rehabilitation of living conditions in the areas affected by the Fukushima nuclear power plant accident.

Between November 2011 and September 2015 a total of 12 Dialogue Symposia were held. This report is intended to briefly present the processes that were used to organise these stakeholder dialogue meetings, and to highlight and document the lessons learned by the Committee on Radiological Protection and Public Health (CRPPH) through the participation of its Scientific Secretariat in all 12 symposia.

The main intention of the ICRP Dialogue Symposia was to assist individuals in the affected areas to better understand their radiological circumstances, and to learn from the experience of those who had been affected by the Chernobyl accident. Nonetheless, the CRPPH found that the questions, concerns and responses of Japanese stakeholders were extremely useful to improve policy, regulation and application of radiological protection for planning and preparation for national and international responses for emergency and post-accident existing situations.

This report is neither intended to evaluate the process of the dialogue nor to assess the Japanese government's policy for managing the Fukushima accident. Rather, it summarises the recovery lessons learned from these dialogue meetings, effectively from the people affected by the Fukushima accident. These lessons are interpreted by the CRPPH in the context of the experience of and lessons learned over the past 25 years or so.

2. CRPPH INVOLVEMENT IN THE ICRP DIALOGUES IN FUKUSHIMA PREFECTURE

After the Fukushima accident occurred, the International Commission on Radiological Protection (ICRP) Main Commission actively addressed the circumstances, organising task-group discussions of lessons and issues, beginning the revision of ICRP publications 109 and 111, addressing emergency and post-accident management issues respectively, and, of relevance for this report, organised discussions with affected members of civil society in Fukushima Prefecture. The CRPPH Scientific Secretariat had been involved with the Committee's stakeholder involvement studies from the early 1990s and was invited to represent the CRPPH. Participation was neither intended to evaluate the process of the dialogues, nor to assess decisions by the Japanese government. Rather, it was intended to learn lessons from the Dialogues. In addition, other organisations with significant stakeholder involvement experience from Chernobyl were invited, including the Norwegian Radiological Protection Authority (NRPA), experts from Belarus, the French Institute of Radiological Protection and Nuclear Safety (IRSN) and the French Nuclear Safety Authority (ASN).

Dialogue symposium organisation

The organisation of the Dialogues was a learning process itself, both for the ICRP and the participants. The structure selected for the first Dialogue was in fact used for all 12 Dialogues, and, for the most part involved the following elements, in general scheduled as presented:

- Welcome and introduction.
- "Classic" PowerPoint presentations from stakeholders, and many times from foreign experts and affected people, addressing a specific Dialogue theme (see list below).
- Structured dialogue, 1st round, where the 30 or so invited Dialogue participants were each given 3 to 4 minutes to express their thoughts on the Dialogue theme.
- Structured dialogue, 2nd round, where the 30 or so invited Dialogue participants were again each given 3 to 4 minutes to again express their thoughts on the Dialogue theme, but to react to what others had said during the 1st round.
- Summary of discussions by Dialogue Rapporteurs.
- Summary of lessons for the CRPPH and the international community by the CRPPH Scientific Secretary.

The meetings were all held over Saturday and Sunday, to allow the participation of stakeholders during non-working hours. The meetings were all locally hosted: the first by Fukushima City; 8 by Date City; 1 by Iitate; 1 by Minamisoma; and 1 by Suetsugu. The act of hosting a Dialogue meeting was a significant part of the meeting's success, in terms of building population commitment to the issue discussed.

In November 2011 when the first Dialogue Symposium was organised, those residents living in contaminated but not evacuated areas were still searching for understanding of their circumstances, for answers to their questions, and for someone to help them to address their concerns. As such, the 40 or so stakeholders sitting at the table to actively participate in discussions were, broadly speaking, angry, and needed to express their feelings. This process seemed to build trust in the Dialogue process and foreign participants, such that the mood of the Dialogues rather rapidly moved from one of anger to one of looking forward. The 12 topics selected for the dialogues were as follows.

Table 3.1: Themes of the first 12 Dialogues

	Dialogue focus	Date
1	Initiation of a news process of discussion among affected stakeholders	November 2011
2	Understand what has been accomplished in Date	February 2012
3	Food production, distribution and marketing	July 2012
4	Education and memory	November 2012
5	The difficult decision to stay/return or go/not return	March 2013
6	The situation and challenges faced by the citizens of Iitate	July 2013
7	Self-help actions taken by local people in cooperation with experts	December 2013
8	The situation and challenges faced by the citizens of Minamisoma	May 2014
9	The challenges of raising children in a contaminated area	August 2014
10	The importance of tradition and culture for recovery	December 2014
11	The importance of measurements for recovery	May 2015
12	The future, in particular the future of the Suetsugu region	September 2015

3. RECOVERY MANAGEMENT: LESSONS FROM FUKUSHIMA

Post-accident situations can be very difficult in terms of stakeholder interactions, because in general affected populations are angry, emotionally and practically overwhelmed with the complexity of the situation, and generally have lost trust in any governmental and “accident source” experts. However, as described above, the Dialogues relatively rapidly helped to build trust, which fostered the expression of open and heart-felt contributions by stakeholders.

The Dialogues resulted in many lessons and suggestions. Much of this was in the context of Japanese culture, yet much of this experience is extremely relevant beyond Japanese culture and the specifics of the Fukushima accident. The experience gained from the International Commission on Radiological Protection (ICRP) Dialogues has all been in the context of post-accident recovery, although much of his experience is applicable to almost any stakeholder dialogue situation. The following aspects are the key examples of what has been learned to assist the rest of the Nuclear Energy Agency (NEA) member countries to be better prepared to more efficiently recover from a nuclear or radiological event.

Obvious lessons: Be at the service of stakeholders

Listening to the concerns, decisions, actions and feelings of the Dialogue participants a few aspects relevant to government preparation and response actions were emphasized during several meetings, on some occasions rather directly. These obvious lessons for governments emphasise the need to be at the service of stakeholders, both before and after an accident situation.

Radiological protection (RP) experts being at the service of stakeholders means, in a practical sense, the establishment of an active stakeholder-interaction presence around hazardous sites before any accident occurs. This requires preparation, and would help to establish, in the best of situations, familiarity with and trust of government expertise. During recovery, the government’s role shifts from making emergency management decisions to, with some exceptions, addressing stakeholder concerns and supporting stakeholder needs. In this context, while clean-up and decontamination work, infrastructure repair, medical surveillance, etc. will be government run they are supporting stakeholder needs. The effectiveness of the governmental role is in large part based on trust, which an active stakeholder-interaction presence can help to enhance. Another lesson learned regarding planning suggested that approaches to and criteria for ending countermeasures should be established pre-accident. Local municipal and public participation in this process should be an important part of the establishment of such approaches.

Government involvement in recovery was also alluded to in many of the Dialogue sessions, suggesting several lessons for government. Early in the recovery, the use of local knowledge as key input for decisions on, for example priority decontamination areas, can improve efficiency and build trust and engagement. Provision of and support for experts to address stakeholder questions, encouraging

stakeholders to share experience by providing venues and trained experts, facilitating access to and understanding of data, and promptly establishment of health follow-up processes are all examples of active governmental stakeholder support. Rapidly engaging with stakeholders in such fashions would promote better understanding of the technical circumstances such that informed choices whether or not to return home can be made.

Obvious lesson implications: Resources, roles and an integrated approach

These obvious lessons have several relevant implications. A key implication is that governmental service to stakeholders during recovery may well require significant governmental resources, and can be more efficient if based on planning with stakeholders. In that nuclear accidents are fortunately rare, this suggests integrating nuclear or radiological accident planning with other disaster-response programmes, such as for recovery from natural disasters. Still, nuclear accidents are unique in their radiological aspects and require the support of experts from many disciplines and sources, including from hospitals, industry, and universities, among others. It is best to have identified these experts or sources in advance of an accident so that they can be quickly mobilised and efficiently coordinated. They should also be provided with up-to-date and accurate information in order for them to best address stakeholders concerns. It should be noted that there would most likely be an insufficient number of experts available, and as such training and provision of information would be rapidly needed.

Roles also change. The government's responsibility for protective actions changes from being "direct", in terms of responsibility for making emergency management decisions, to making more "stakeholder support" decisions, such as:

- supply of individual dosimetry (e.g. equipment, training, meaning, database creation and accessibility, data interpretation, etc.);
- whole body counting (e.g. equipment, operators, training, meaning, database creation and accessibility, etc.);
- environmental monitoring (e.g. equipment, training, meaning, mapping, availability and accessibility of data to the general public, etc.);
- decontamination and waste management;
- post-accident food management;
- health monitoring; and
- infrastructure repair and revitalisation.

As mentioned above, it also fall to the government to provide the means for addressing concerns (e.g. processes/venues for all parties to ask questions and receive honest, factual answers). Generally this is best accomplished through trained staff who are physically present or easily accessible, etc.). Again, the resources needed to address this are substantial and need adequate planning.

In addition, given that nuclear accidents are, and will hopefully continue to be rare, a multi-risk, integrated national approach should be considered. In practice, this implies that those emergency planning and implementation aspects (e.g. evacuation and sheltering) that are in place for addressing more frequent situations (e.g. large-scale fires, floods, hurricanes, tornados, etc.) should be appropriately extended to include nuclear accidents. Emergency response personnel should similarly be trained to assist in a nuclear incident, including having a familiarity with basic radiation detection instruments and understanding the principles of personal protection (e.g. time, distance, shielding and use of personal protective equipment).

Less obvious lessons: Roles and responsibilities

Some of the lessons emerging from the Dialogues were not expressed directly, as with the “obvious lessons”, but can be seen in an overview sense from the ensemble of Dialogue sessions. These have mostly to do with the role and attitude of the RP expert.

For example, in dealing with affected populations, with ministry officials, and with regional and municipal governments, RP experts are rarely decision-makers. Rather, the RP expert’s primary role is to offer scientific advice to address stakeholder questions and concerns. As such, while the advice of the RP expert can be very useful to those making lifestyle, support and individual choices, such advice generally inform rather than drive decisions. So, when looking to recommend approaches that would help lead to protection being optimised, the RP expert need to take “practical” considerations of social and economic aspects into account. In general, stakeholders at all levels understand their detailed, practical circumstances more thoroughly than the RP expert, and thus making effective recommendations require ongoing (with preference to starting before any accident) stakeholder interactions to inform the RP expert of the stakeholder’s prevailing circumstances. This would help to assure that recovery decisions are well informed. Through this process stakeholders may begin to regain “control” of their responsibilities. In the case of affected individuals, “responsibilities” refers to lifestyle choices, which can be very constrained and complex in nature, for example involving such things as family priorities, job issues, social prerogatives, etc. In the case of ministry officials this refers to regulation and support programme choices. In the case of regional and municipal governments this refers to managing recovery with relevant ministries and with affected populations. Better understanding, and easy access to good, scientific information, can also help individuals to develop their own vision of their future, and thereby inform the choices they make and the outcomes they expect from those choices. Such understanding can facilitate decisions, that is, trusting of information can contribute to feeling comfortable with a decision rather than feeling stressed by uncertainty.

In the case of those considering remaining in or returning to a post-accident contaminated zone, the choice to stay or to leave can be extremely complex, and must be respected by RP experts as a valid personal choice. In general it is felt that such decisions would be more reassuring for people the quicker it can be taken following an accident, of course bearing in mind the time dependence that individual decisions may have on actual circumstances (e.g. status of infrastructure, of decontamination issues, of an individual’s home, etc.). Understanding by RP experts of decisions to stay or to go taken by affected individuals need to take cultural aspects into account.

Less obvious lesson implications: Roles and responsibilities

These lessons imply that a certain level of attention to the needs of individuals is required, and that this is best provided if RP experts are trained to appropriately handle such situations, and sufficient resources are allocated to promptly and appropriately provide individuals with information to address their concerns. Many personal and electronic mechanisms are available for this, but any mechanism most likely requires significant resources. Partly, this is because there is no “average person” or “average concern” – each individual have their own prevailing circumstances, their own concerns, and their own views and opinions. Cultural aspects may play a role in decisions, and in planning and implementation of protective actions, and this needs to be factored into interactions and governmental and municipal decisions. As such, concerns should be addressed in the context of culture, and treated as individually as possible.

To address the huge effort that may be needed from experts to appropriately interact with affected individuals to address their concerns, resources for such an effort should be pre-planned. As part of this planning, the RP experts involved in such public interactions need some level of training in public communications to facilitate effective, non-confrontational dialogues.

Behaviour lessons: Finding and believing information

In a recovery situation, people living in or from affected areas tend to act on their own behalf, and to take their own decisions based on their perception of their own situation. This is increasingly the case as things progress from an emergency situation to a recovery situation. Affected stakeholders address their situations themselves, with or without government assistance, with or without broad knowledge of their situation, with or without a “scientific” understanding of their risks. For example, they may make dose and dose-rate measurements themselves, with whatever equipment they can buy or borrow; take on decontamination work with or without guidance; or alter their farming practices with advice from local agricultural experts such as available advice, from for example university professors, etc. The dialogues showed that local people, whether they left or stayed, suffered enormously. The complexity and difficult presentation of ICRP exposure situation criteria (1 mSv limit for planned, and 20 – 100 mSv reference level for emergencies) certainly did not assist affected people to understand their circumstances or address their concerns, thus did not contribute to alleviating their uncertainty and psychological suffering.

This tendency suggests that stakeholders, affected populations in particular but also elected officials from affected municipalities, do their best to learn about radiological risks from the internet, university professors, medical doctors, etc. Such information may or may not be fully correct, but unless government experts are not able to fill at least part of such stakeholder needs significant loss-of-trust in government may occur. Government presence and active information provision (e.g. web pages, blogs, newspaper ads, public meetings, etc.) can contribute to avoiding, or at least diminishing such loss of trust. Again, such efforts can represent significant resource allocation.

Implications of behaviour lessons: Finding and believing information

It is likely that post-accident affected individuals would collect information to better understand their radiological circumstances. However, while dose-rate measurements are easily collected with radiation detectors available for purchase over the internet, the “background knowledge” needed to properly

understand how to most effectively protect oneself and to make informed decisions generally need input from RP experts.

For example:

- a map of dose rates is useful as input to the prioritisation of decontamination efforts;
- measurement of locally-grown fruits and vegetables is useful as input to decontamination and agricultural management efforts; and
- personal dosimetry is useful to know an individual's exposure and the effects of behaviour changes.

But it is likely that all of this type of radiological knowledge would need to be put into the framework of a “radiological protection culture”, that is, understanding how all these elements fit together, and what they mean for an individual's radiological risk. In terms of an individual's personal behaviour, a certain level of technical understanding contribute significantly to their ability to make informed decisions.

This observation again suggests that the long-term commitment of technical resources would be needed to appropriately address these issues and the need to responsively address the concerns of affected individuals. These dialogues have helped to build a practical level of radiological protection understanding, a sort of radiological protection culture in dialogue participants, which in turn has, for some, brought a positive future supported their taking allowed to take informed decision for their future. This encourages the development of a process to reach more people through this level of discussion.

Trust: An essential element for addressing stakeholders' concerns

Before an in-depth discussion of stakeholder concerns can start, stakeholder need to trust the source of information. This particularly applies to information coming from the organisation(s) blamed, correctly or not, for having caused the accident, and from governmental authorities such as regulatory authorities. Experience from Fukushima, and from other stakeholder involvement situations, has clearly shown that trust and acceptance must be earned.

As alluded to above, achieving trust can be supported by experts, governmental or other, being locally connected. Ideally, this local connection should be established before any accident has occurred, and experts should remain locally connected for as long as stakeholders have need of information. It should also be mentioned that a long-term connection between affected populations and central government should be established to foster dialogues addressing such things as data centralisation and provision, furnishing information to groups and individuals to address concerns, furnishing support and expertise to municipality and stakeholder group protection actions, etc.

Another element that may enhance trust in government is the independent verification of information, measurements and data. In this context, independent is taken to mean not financially or managerially involved, such as NGOs, university volunteers, local individuals, etc. Seeing that such elements are coherently repeated or validated by non-governmental organisations, universities, private laboratories, etc. can be an important element of trust. As such, governmental support, through stakeholder requests for

independent verification can be investments in building trust. An instrument known to be very efficient in regaining trust and independent verification of data and approaches is the international peer review.

Unaffected populations also have concerns, for example about food from and travel to affected areas. It would thus also be important for government at all levels to establish trust in food producers, and in governmental decisions. Here again, clear and transparent information, and if possible independent verification, would facilitate the resolution of trust issues.

Implications of trust: An essential element for addressing stakeholders' concerns

Trust is easy to lose and hard to build. Following an accident, the absence of or decline in trust in government has often provoked other experts to emerge (either independently or through stakeholder requests) from universities, laboratories, and hospitals to address stakeholder concerns. Governmental organisations need to issue their own information, somewhat “in competition” with other information being made available. In order to move towards stakeholders building trust in government, government must have trust in stakeholders. That is, trusting that stakeholders would themselves eventually be able to distinguish “good” information from “bad”. Open and transparent provision of information and data is central to this process.

Recovery: A long process with many aspects beyond RP

Recovery is “achieved” when the post-accident circumstances become “just the way things are”. Affected individuals recognise that the situation is new, but new behaviours become “habits of daily life” and no longer cause significant stress.

Achieving recovery is a step-by-step process, and radiological recovery is only one part of the accident recovery. As previous CRPPH experience indicates, the radiological circumstances would certainly be an input to decisions on whether to stay in or to go from contaminated areas. However other factors, such as social infrastructure, community services, employment, etc. would also play significant roles in personal decisions. Governmental responses to post-accident circumstances would thus need to address many issues at the same time.

Nonetheless, RP criteria, short- and long-term, are important government choices for which stakeholder input should be transparently considered and reflected such that the transition to the new normal becoming just the way it is, is supported. To achieve recovery, RP input needs to be patiently provided, for as long as is judged to be necessary, which could be very long-term and involve the need for ongoing stakeholder attention. ANY stakeholder decision needs to be respected. Individuals in affected areas may choose to stay or to leave – each choice would involve adjustment to a “new normal”.

Implications of recovery: A long process with many aspects beyond RP

Recovery is a state of mind, and involves focus and attention by those affected to the new radiological circumstances of their lives. Achieving such a state takes time, and needs social and technical support. Support needs understanding of many/all aspects of an individual's circumstances (e.g. RP, economic, social, political, physical, etc.). This requires the cooperation of many different stakeholders: RP experts;

local, regional and central governmental officials; business and industry; hospitals, schools, etc. Recovery is a long-term commitment by RP experts and others to support affected populations.

4. PLANNING FOR RECOVERY: LESSONS FROM FUKUSHIMA

One of the key messages learned from the Fukushima Daiichi NPP accident is that recovery is a long process that is socially and technically complex, and that is extremely resource intensive. Because of the magnitude and diversity of resource needs, it is not possible to have such resources in pre-accident “stand-by” mode. Rather, it is necessary to have established networks in place to mobilise relevant expertise, and to have processes and procedures in place to create and assemble the resources needed to support recovery efforts at all levels. The following overview provides brief descriptions of the more important specific aspects that should be integrated into large-scale radiological accident recovery planning. Note that they are not presented in a specific order.

Trust

Large-scale radiological accidents tend to erode public trust in government authorities responsible for radiological safety regulation and technical assessment. Data and information for the public from the accident facility owner/operator is often discounted as being unreliable or as covering up the truth. To help prevent or lessen such erosion of trust, the following lessons have been learned:

- Trust can be supported by experts, governmental or other, being locally connected. Ideally, this local connection should be established before any accident has occurred. Although resource needs may be too large to establish permanently-staffed offices in many locations, facilities and activities identified by hazard assessment should have some level of regular physical presence, and a well-publicised source (e.g. web page, hot line, nearby office, etc.) of easily accessible and understandable information.
- Another element that may enhance trust in government and operator information and data is independent verification. In this context, independent is taken to mean not financially or managerially involved, such as NGOs, university volunteers, local individuals, etc. This should ideally be established, for each facility and activity identified by hazard assessment, with local stakeholder groups for normal operations. Such local stakeholder groups should be part of the local connection network discussed above, and the results of work by such groups should be in some fashion part of the information, measurement and data communication strategy of governmental authorities.

An approach that has been demonstrated to assist in regaining trust and independent verification of data and approaches is the use of international peer review.

- Experience has shown that rumours and misinformation make it difficult to distinguish scientifically accurate information from that which is not. Because of the ubiquitous nature of social media and electronic information, government need to trust that stakeholders will themselves eventually be able to distinguish “good” information from “bad”. Open and transparent provision of information and data is central to this process.
- An important element of trust in a decision situation is the management of expectations. In general, the range of choices available to deciders in a given prevailing circumstance would be limited: by physical circumstances, by science, by culture, by environmental impacts, by political prerogatives, by social norms, by budgetary constraints, etc. This framework needs to be one of the first topics addressed with stakeholders, and some level of consensus on the constraints to decisions needs to be reached.

Radiological protection system

The system of radiological protection developed by the ICRP is used by regulatory authorities and by radiological protection practitioners around the world for the protection of the public, workers and the environment from the effects of ionising radiation. Since the first ICRP General Recommendations, ICRP Publication 9 in 1959, the tone of these documents has slowly evolved. Publications 9 (1959), 26 (1976), and 60 (1990) presented a system using some criteria that were broadly action levels, that is, above the criteria action is needed, below the criteria actions are not justified. These recommendations also classified situations rather strictly, with Publication 60 insisting that dose limits could not be used for intervention work. Publication 103, the latest ICRP General Recommendations (2007) and written prior to the Fukushima accident, is a well-polished radiological protection framework, and focuses more clearly on the need for input for stakeholders. However post-Fukushima experience suggests that the nuances of “exposure situations” could better address post-accident situations. The RP system should focus more on providing a framework of processes and tools to specifically address the prevailing circumstances, using the most relevant radiological protection tools available.

- In planning, the ICRP system should be viewed as a framework of radiological protection principals and tools to support the development and implementation of protection decisions.

Regulation

Recovery is a long term process for which a regulatory framework can be planned and put in place in advance. However, because the nature of recovery issues would depend on the actual, long-term, post-accident prevailing circumstances, some flexibility in the regulatory framework would be necessary.

- Areas where a regulatory framework, not necessarily issued by radiological protection authorities, would be of value would include:
 - Occupational exposure management for off-site (and on-site) recovery workers
 - At best “require”, or at least “encourage” that decision processes should be undertaken with stakeholders
 - At best “require”, or at least “encourage” that radiological data, appropriately protecting personal information, should be centrally collected and made publically available, again as appropriate
- Case-specific regulations should be possible, but should be developed through decision processes undertaken with stakeholders

Radiological science and protection expertise

Like many other risks present in modern society, the level of understanding of radiological science at virtually any level of society is minimal. Although a long-term radiation-science education programme, starting with discussion in lower-school science programmes, might help to raise awareness, changes in education programmes are generally extremely slow and cautious. And with radiological accidents being thankfully infrequent and unlikely, and with radiological risk being only one of a myriad of modern risks, raising awareness of radiological science through national education programmes seems not to be a top priority.

As such, should a large-scale radiological accident occur in the future, it is likely that affected stakeholders would not be in a position to judge their levels of radiological risk based on valid scientific understanding. As such, it would be extremely important to support affected stakeholders by assuring their access to information to address their concerns. Given that the health professional community (e.g. family doctors, local nurses, pharmacists, etc.) is traditionally a trusted source of health advice for individuals, it should be assured that the health professional community is well informed. This should include radiological science and risk basics, as well as local “radiological status” information.

In general, though, health professionals are often no more informed on radiological science and radiological protection than any, average member of the public. Thus, planning, prior to any radiological accident, should address the following aspects:

- Development of scientifically sound, clear-language radiological science and radiological protection information to assist the health professional community to address stakeholder radiological concerns.

- Establishment of a formal health professional community network for the quick provision of trusted radiological science and radiological protection information to the health professional community
- Development of a network of RP experts: to analyse and interpret evolving radiological circumstances; to directly (e.g. participation in local meetings) and indirectly (e.g. supporting the health professional community and other groups directly interacting with affected stakeholders) interact with stakeholders to address their concerns; and to support governmental decision-making processes.
- For the longer term, educational materials should be provided, to prevent the loss of memory of the rationale for new behaviours in affected areas, and to appropriately contextualise the situation for those not living in affected areas.

Decision-making

In recovery situations, many decisions would be “behaviour” and “lifestyle” choices made by individuals remaining in or having left affected areas, for example: should an individual stay or leave; should an individual return or not; what level of radionuclides in food (e.g. from an individual’s garden, picked in the wild, purchased at a market or store, etc.) is ok; etc. Such decisions would generally be based on an individual’s judgement, which is hopefully supported by a reasonable level of scientifically-sound radiological understanding. Such choices can be very constrained and complex in nature, for example involving such things as family priorities, job issues, social prerogatives, etc., such that planning should assure the availability of such information (see above).

In recovery situations, some decisions would be made by central, regional or local government officials. Such governmental decisions would generally address support activities, such as: radiological data collection and publication; equipment, procedures and personnel support for food radiological assessment; equipment, procedures and personnel support for individual dosimetry and whole body counting; site decontamination activities; releasing areas after “successful” decontamination activities; adjustments to radiological criteria (e.g. food marketing levels, reference levels, return-home levels, etc.). For all such decisions, planning should arrange for the following:

- Decision-makers need to plan to participate in meetings with stakeholders. This can enhance trust and participation. Planning should “allow” and “encourage” stakeholder discussions with decision-makers.

- An experienced mediator / social scientists should be involved in “developing” decisions, again to enhance trust and participation by adding an air of neutrality and validity to discussions.
- Stakeholders are not looking to take responsibility, but want to see their concerns taken into account in process and decision. Planning should arrange for governmental responses to stakeholder concerns.

Resource management – An integrated approach

Recovery from a large-scale radiological accident involves rebuilding social, economic and structural frameworks, which are mostly made up of individual decisions. Each affected stakeholder would judge, based on their own prevailing circumstances, what actions and choices would best serve their own, and as appropriate their families', well-being. While recovery aspects can be viewed as “trends” and “averages”, in fact there is generally no such thing as an “average stakeholder” or an “average concern”. Everyone needs to understand the complexity of their own situation in their own fashion. That each stakeholder needs somewhat “custom” information to address their concerns is a key reason that recovery management can be very resource intensive.

- A resource-optimisation approach is to integrate large-scale radiological accident planning with other disaster-response programmes. A multi-risk, integrated national approach should be considered. Non-nuclear recovery response personnel (e.g. fires, floods, earth quake, etc.) should similarly be trained to assist in large-scale radiological accidents.
- To help to address the huge effort that may be needed from experts to appropriately interact with affected individuals to address their concerns, RP experts involved in such public interactions would need some level of training in public communications to facilitate effective, non-confrontational dialogues.
- Radiological protection support to stakeholders should be based on the latest and the most complete data and information available. For this, a comprehensive data collection process and display/analysis system should be included in planning, along with an approach to put it into place. Ideally, much of such data, privacy being addressed, would be publically available.
- It should be noted that there would most likely be an insufficient number of radiological science and protection experts available, and as such training and provision of information would be rapidly needed.

Practical aspects

Planning should consider a few practical aspects addressing the long-term nature of engagement in recovery activities. Of particular importance to affected stakeholders are aspects dealing with individual and collective well-being.

- Stakeholders living in radiologically-affected areas would need to understand their radiological environment and their radiological exposure. Part of acquiring such understanding is the availability of radiological data. In the best of circumstances this would include ambient dose rates, both inside their homes and in their external environments, to contextualise their behaviour choices. More importantly, they would need to know their own annual exposure for, again, contextualising their behaviour choices considering established reference levels.

To assure that these things can be accomplished, planning needs to foresee the distribution of radiation detectors and of personal dosimeters, and the availability of whole body counters. While some stakeholders would generally independently purchase radiation detectors (if available – in some cases post-Fukushima detector vendors were initially overwhelmed by demand), and perhaps personal dosimeters, provision of such equipment would help to build trust. Stakeholders should be involved in measurement of their own doses and radiological environment.

It should be noted that the previously-mentioned networks for responding to stakeholder questions and concerns should focus on assisting stakeholders to interpret such radiological data in order to understand its meaning for their personal decisions. This “radiological protection culture” needs to be acquired by stakeholders, through knowledge and experience, as a new “habits of daily life” for their behaviour choices. This acquisition is a long-term process.

- Approaches to and criteria for ending countermeasures should be established pre-accident. Local municipal and public participation in this process should be an important part of the establishment of such approaches. Pre-accident, generic criteria would need to be revisited and updated so as to appropriately address actual prevailing circumstances.

5. CONCLUSIONS

The lessons and observations presented here have been developed in the framework of the experience the CRPPH has developed over the past 25 years (annex), and have been drawn from the Fukushima recovery (Section 3). The overall conclusions from these two elements, while coming from a patchwork of very different circumstances in many different cultures and countries, are nonetheless felt to be relatively universal. The following simplified global recovery lessons thus represent the broad aspects that would be extremely important to address should another large-scale nuclear accident occur:

- the radiological protection focus of stakeholder involvement in a post-accident recovery situation should be on long-term technical support;
- trust is a necessary and central component of successful stakeholder involvement, success being understood as providing information and support so that stakeholders can make informed decisions, and so that they feel that their concerns have been addressed;
- stakeholder involvement can contribute to individuals developing a positive vision of their future, which will help them to make an informed choice about whether to stay or to go;
- it is essential to clearly express that individual decisions, whether to stay or to go, are all valid; and
- the level of support needed to achieve the goals listed here can be very resource intensive.

This experience has identified many stakeholder issues that should be addressed in emergency and recovery planning and preparation, including such things as:

- Resource planning: the resources needed to support stakeholders during recovery can be extremely large, in particular the trained personnel needed to interact with stakeholders to address their concerns. The health professional community in affected areas would often be a trusted source of information, but generally would know little about the radiological science needed to understand post-accident radiological circumstances and risks. Planning will therefore need to address being prepared to provide relevant information to the health professional community.
- Radiological protection culture: while understanding the science of radiological risks is independent of decisions to accept a radiological risk, having some knowledge of radiological risks would help to bring about informed decisions. Information would be sought from many sources following an accident, including the local health professional community as mentioned above, however some level of pre-accident understanding would also be of use to stakeholders.

Thus, although difficult to achieve, a long-term risk-education programme should be considered as a complementary element to preparations for post-accident provision of radiological protection and risk information.

- More generally, over any type of RP decision, the CRPPH has been through a learning process over the past 25 years. It has taken time to recognise the role of the RP specialist in decision processes, and that the skills needed for embarking on stakeholder interactions are not in some cases addressed in RP education programmes. Recognising that the “most effective” stakeholder interactions are done by RP experts trained in public interactions rather than by communications experts trained in RP, it would be important to review and most probably revise university and on-the-job training approaches for RP experts to include stakeholder interaction training. This includes, but is not limited to interaction with the public.

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ANNEX CRPPH STAKEHOLDER INVOLVEMENT HISTORY

The lessons learned from the Fukushima accident have been summarised in the context of the experience of and lessons learned by the Committee on Radiological Protection and Public Health (CRPPH) over the past 25 years or so. As such, to best understand the Committee's Fukushima lessons it is important to briefly review the historical achievements, lessons and experience of the Committee since the Chernobyl accident.

By 1992 the CRPPH had done considerable work on characterising the radiological impacts of the Chernobyl accident, and of the radiological protection actions taken and of the implications identified by the Economic Co-Operation and Development (OECD) Nuclear Energy Agency (NEA) member countries. Noting the environment of evolution and change suggested by this experience, the CRPPH organised a workshop to identify the main lines of the future directions that radiological protection policy, regulation and application might take. The workshop "Radiation Protection on the Threshold of the 21st Century" (NEA, 1993) held in Paris on 11-13 January 1993, took place 2 years after the issuing of International Commission on Radiological Protection (ICRP) Publication 60 (ICRP, 1990) and addressed most aspects and applications of radiological protection.

One of these areas was relatively new, and in fact the workshop was one of the very early meetings to clearly identify stakeholder involvement as an area essential to radiological protection decision-making, and as a topic that the CRPPH should further study. However, while this was recognised as a new key area at that point, "stakeholder involvement" was generally viewed by the radiological protection (RP) community as "explaining decisions to the public". Technical aspects were still broadly seen as the responsibility of the technical RP community, and the public was seen mostly as not being in a position to actively contribute to technical decisions.

The Villigen workshop series

From 1992 to 1998 the Committee's discussion of stakeholder involvement in RP decision-making continued, mostly in the context of optimisation. Increasingly, "stakeholder" was viewed as being a broad group, certainly including the public and non-governmental organisations (NGOs), but also including workers and worker management in the context of occupational exposure, elected officials in the context of emergency management, and regulatory authorities in the context of worker and public exposures. These discussions concluded with the CRPPH deciding to hold a workshop entitled "The Societal Aspects of Decision Making in Complex Radiological Situations".

The first of these workshops was held in 1998, in Villigen, Switzerland, hosted by the Swiss Federal Nuclear Safety Inspectorate (HSK). Serge Prêtre, the HSK Director and former CRPPH Chair opened the meeting with a key question: "should the radiological protection community be integrating societal aspects into radiation protection decision-making, or be integrating radiation protection into societal decisions?".

The CRPPH held two further workshops in 2001 and 2003 as follow-up to the first meeting, again in Villigen and hosted by HSK. The topics of these workshops evolved significantly, from initially sending the message that stakeholders should be involved, to a final message on how they should be involved.

The three workshop titles were:

- “The Societal Aspects of Decision Making in Complex Radiological Situations”, Villigen, Switzerland, 13-15 January 1998.
- “Better Integration of Radiation Protection in Modern Society”, Villigen Switzerland, 23-25 January 2001.
- “Stakeholder Participation in Decision Making Involving Radiation: Exploring Processes and Implications”, Villigen, Switzerland, 21-23 October 2003.

Chernobyl

Developing somewhat in parallel to the Villigen-related stakeholder involvement evolution, study of the impacts of the Chernobyl accident also began to consider stakeholders in an evolving light. The CRPPH focus almost immediately after the accident was on the radiological impacts of the accident in NEA member countries, on governmental emergency response experience, and on future research areas. One exception to this was an NEA workshop in 1988 on public understanding of RP concepts, organised by the NEA’s public affairs office, and focused on “giving information” so the public would “understand”.

Yet CRPPH post-Chernobyl work also evolved, the following publications showing the chronological progression of emergency management thinking:

- “The Radiological Impact of the Chernobyl Accident in OECD Countries”, 1987.
- “Proceedings of an NEA Workshop on Public Understanding of Radiation Protection Concepts”, 1988.
- “Emergency Planning Practices and Criteria after the Chernobyl Accident – A Critical Review”, 1988.
- “Nuclear Accidents: Intervention Levels for Protection of the Public”, 1989.
- “Radiation Protection Survey of Research and Development Activities initiated after the Chernobyl Accident”, 1989.
- “Radiation Protection Today and Tomorrow, A Collective Opinion of the CRPPH”, 1994.
- “Chernobyl Ten Years On – Radiological and Health Impact, An appraisal by the NEA CRPPH”, November 1995.

- “Chernobyl: Assessment of Radiological and Health Consequences, 2002 Update of Chernobyl: Ten Years On”, 2002.
- “Stakeholders and Radiological Protection: Lessons from Chernobyl 20 Years After”, 2006.
- “Practices and Experience in Stakeholder Involvement for Post-nuclear Emergency Management”, 2011.

As experience was gained, and as the CRPPH focused more on “soft social issues”, progressively its work shifted from “scientific” aspects to “social” aspects. The need to better interact with the public, particularly in emergency management situations was becoming increasingly viewed as essential, before, during and after an accident.

Science and values

Beyond emergency management aspects, studies took the CRPPH towards the realisation that radiological protection decisions take both RP “science” and “social values” into account, but that decisions should more transparently express their drivers. Based on studies and experience from the above-mentioned work, the CRPPH focused on better understanding of the elements that are considered when making radiological protection decisions. The distinction was expressly made between RP “science” and “social values”, and to study these aspects the CRPPH organised a series of workshop on “Science and Values in Radiological Protection”.

The Science and Values workshops (S&V1, S&V2, S&V3, S&V4) were designed to identify the science and social values aspects justifying radiological protection decisions. The focus of discussions was on specific issues in order to more clearly show examples. Each workshop addressed 3 topics:

Table 2.1: Topics addressed by each S&V workshop

	Topic 1	Topic 2	Topic 3
1 st S&V	Non-targeted effects	Individual sensitivity	Radiation-induced circulatory diseases
2 nd S&V	Domestic exposure to radon	Growing medical exposures in diagnostic and screening procedures	Radiation-induced vascular effects
3 rd S&V	Assessment and management of low-dose exposures and public health	Protection of children and self-help behaviour approaches	Non-cancer effects
4 th S&V	Medical surveillance	Uses of effective dose	Addressing safety concerns

The documents summarising these workshops are:

- “Science & Values in Radiological Protection – Summary of Helsinki (2008) & Vaux-de-Cernay (2009) Workshops”, 2011.

- “Third Workshop on Science and Values in Radiological Protection Decision Making – Summary Report of the Workshop and of the 6th Asian Regional Conference on the Evolution of the System on Radiological Protection”, 2013.

CRPPH lessons

These three CRPPH focus areas are not the only work where stakeholder involvement in radiological protection was an important theme. They are, however, the topics that most influenced the Committee’s strategic direction and focus towards the “soft” issues of public health and social values. Although somewhat simplified, the high-level messages that slowly evolved from these areas, and which were significant for the radiological protection community, can be characterised as follows:

- Villigen Workshops (1998, 2001, 2003)
 - Integrate RP aspects into societal decisions, rather than integrating societal values into RP decisions.
- Chernobyl Work (1987-2011)
 - The RP expert should be at the service of stakeholders.
- Science and Values Workshops (2008, 2009, 2012, 2015)
 - Decisions are informed by science, but are driven by social values.

These enlightening conclusions lead the Committee to another important generic message, that, in general, the RP expert is an advisor and a councillor rather than a radiological protection decision-maker. Generally, stakeholder decisions can be characterised in a simplistic fashion, i.e. Governments (national, regional, local) take decisions regarding policy and regulation; Licensees take decisions regarding procedures and resources; Workers and their management take decisions regarding safety culture; and Affected Populations take decisions regarding lifestyle.

It should be noted that protection decisions involving circumstances where radiological effects would be significant are strongly based on scientific and technical input. For example, in a recovery situation returning to areas that would cause over 100 mSv/a would be forbidden based almost uniquely on radiological conditions. The importance of stakeholder involvement, however, becomes evident when radiological exposures are in the range of scientific uncertainty in terms of adverse effects (e.g, < 50 mSv or so). At such levels, the prevailing circumstances (including but much broader than radiological conditions) and individual views will be more influential than science alone.

These areas of study represent the most significant drivers of the Committee’s evolution in stakeholder involvement appreciation. The resulting lessons then frame the Committee’s understanding of stakeholder involvement, and position the CRPPH Scientific Secretariat to most effectively learn lessons from the governments, industries and populations of the areas affected by the accident, particularly those in Fukushima Prefecture.