Towards a Shared Understanding of Radiological Risks
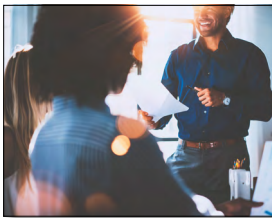
Summary Report of the NEA Stakeholder Involvement Workshop on Risk Communication

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Radiological Protection and Public Health

Towards a Shared Understanding of Radiological Risks

Summary Report of the NEA Stakeholder Involvement Workshop on Risk Communication

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The OECD Nuclear Energy Agency (NEA) was established on 1 February 1958. Current NEA membership consists of 34 countries: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Russia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission and the International Atomic Energy Agency also take part in the work of the Agency.

The mission of the NEA is:

– to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally sound and economical use of nuclear energy for peaceful purposes;

– to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the sustainable development of low-carbon economies.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management and decommissioning, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

Foreword

The OECD Nuclear Energy Agency (NEA) has for many years been considering the challenges that risk communication poses for its member countries, particularly when communicating with the public about the hazards of ionising radiation. In April 2018, a topical session was dedicated to the subject of risk communication during the 76th meeting of NEA Committee on Radiological Protection and Public Health (CRPPH). A second theme of the meeting was the potential use of a radiation index or scale to help non-experts, such as members of the public, to better understand the risks and consequences of radiological exposure. It was determined at the time that further analysis of such issues would benefit significantly from the input of the wider community, including non-governmental organisations (NGOs) and members of the public.

After the success of the NEA Workshop on Stakeholder Involvement in January 2017, which addressed nuclear decision making, the NEA thus decided that a second Stakeholder Involvement Workshop, this time focusing on risk communication, would be an appropriate means to gather the views of a wide range of experts and stakeholders. Both the first and second workshops would benefit from the support and active collaboration of all NEA standing technical committees.

The NEA Committee on Nuclear Regulatory Activities (CNRA) confirmed the relevancy of and its interest in the topic of risk communication at its 39th meeting held in June 2018. Some of the more challenging areas were considered during this meeting, including the possible biases that might exist in various audiences in relation to the perception of nuclear power and radiological safety, as well as any of the associated risks. A workshop was viewed as the appropriate platform to examine how these biases may have an effect on communication efforts; the difficulties that may be encountered when delivering messages in the field of risk communication; the usefulness of taking an all-hazards approach to identify optimum protection solutions; and the importance of stakeholder trust and confidence in sources of information.

Presentations were provided to other NEA standing technical committees in an attempt to prompt discussion on the planned event and ensure that the workshop would be both collaborative and cross-cutting. The Committee on the Safety of Nuclear Installations (CSNI), the Radioactive Waste Management Committee (RWMC), the Committee on Decommissioning of Nuclear Installations and Legacy Management (CDLM), the Nuclear Law Committee (NLC), the Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle (NDC), and the Nuclear Science Committee (NSC) all supported the idea of a workshop considering the challenges and good practices associated with risk communication.

The NEA "Workshop on Stakeholder Involvement: Risk Communication" was therefore held in Paris on 24-26 September 2019 with the collaboration of all NEA standing technical committees. The primary goal of the workshop was to better understand approaches and learn more about tools to foster dialogues that would lead to a shared understanding of radiological risks. The workshop attracted a total of 145 participants from 30 countries.

The present report provides highlights of the discussions and presentations, contributing additional background information from NEA work and from various respected sources. The report attempts to capture the collective wisdom generated during the three days of interactions in the hopes that the knowledge gained from this workshop will benefit governments and citizens alike. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the NEA and its member countries.

Acknowledgements

The Nuclear Energy Agency (NEA) would like to express its appreciation to the members of Workshop Programme Committee for their substantial involvement and contributions to the overall success of the NEA "Workshop on Stakeholder Involvement: Risk Communication". In particular, it would like to recognise the efforts of Michael Boyd, Chair of the NEA Committee on Radiological Protection and Public Health (CRPPH), Hiroyuki Umeki, Chair of the NEA Radioactive Waste Management Committee (RWMC), Roland Dussart-Desart, Chair of the NEA Nuclear Law Committee (NLC), Jorma Aurela, Vice Chair of the NEA Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle (NDC), Thierry Schneider, Vice Chair of the CRPPH, Emmanuel Bouchot, Chair of the NEA Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) of the NEA Committee on Nuclear Regulatory Activities (CNRA), Sylvie Charron, representative of the French Institute for Radiological Protection and Nuclear Safety (IRSN), and Nuria Prieto Serrano, member of the NEA Forum on Stakeholder Confidence. The expertise, insights, and concerted efforts that these individuals brought to the planning process were instrumental and greatly appreciated.

The workshop also owes its success to the valued contributions of the guest speakers, presenters and panellists, all of whom generously shared their time, knowledge and experience with the workshop participants.

Both the workshop and the summary report were co-ordinated by the NEA Division of Radiological Protection and Human Aspects of Nuclear Safety (RP-HANS) under the oversight of Yeonhee Hah, Head of Division, and Pascale Bourassa, Deputy Head of Division, and with the support of a cross-cutting team of NEA staff from divisions across the Agency. The efforts of all of these contributors have made this report possible.

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List of abbreviations and acronyms

BfE	Federal Office for the Safety of Nuclear Waste Management (Germany)
CDLM	Committee on Decommissioning of Nuclear Installations and Legacy Management (NEA)
CNRA	Committee on Nuclear Regulatory Activities (NEA)
CRPPH	Committee on Radiological Protection and Public Health (NEA)
CSNI	Committee on the Safety of Nuclear Installations (NEA)
FSC	Forum on Stakeholder Confidence (NEA)
ICRP	International Commission on Radiological Protection
IGSC	Integration Group for the Safety Case (NEA)
LNT	Linear non-threshold
NDC	Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle (NEA)
NEA	Nuclear Energy Agency
NGO	Non-governmental organisation
NLC	Nuclear Law Committee (NEA)
NRC	Nuclear Regulatory Commission (United States)
OECD	Organisation for Economic Co-operation and Development
RAIN	RAdiation INdex
RP-HANS	Division of Radiological Protection and Human Aspects of Nuclear Safety (NEA)
RWMC	Radioactive Waste Management Committee (NEA)
TSO	Technical support organisations
WGPC	Working Group on Public Communication of Nuclear Regulatory Organisations (NEA)
WHO	World Health Organization

Executive summary

The decisions made in relation to actions that will protect people and the environment in situations involving exposure to ionising radiation have tended to be driven by subjective judgements about the health risks that radiation exposure may cause. Communicating what is known and what is uncertain about potential risks in such situations thus becomes a central element of the process to identify and implement a radiological protection option that is acceptable and sustainable. While many types of nuclear activities involve a potential risk of radiation exposure, the radiological concerns raised in these different situations, and the decisions and tools used to address concerns, nonetheless have a certain number of commonalities.

Among the various roles and responsibilities of nuclear safety regulators, government officials, nuclear facility operators and other nuclear energy decision makers is that of ensuring risk communication and stakeholder involvement. In order to achieve decisions that are effective and sustainable, it is essential to communicate scientific, technical and regulatory information regarding radiological and other risks to stakeholders who may be directly or indirectly affected by those decisions. Communicating such information can, however, pose a particular challenge and can be complex since people can judge and evaluate risks differently depending on the context and on their perceptions of risk. Although situations that require radiological protection decisions (e.g. building a new nuclear installation or siting a deep geological radioactive waste disposal facility) can be entirely different, the concerns of directly and indirectly affected stakeholders will have commonalities, as will the decisions taken and the tools used to address such concerns.

The NEA "Workshop on Stakeholder Involvement: Risk Communication" provided an opportunity for NEA member countries to share perspectives and document lessons learnt in risk communication, identifying what has been effective and what has been less effective in the different cases. The workshop took place over three days and was organised into nine sessions (see Workshop agenda in Appendix A) that explored issues from developing and implementing risk communication approaches and learning from non-nuclear sectors to engaging with civil society and younger generations, as well as with the media and various influencers.

Overall, workshop discussions confirmed the general belief that achieving effective risk communication for a common understanding of radiological risks to address concerns and to engage with stakeholders under different prevailing circumstances can be a complex undertaking. The key messages reached during the workshop can be summarised as follows:

- Risk communication is a multidimensional, socially and technically complex, resource-intensive activity.
- Communicating risk is not a one-step process but a dynamic process that:
  - needs time to be established in a sustainable way;
  - should evolve in an anticipated manner as society and stakeholders' needs and expectations evolve. Attempting in advance to identify concerns that stakeholders are likely to have in a given circumstance can facilitate the preparation of risk communication and engagement activities.
- Dialogue with stakeholders should be an institutional requirement for regulatory authorities.
- Non-governmental organisations (NGOs) and local stakeholders have a specific understanding and knowledge of the local context, which can be particularly useful to national, regional and local decision makers.

- Local and long-term engagement is key to obtaining and maintaining trust.

- A simple and visual radiation exposure scale could be a useful tool for communicating radiological risks.

- Messages should be succinct, following, for example, the 3/27/9 rule of 3 messages using 27 words delivered in 9 seconds. These messages should focus on addressing the concerns of the specific audience.

- Efficient and effective radiological risk communication highly depends on:

  - The way in which the message and communication tools are adapted to meet the audience's needs and address its concerns;

  - The confidence that recipients have developed for the organisation or individual providing the information;

  - Experience from past situations.

- Social media is a key tool, in particular when reaching out to younger generations and when identifying concerns in advance. However, monitoring and swift responses are required, which can be resource intensive.

- A multidisciplinary team, including experts in various fields – radiation specialists, engineers, researchers and representatives of the medical community – could help with communication and engagement activities. These experts should be trained in risk communication techniques.

- A path forward to creating harmonisation and consistency in radiological risk communication could be to first reach international consensus on the objective attribution of the effects of radiation and on the potential subjective inference of radiation risk.

The most prevailing theme that permeated the three days of the workshop was that of trust as an essential and demonstrated value for effective communication, which can be best summarised by the perceptive comment made by Mr Michael Boyd, Chairman of the NEA Committee on Radiological Protection and Public Health (CRPPH):

> **To be trusted, you must communicate successfully. To communicate successfully, you must be trusted.**

Several concrete actions were identified during the workshop as areas that the NEA and its standing technical committees could further explore when developing their programmes of work. These included: i) identifying the characteristics of a trusted regulatory authority; ii) developing a radiological exposure scale to help the public understand the impacts of radiation; and iii) training specialists in risk communication skills.

The NEA believes that this workshop proved to be an excellent step towards capturing the multiple complexities of risk communication. The NEA standing technical committees are grateful to have received gainful insights into deliberations on risk communication in different national contexts, which will ultimately enhance their programmes of work in the coming years. By understanding how situation-specific factors influence risk communication, a common framework addressing such circumstances can begin to emerge. For almost all such situations, listening to and addressing stakeholder concerns, focusing on capturing all the relevant, radiological and non-radiological aspects of the prevailing circumstances, should help countries more effectively achieve sustainable decisions through well-informed decision-making processes. While each situation is unique, there are common elements when engaging with stakeholders in any situation. While additional work to further orient radiological protection frameworks in the appropriate direction is needed, the workshop nevertheless provided the important insights needed to chart a path forward.

Introduction

The NEA Workshop on Stakeholder Involvement in Nuclear Decision Making, held in January 2017, concluded that stakeholder involvement is essential to achieving sustainable decisions for nearly all aspects of nuclear energy. Building on the success of this first workshop and responding to the comments and recommendations of workshop participants, it was decided that the NEA would hold a second workshop to consider challenges and good practices in radiological risk communication. In September 2019, the "Workshop on Stakeholder Involvement: Risk Communication" was thus held in Paris, France. The present report highlights the discussions and presentations made during the nine sessions, as well as the conclusions drawn during the closing panel discussions.

The OECD Secretary-General, Mr Angel Gurría, opened the workshop with a strong statement on the importance of stakeholder involvement in nuclear regulatory decision making. Keynote addresses were also made by H.E. Minister János Süli, Minister without portfolio, Responsible for the Planning, Construction and Commissioning of the Two New Units at the Paks Nuclear Power Plant (Hungary), and by Stefano Vignaroli, Member of Parliament and President of the Waste Committee of the Chamber of Deputies (Italy).

The workshop was organised into nine sessions (see Workshop agenda in Appendix A):

- Session 1: Risk communication: What and why?
- Session 2: Developing and implementing risk communication approaches.
- Session 3: Understanding actors, roles and responsibilities in risk communication (interactive panel discussion).
- Session 4: Learning from non-nuclear sectors.
- Session 5: Dialogues around risk communication case studies.
- Session 6: Panel on case study findings.
- Session 7: Engaging in dialogues with civil society and the next generation (interactive panel discussion).
- Session 8: Engaging with media and influencers (interactive panel discussion).
- Session 9: Opportunities for progress and next steps.

Input from every sector of work under the umbrella of the NEA – nuclear regulation, nuclear safety, radioactive waste management, human factors, nuclear decommissioning, radiological protection, nuclear law and nuclear science – were included in a cross-cutting fashion. A forum for representatives from all NEA standing technical committees and subsidiary bodies, as well as from civil society, including non-governmental organisations (NGOs) and the media, was established to discuss challenges and identify approaches that would help improve communication and engagement. The workshop was structured to include plenary discussions and group dialogues, to optimise exchanges between groups of individuals from various backgrounds, interests and knowledge. The workshop attracted a total of 145 participants from 30 countries.

A common theme predominating throughout the three-day workshop was that of trust as being essential for effective risk communication, and that of effective communication building trust. Organisations, through the people who work there, must build and maintain healthy relationships with stakeholders based on mutual respect and trust in the pursuit to inform and engage in dialogues that will lead to a common understanding of radiological risks. It was also noted that local and long-term engagement is key to obtaining and maintaining trust.

Key areas identified for further improvement include better guidance for more effective use of social media tools, encouraging youth participation in various areas and in forums, and developing better communication networks with local communities.

Many participants stated that, in order to effectively share decision-making experience when selecting radiological protection solutions and identifying situational commonalities, it is essential to recognise the complexity of balancing the risks and benefits of decisions with their consequences. When communicating with stakeholders, it is thus important to address the "big picture", that is the social, economic, health and individual aspects that the prevailing circumstances may cause and that can result from the protection decisions that have been taken. Addressing the big picture will help to ensure that stakeholder understanding is well informed in terms of the optimum protection solution. Presenting the big picture can, however, be a challenge for authorities whose mandates are specific to safety and security.

The workshop concluded that exposure situations can involve a wide array of safety aspects beyond radiation exposure, and that the impacts of such situations, and of the protective actions that have been implemented, may have an impact on the social, economic, health and individual aspects of the lives of individuals who are either directly or indirectly affected. Faced with such complexity, risk communication must address all of these elements in order to identify the best protection options, and for this an atmosphere of trust is essential. It was broadly agreed, however, that the greater risk in risk communication is a lack of communication.

In his closing statement, NEA Director-General William D. Magwood, IV encouraged the NEA standing technical committees to consider the outcomes of this workshop when developing their programmes of work. He insisted that people trust other people, and not organisations, and thus impressed upon experts to engage directly with the public and interact with people. Experts have a deep understanding of the nuclear industry, of radiation and of the regulatory frameworks in place to ensure the safe operations of nuclear installations, as well as the use of radiological substances. It remains the responsibility of these experts to explain nuclear science and technology to a non-technical public. Although it is not an easy task, it is one that must be done.

Chapter 1. **Basic features of risk communication related to stakeholder involvement**

Background

In the past decades, the policies of Nuclear Energy Agency (NEA) member countries have developed progressively towards an integration of stakeholder involvement into the three components of risk governance, risk assessment and risk management, throughout which stakeholder communication is cross-cutting. This integration requires stakeholder involvement to go beyond information sharing or consultation. It includes the need for a shared understanding of how to characterise and assess "risk", and most importantly, broad co-operation on how to manage risk through decision making and the implementation of actions.

Assessing risk while involving stakeholders implies that efforts be undertaken to share knowledge in all possible areas of concern so that the dialogue can be productive. Managing risks must involve broad, inclusive and fair deliberations with stakeholders so that decision-making outcomes will result from multiple trade-offs that reflect the views of stakeholder groups or communities – in other words, the people affected (or potentially affected) by decisions. It is often difficult to do so, however, because it requires trade-offs among competing options and views. Experience in various sectors where risk communication has been developed either during "peaceful" times or during crises or emergencies suggests that stakeholder involvement generally helps risk assessors and decision makers to increase the level of adhesion to or confidence in decisions of individuals or the groups of people concerned. The main reason for this is that the approach is responsive to societal needs, concerns and perceptions.

Setting the scene during the first session of the "Workshop on Stakeholder Involvement: Risk Communication" consisted of delineating the complexity of any situation where an understanding about risk is different in the case of expert-to-expert discussions and in the case of expert-to-public communication and dialogue. This session highlighted approaches to improving communication in such instances and capturing the basic lines of effective risk communication strategies from the regulator's point of view.

The complexity of risk and how it impacts risk communication

The complexity of the risk communication issue arises from the many aspects that must be taken into consideration when characterising or estimating the risk associated with a given situation. One of the fundamental aspects in doing so is having the required knowledge to effectively assess and quantify the causal relationship between the stressor(s) and the potential consequences (e.g. on human health, biodiversity, environmental quality). In addition, depending on the prevailing circumstances, risk estimates may evolve over time and space; they may differ among groups of affected people, among groups of various interests and among various cultures. When dealing with human health risk in relation to any potential stressor(s), knowing how to identify and quantify the exposure to the stressor of concern is also important. Knowledge concerning both exposure and its effects can be impacted by uncertainties and is often a source of dispute at the expert level.

The origins and evolution of the meaning of the word "risk" also deserve some consideration. Subject matter experts from different fields have defined the term as it relates to their specific technical field, while other stakeholders and members of the public have developed their own views (see Figure 1.1) based on values, knowledge, experience and individual understanding. These multiple means of interpreting the definition of risk have led to some ambiguity surrounding this key term.

Figure 1.1. **Common words people associate with risk***

* Responses were obtained from an NEA public survey that was conducted on the NEA website from 3-22 September 2019. The survey received 208 responses from individuals in 33 countries and regions.

Ortwin Renn states in his white paper on risk governance that human behaviour is primarily driven by perception and not by facts (Renn, 2008). This phenomenon can be explained by factors that influence the human processing of information and understanding, as shown in Table 1.1.

Table 1.1. **Psycho-social factors that influence human information processing and decision making**

Factor	Description
Apathy	Lack of interest (e.g. why should I care?)
Overconfidence and unrealistic optimism	When the feelings of susceptibility are reduced by personal control or knowledge
Understanding probabilistic or unfamiliar information	The way in which uncertain information is presented (e.g. survival curves)
Desire and demand for scientific certainty	People are averse to uncertainty as it causes anxiety
Belief	Willingness to ignore evidence that contradicts initial beliefs
Assimilation/perception of risk	The way in which the magnitude of risk is judged

Source: Adapted from Skarlatidou et al. (2012), https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1539-6924.2011.01773.x.

To go a step further, the assimilation or perception of risk – that is, the way the magnitude of the risk is judged – can be further attributed to what the literature has referred to as "outrage factors" (Covello and Sandman, 2001), elements of which are presented in Table 1.2. While these factors are qualitative perceptions and responses that may prove difficult to address through technical analyses, understanding the basis of how these factors are involved in the formation of stakeholder views is important when developing communication plans. Successfully reflecting these factors in such plans can contribute to building trust.

Table 1.2. **Qualitative factors that affect risk perception**

Factor	Conditions associated with increased public concern	Conditions associated with decreased public concern
Catastrophic potential	Fatalities and injuries grouped in time and space	Fatalities and injuries scattered and random
Familiarity	Unfamiliar	Familiar
Understanding	Mechanisms or processes not understood	Mechanisms or processes understood
Uncertainty	Risks scientifically unknown or uncertain	Risks known to science
Controllability (personal)	Uncontrollable	Controllable
Voluntariness of exposure	Involuntary	Voluntary
Effects on children	Children specifically at risk	Children not specifically at risk
Effects manifestation	Delayed effects	Immediate effects
Effects on future generations	Risk to future generations	No risk to future generations
Victim identity	Identifiable victims	Statistical victims
Dread	Effects dreaded	Effects not dreaded
Trust in institutions	Lack of trust in responsible institutions	Trust in responsible institutions
Media attention	Much media attention	Little media attention
Accident history	Major and sometimes minor accidents	No major or minor accidents
Equity	Inequitable distribution of risks and benefits	Equitable distribution of risks and benefits
Benefits	Unclear benefits	Clear benefits
Reversibility	Effects irreversible	Effects reversible
Origin	Caused by human actions or failures	Caused by acts of nature

Source: Adapted from Covello and Sandman (2001).

Risk uncertainty and specificities of radiological human health risk

While health risk estimates at moderate to high radiological exposures are scientifically well-established through epidemiological studies, at very low- to low-dose exposure, the current level of scientific evidence from epidemiology has not provided broadly accepted and conclusive answers about the dose-risk relationship. In the absence of scientific certainty that could lead to regulatory change, the International Commission on Radiological Protection (ICRP, 2007) recommends via the international radiological protection system adopting a linear extrapolation from epidemiological data to infer cancer risk at low doses and dose rates (the so-called linear non-threshold model, or LNT model). As such, the LNT dose–cancer risk model is being used for the practicable purpose of radiological protection. While other extrapolation models can be used (see Figure 1.2), recent results emanating from epidemiological cohorts for the most part support non-threshold linearity as the most plausible dose-risk model at low doses. An LNT model is also being used outside of the radiation field: for example, a no-threshold relationship is considered when assessing risk for many carcinogens, including chemicals, diesel exhausts, heavy metals or alcohol (EPA, 2005). At present, the LNT model appears to be the most scientifically reasonable and practical tool for the management of radiological exposure.

Figure 1.2. **Simplified representation of uncertainties in dose-risk models for low-dose radiation exposure**
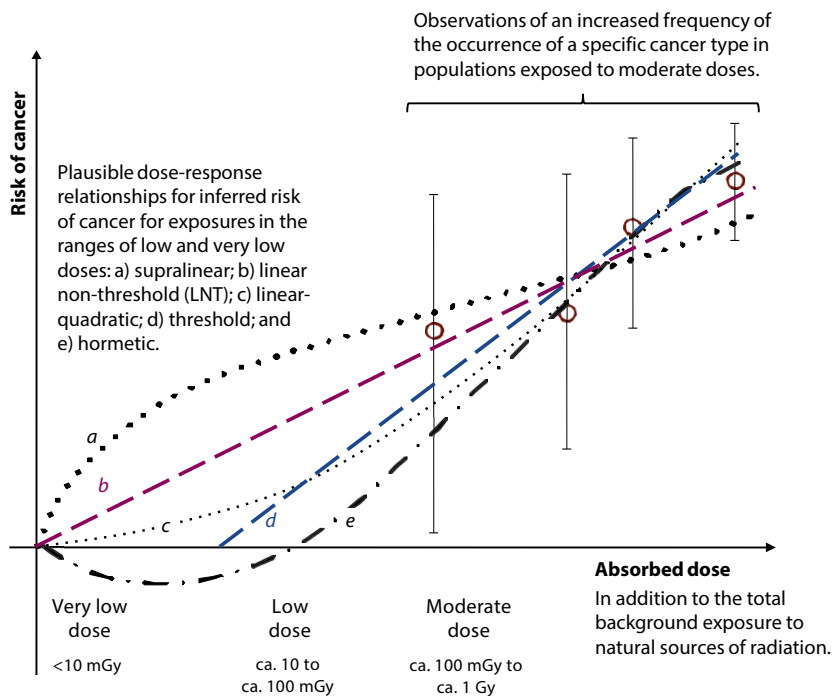
Source: adapted from UNSCEAR (2015). Note: mGy - milligray; Gy – gray.

The scientific uncertainty regarding whether or not low exposure can cause health risks is a subject of dispute among experts. The inherent scientific complexity of radiological exposure and the potential health risks make it very difficult to communicate clearly with stakeholders at many levels. Stakeholders often perceive this difficulty to communicate as a lack of scientific understanding of the effects of low exposure. The combination (i.e. of uncertainty, ambiguity and the difficulty in understanding risk) has led to significant complications in transforming complex risk assessments into a broadly accepted set of actions and decisions. When communicating with stakeholders, it is important that these uncertainties be presented as the best available knowledge at present time, rather than as a lack of knowledge about key scientific areas. Managing uncertainty by adopting assumptions, deriving limits or setting boundaries is a challenging issue since it is the result of combining complex, uncertain and divergent points of views and perspectives. To resolve this problem generally requires multidisciplinary knowledge and sensitivity to the ethical and cultural values defended by groups of concerned people. A high-level, overarching reasoning would also be required to find a consensus or options that are acceptable to all interested parties.

Communicating on low-dose risks requires a better distinction between science-based evidence and expert judgement, taking values into consideration through multidimensional stakeholder engagement. Risk communication needs to take place through proactive dialogues with the public, using a more accurate language with a proper balance between facts and the unknown.

A holistic view of prevailing circumstances for improving risk communication and stakeholder involvement

For risk management purposes, whatever the type of risk, it is well known that ethical and cultural values, as well as international, national or local contexts, may influence public perception and therefore the "tolerability" or "acceptability" of the outcome. In terms of radiological risks to human health, the need to take a holistic view of the prevailing

circumstances – or the so-called "big picture" – is essential to achieving an effective and efficient association of stakeholder involvement and risk communication. The Fukushima Daiichi Nuclear Power Plant accident demonstrated the importance of integrating knowledge, values, interests and the preferences of affected people into decision making so as to build a recovery strategy in affected areas. On the basis of these experiences, the ICRP developed and defined the "co-expertise" approach in which authorities, experts and stakeholders work together to share experience and information in affected communities, with the objective of developing a practical radiological protection culture that will enable individuals to make informed decisions about their own lives (ICRP, 2020). "Stakeholders" in this context refers to those groups and individuals who will live and work with the outcomes of the decisions made.

Panel in Session 1: Risk communication – What and why?

Developing and implementing risk communication approaches

Workshop participants had the opportunity to hear what approaches organisations around the world are taking to build effective risk communication programmes, as well as what challenges and lessons learnt these organisations have experienced.

The following paragraphs summarise key considerations that were shared with the audience to help enhance the effectiveness of risk communication activities when engaging with stakeholders.

Adapting to different audiences

Delivering a message that is understandable is difficult in scientific and technical areas where topics are complex and not easily accessible to the general public. When risk perception is a critical issue for communication, it is also imperative to know the audience's interests, concerns and expectations. Knowledge about a particular audience cannot be achieved without investing the time and effort to understand the background, as well as the context in which the stakeholders find themselves. Engaging with an audience and taking the time to build a relationship is in fact the only way to gain such knowledge. The type of language, presentation and media would then need to be adapted so as to effectively deliver the message to this particular audience. Examples could be provided in ways that would help people to understand the risk, for instance by presenting comparisons that put the risks into perspective through the use of existing cases. In other cases, reminding the audience of historical events and comparing them to today's circumstances in order to better understand the risk can also be helpful. It should be kept in mind, however, that the information presented is subject to individual interpretation and judgement regarding the transparency, trust and accuracy of the sources, which can make risk communication even more complex since messages that are intended to educate and enlighten may in the end result in anger and distress.

Expectations may differ depending on the audience, and various subjective factors may impact how the message is delivered, received and evolves. Taking into account human behaviour and societal considerations when communicating can help to ensure that effective and understandable messages are delivered.

Building a culture of risk awareness

There are various initiatives worldwide that are providing the public with the opportunity to discuss risks and help build a culture of risk awareness. These initiatives have demonstrated that when confronted with a new risk, the public tends to make turn to trusted sources in order to learn about the scientifically valid nature of the risk. Risk culture must be supported by stakeholder involvement processes to make the process effective and successful. The way in which the concerns and interests of the public are dealt with is a key factor in ensuring an open dialogue and exchange that will lead to a common understanding of risks. The more the public sees how its feedback is taken into account in the decision-making process, the more such initiatives will be trusted and valued. The more the public identifies with the topics covered by such initiatives and feels concerned by them, the more it will contribute to enhancing the culture of risk.

Using simple tools

Different tools or strategies can be implemented to make communication more efficient and effective. Message mapping, for example, is one method that was introduced by Dr Vincent Covello to develop a quick and persuasive message. The 3/27/9 rule identifies 3 key messages and uses 27 words in total (or less) that are delivered in 9 seconds. The development of simplified scales or indexes to support communication on complex issues could also help to deliver messages that are easily understood by the public. A new RAdiation INdex (RAIN) was also presented to workshop participants (Cho et al., 2017). To avoid the complexity of technical metrics, RAIN is expressed in plain numbers without an attached scientific unit (similar to the Richter Scale developed to represent the magnitude of earthquakes), helping to illustrate the health consequences of radiological exposure.

Constructive and helpful forms of risk comparisons can also be used to give an idea of the level (or severity) of a radiological risk for health, for instance by comparing dose levels from living in areas affected by a nuclear accident to that of getting a few chest X-rays or to smoking. However, it should be clearly stated that such comparisons are designed to place the level of risk into a context that will allow it to be easily understood by stakeholders, and not to claim that the risk is acceptable.

Panel in Session 2: Developing and implementing risk communication approaches.

Considering emotions

The experience of risk communication in non-nuclear sectors, such as road safety, provides an example of how to influence public behaviour through the use of vivid and emotional images and messages. Participants were shown compelling road safety campaigns conducted by the French Ministry of Transport. These images included seeing different family members mourning a loved one and what "good behaviour" looks like, along with statements from high-profile "media stars". Such campaigns were developed using the "nudge theory"; in other words, gently pushing ("nudging") the public to take positive action by touching upon human emotion, belief and culture to convey risk-related messages.

Perspectives from governments and non-governmental organisations

During the workshop, participants had the opportunity to consider the points of views of a diverse group of lawyers and government officials who described the roles of different players in radiological risk communication and how these have evolved over the past few decades. The importance of establishing and maintaining trust with stakeholders and organisations that may have different roles and responsibilities, including NGOs and members of the public, was also highlighted.

Government

Governments should establish effective structures to communicate effectively with a wide range of audiences, while remaining a trustworthy source of information. Social media can be an advantageous tool for governments to reach a wider and diverse audience, and to understand people's interests and expectations. It can be used to communicate information on events about which people feel concerned, and also enable feedback from these people. It remains to be seen, however, whether social media can help to build mutual trust.

NGOs

It is not entirely clear how the diverse groups of civil society receive information on their governments' projects and engagement activities, or how these groups can be involved in their governments' information disclosure programmes. Creating information exchanges with third parties, by for example working with NGOs, could serve as a bridge between governments and the public. However, NGOs may have difficulties to easily obtain government information and acquire access to the raw data upon which assessments and regulatory decisions are made. The principles of openness and transparency were thus raised during workshop discussions as issues that remain to be addressed in order to achieve effective communication.

Panel in Session 3: Understanding actors, roles and responsibilities in risk communication.

There are different groups that can help regulators understand public concerns, and these groups also have important local knowledge that can be helpful to decision makers. The sharing of information thus goes both ways with regulators informing the public and at the same time being informed by these public groups via active listening and learning. NGOs have access to experts in various fields from biology and engineering to law, all of whom could help bring a needed third-party view to the regulator's position. The fact-checking carried out by NGOs could ultimately help a public who may be distrustful of government bodies to better understand the risks.

Finally, it was noted during workshop discussions that international NGOs can play the very important role of leveraging knowledge and information, working with groups and with larger communities. It is thus important for such international NGOs to be included in risk communication efforts.

Learning from other sectors

The last session of the first day of the workshop focused on the challenges of risk communication in the non-nuclear area, and particularly in the following three areas: i) health emergencies; ii) food safety; and iii) civil aviation.

The representative of the World Health Organization (WHO) took the opportunity to outline some of the challenges related to risk communication in public health emergencies. Emergency risk communication refers to the real-time exchange of information between experts or officials and those people who are facing a threat. The ultimate purpose of emergency risk communication is for everyone at risk to be able to make informed decisions that will help to mitigate the effects of threats – such as those related to a disease outbreak, for example – and take preventive action. Emergency risk communication uses a mix of communication and engagement strategies, including media communications, social media, mass awareness campaigns, health promotion, stakeholder engagement, social mobilisation and community engagement.

WHO international health frameworks concerning health emergencies were also highlighted. The Pandemic Influenza Preparedness (PIP) Framework was identified as an important global mechanism to help countries prepare for the next pandemic, which has become particularly relevant with the current Covid 19 pandemic. Risk communication is one of the key areas within the PIP Framework. The WHO Joint External Evaluation Tool describes five programme strategies adopted by countries to test and assess their readiness in terms of public health emergencies and in radiological or nuclear emergencies. These five strategies are: i) risk communication systems for emergencies; ii) internal and partner co-ordination for emergency risk communication; iii) public communication; iv) communication engagement with affected communities; and v) the perception of risky behaviours and misinformation. Under the auspices of the WHO, several steps are being taken to build national capacity in risk communication, which consist of training, capacity mapping, social mapping, writing, testing and adoption.

The WHO has also published several guidance documents, including *Communicating Risk in Public Health Emergencies* (WHO, 2018). The recommendations in these guidelines provide evidence-based guidance for building trust, engaging with communities and communicating uncertainty, as well as for integrating risk communication into existing national and local emergency preparedness structures and emergency risk communication practices. Discussions with the audience touched upon the status and growing importance of the issue of vaccine confidence, as well as the increasing expectations of the public to be informed.

"
The ultimate purpose of risk communication is to enable people at risk to take informed decisions to protect themselves and their loved ones.[*]
"

* World Health Organization,
www.who.int/risk-communication/background/en.

During the workshop, the representative from the European Food Safety Agency presented different aspects of risk communication in the area of food safety. The presentation described how risk assessment plays an important role in providing scientific advice on food-related issues to support decision making. The need to acknowledge and communicate uncertainty was also highlighted, as well as the need to develop guidance on communicating uncertainty in scientific assessments. Empathy in risk communication was also shown to be crucial, as such communication deals with sensitive topics, including genetically-modified organisms. A central theme of the presentation was the importance of evaluating the risks and benefits associated with eating food, acknowledging values, responding to audience needs and establishing openness, transparency and clarity in language.

Representatives from the International Civil Aviation Organisation and from Eurocontrol illustrated the different aspects of risk communication in the aviation field. The presentation revealed, for example, that volcanic ash poses considerably more risks to aviation than any nuclear events. Volcanic ash exercises are thus conducted yearly to test volcanic ash contingency plans and suggest updates accordingly. These exercises are rotated between Iceland, Italy, Portugal and Russia. Collaborative decision-making processes are conducted between stakeholders in order to report on exercises and make further recommendations in this field. After the 2010 ash crisis, a European Aviation Crisis Coordination Cell was established in 2011, which participates in these exercises. The speakers underlined that customer perception is very important when assessing the business risk, and that delivering the right information at the right time is crucial to support risk-based decision making.

All four of these presentations confirmed that risk communication is a key challenge for building trust, communicating uncertainty, engaging with affected communities, being transparent, obtaining feedback from the public, ensuring co-ordination, responding to audience needs, explaining risk in non-technical terms and sharing consistent messages from different sources. The importance of developing an integrated strategy with social media to inform stakeholders on issues related to risk communication was highlighted as well. Speakers emphasised the need for heightened communication between stakeholders, and for special media training programmes directed at scientists who are interacting with others on social media.

Panel in Session 4: Learning from non-nuclear sectors.

Chapter 2. **Towards a shared understanding of risk communication**

People's openness to listening and learning, and their preoccupation and/or stress towards a given situation is to a large extent dependent on individual circumstances. This chapter demonstrates how different circumstances may be analysed by different stakeholders. More importantly, it emphasises the commonalities, challenges and opportunities for improvement, while providing some innovative ideas to should help to develop effective risk communication approaches.

Workshop participants separated into small, mixed groups to share and learn from two of the six case studies of their choice. The purpose was not to review or critique the case studies but to start a dialogue on stakeholder involvement and risk communication in the specific, prevailing circumstances of the case study, fuelled by what was heard during the previous sessions.

Introduction to case studies

The case studies addressing six prevailing circumstances included: i) normal operations of a nuclear power plant in the United States; ii) legacy waste management in Canada; iii) natural radon exposure in Ireland; iv) new build projects in the United Kingdom; v) a nuclear power plant in emergency situation in France and vi) long-term waste management in Germany (the specific outcomes from these small group exchanges on each case study can be found in Appendix B of the present report).

Case study 1: *Normal nuclear power plant operations – United States*

The United States Nuclear Regulatory Commission (NRC) issues initial operating licences for nuclear power plants for up to 40 years and allows licences to be renewed for an additional 20 years at a time. Seabrook Station has a single unit pressurised water reactor that began operation in 1990. Twenty years after receiving its operating licence, the company that owns the plant, NextEra Energy, applied for a renewed operating licence in June 2010.

This case study covered NRC implementation of its licence renewal communications strategy for Seabrook, including large, formal meetings with the public, separate small meetings with local/state and federal officials, media outreach, advertisements and press releases. It also showed how the NRC needed to adjust its approach when the plant found some concrete degradation during the licence renewal process.

Presentation by Diane Screnci,
NRC, for case study 1.

Case study 2: *Legacy management – Canada*

This case study looked at Canada's commitment to clean up and safely manage historic low-level radioactive waste, which is predominantly contaminated soil resulting from past activities involving the refining of radium and uranium in the 20th century. The waste is located in the municipalities of Port Hope and Clarington, Ontario. The nature of the contamination requires the remediation of both industrial sites, owned by Atomic Energy of Canada Limited, as well as hundreds of residential properties. Atomic Energy of Canada Limited presented the public engagement and communication activities that were carried out for the clean-up initiative. The case study examined external influences on public perception of risk, and the various communication approaches, including telling personal stories and using science to counteract misinformation. Emerging challenges and plans to address these challenges were also shared.

Participants in the group discussion of case study 2.

Case study 3: *Natural exposure – Ireland*

Ireland has a particular problem with exposure to radon, with approximately 300 lung cancers attributed to radon exposure every year. The ultimate purpose of communicating this risk to the public is to motivate behaviour change: to encourage homeowners to test and, where necessary, implement remedial action in their homes. This is particularly difficult given that radon is naturally occurring and has no colour, taste or smell. A representative from the Environment Protection Agency in Ireland shared an experience in communicating radon risk, and how Agency approaches have evolved to more structured risk communication campaigns. Lessons learnt, along with concerns as to why the response to campaigns had not been greater, were also shared. The case study included an evaluation of the Agency's work by a health psychologist, along with findings and recommendations, and a review of the Agency's experience thus far in implementing these recommendations. Metrics that the Agency uses to assess the effectiveness of its work were presented as well, along with its plans for future risk communication work.

Participants in the group discussion of case study 3.

Case study 4: *New build projects – United Kingdom*

As part of the nuclear renaissance in the United Kingdom, Horizon Nuclear Power presented its stakeholder involvement activities, focusing on its lead new build project, Wylfa Newydd. The case study addressed the most effective tools used to cover risk communication topics specifically. It also highlighted the importance of tailoring the approach to all communications for different stakeholders, and of the complimentary roles of formal public consultations and informal communications. Lessons learnt were shared, such as the importance of being robust on the science in an accessible manner while not assuming that education on radioactivity is the golden solution.

Participants in the group discussion of case study 4.

Case study 5: *A Nuclear power plant in emergency situation – France*

The Steering Committee for the Management of the Post-Accident Phase of a Nuclear Accident (CODIRPA), under the French Nuclear Safety Authority (ASN), decided to establish a "Health" Working Group to provide, through a pluralistic approach, information for health professionals who would be in the front line in the case of a nuclear accident. The intention is to help health professionals effectively manage the situation, and in turn, inform the population during a post-accident phase.

This case study explained the process that is being followed to carry out this work and the different players involved to achieve a consensus-based document that will be disseminated to health professionals on a national scale, through various means, including via the CODIRPA website on post-accident situations, professional associations, journals and seminars.

Participants in the group discussion of Case study 5.

*Case study 6: **Long-term waste management – Germany***

In 2017, the new site selection process for a safe disposal of high-level radioactive waste was launched in Germany. This stepwise process is designed to be transparent, based on scientific insights, and free of preconceived opinions regarding its outcome. As part of this process, the participation procedure provides for complex, long-term communication between different governmental institutions and various stakeholders, including the public.

The Federal Office for the Safety of Nuclear Waste Management (BfE), the regulating authority and the body responsible for public participation, is implementing different formats for participation and gaining first experience with regard to risk communication. The announcement of subareas in 2020 was a challenge in terms of communication for the project developer, but also for the BfE and especially for the affected municipalities. For this reason, the BfE has developed a tailored approach for this stakeholder group. This case study presented in detail the regional workshops for municipalities across Germany, and provided insights into the general communication strategy in the early phases of the site selection process.

Participants in the group
discussion of case study 6.

Case study findings

The breakout sessions were designed to bring diverse groups together in order to consider a risk communication case study in a specific context. The presentations were well received by the participants and served as a springboard to dialogues on better understanding the different experiences that the participants would have had in similar contexts, the challenges encountered, the approaches used to address these challenges and finally ideas on what else could be done to improve risk communication. It was noted that the national contexts, such as the regulatory frameworks and cultural backgrounds, differ considerably from one country to the next. As such, not all of the challenges will be the same, nor will the identified approaches and good practices.

The specific outcomes from these small group exchanges on each case study can be found in Appendix B of the present report. The paragraphs that follow summarise the overall outcomes of these exchanges, which were presented in plenary at the end of Day 2 of the workshop. The outcomes, which focus on stakeholders, as well as commonalities and opportunities for improvement, will help the NEA and its member countries to identify possible future work that will enhance the effectiveness of risk communication and engagement activities.

Stakeholders

In all case studies, listening to and working with stakeholders can help build, maintain, and in some circumstances, rebuild trust. Stakeholders are a resource to help identify problems and practical solutions on the ground, and a multidisciplinary team of professionals is needed to address the spectrum of stakeholder issues that can be raised. The following general categories of stakeholders were identified:

- elected government officials;

- regulatory authorities;

- members of industry;

- members of the public;

- professional associations;

- NGOs, including environmental groups.

Other stakeholders, depending on the context, can include more specifically:

- a range of local, national and international stakeholders;

- indigenous peoples;

- investors;

- public opinion builders;

- supply chain and existing and future workforces;

- host communities;

- other safety authorities.

It was clear from the case studies that it can be a challenge to identify the specific stakeholders, what their needs are and how to adapt the approach accordingly. Efforts should continue to ensure all possible stakeholders have been identified to the extent possible and included in the planned activities. For instance, in the case of a nuclear emergency, stakeholders that were not included during normal operations may be identified.

Several approaches, as well as general principles on how countries engage with stakeholders, were shared and are summarised below. Appendix B provides further information on these approaches.

- Open-door public events to engage stakeholders and answer their questions.

- Discussions among representatives from NGOs and local communities that are engaged in exchanges on the events and licensing processes.

- Debates at the European level – a requirement of the European Commission – with the involvement of neighbouring countries.

- Continuous communication over different channels (podcasts, webpages, speeches, reports, papers, "in the real world" (schools, local restaurants or pubs, etc.) and via social media (e.g. Twitter), with adapted language and depth of information.

- Quick replies to and engagement with stakeholders so as to diminish concerns through a two-way communication strategy. Similarly, dealing with fake news swiftly has proven to be effective.

- Engagement with professional or social associations that deal with the issue at hand to help create trust and build credibility. Stakeholder engagement is a long-term relationship requiring special care (the example was given of house-to-house visits).

- Use of a relaxing atmosphere to engage people (e.g. after-work meetings).

- Use of common and well-known facts, as unprepared and vague statements can be more confusing and lead to incorrect interpretations.

- Notions of risk are to be communicated in a general context (non-nuclear) so as to provide perspective (comparable and understandable to non-experts).

- "Advisory committees" exist in some countries and include key players from the industry, the regulator and government agencies) who engage with local communities and the media.

- Risk analysis and well-prepared counter-actions to allow for better responses and the rapid communication of information, ready on short notice.

- The term "educate" is to be avoided since it implies a top-down approach.

In addition, several gaps where further work is needed to facilitate a path forward, as well as additional points to be carefully considered, were identified. These include the following:

- Training scientists/workforces/etc. to become better communicators. It is more difficult to convert a communicator into a scientist than vice versa.

- Including public engagement in the training and educational programmes offered in schools.

- Approaching younger generations to encourage closer co-operation with influencers.

- Identifying who is carrying the message for the organisation (influencer, communication officer, etc.).

- Making use of the medical community in affected areas as a source of information on radiation health effects since medical professionals will likely be locally trusted. Training of the local medical community will generally be needed and thus communication networks and training materials will need to be pre-established.

- Engaging more with NGOs, policy makers and elected officials.

- Effectively communicating information since miscommunication can have a much greater health impact (psychological, psycho-social, panic, etc.) than the radiological risk at stake.

- In the context of the reduction of the carbon footprint, implementing a holistic approach that requires a large variety of solutions. Communication can therefore be approached from a broader context (also non-nuclear).

- Exploring virtual reality and robotics as a novel way to reach other audiences.

- For low dose, low-dose rate exposure situations, observing the direct health consequences, which are generally far smaller than the indirect psychological effects.

- Extending invitations from schools and other educational bodies for external professionals to intervene with accurate and in-depth information.

Commonalities and opportunities for improvement

The challenges and approaches used to communicate and engage with a specific audience will differ according to the national context. However, since the intention is to leverage lessons learnt from different contexts and expand the possibilities of approaches that could be used, Table 2.1 lists the commonalities and opportunities for improvement that were highlighted during exchanges on the six case studies. It should be recognised that these statements do not necessarily represent all of the views of all workshop participants. They can nevertheless be used as a starting point to explore possible areas of future work.

Table 2.1. **Commonalities and opportunities for improvement**

COMMONALITIES
Context:
–   Circumstances drive stakeholder concerns, and are generally complex and multidimensional.
–   The "big picture" should be the focus of discussions with affected stakeholders and should be a key aspect in making informed decisions.
Trust is:
–   essential for effective communication;
–   built over the long term;
–   reinforced through local and long-term engagement.

OPPORTUNITIES FOR IMPROVEMENT
Consider developing guidance for regulatory authorities on the following aspects relating to the use of social media as a communication tool:
–   encourage or discourage staff to use social media, and explain why (i.e. the benefits or risks, according to the chosen policy), providing guidance as appropriate;
–   address, or not, "fake news" as it appears;
–   develop, or not, responses to "standard" radiological protection questions in order to facilitate quick responses.
Encourage youth participation, including:
–   students in radiological protection, nuclear science and engineering;
–   young professionals to become interested in stakeholder involvement activities and be engaged stakeholders.
Social-Economic Impact Assessments (SEIA)
–   Share operator and regulatory experience in developing social and economic impact analyses of nuclear projects in an effort to explain what is being considered, how the public can contribute or be informed of the process and what the outcomes are. This can help to see the big picture of a project.
Communication Networks
–   Develop situation-specific identification of groups who could serve as trusted, local liaisons. These liaisons could include local health authorities, community leaders or school principals. Develop a relationship with these groups and provide educational material and information to strengthen and maintain their understanding of the radiological risks that may exist in their communities.

Chapter 3. **Improving stakeholder interactions**

This chapter presents the experiences and engagement of stakeholders who were invited to share their views during the "Workshop on Stakeholder Involvement: Risk Communication" on improving stakeholder interactions and engaging with media. The presenters included affected civilians during the Fukushima Daiichi nuclear power plant accident, representatives of non-governmental organisations (NGOs), a university professor, a young adult and media representatives. All of the speakers emphasised the need to deliver reliable and timely communication and shared their points of view on how to improve stakeholder involvement approaches.

Insights from Fukushima

Workshop participants had the opportunity to hear personal accounts from a retired high school principal and three young students from the Fukushima Prefecture, who recounted how they felt during the event and the evacuation. Their stories were personal and brought vivid images to life for the audience. They were told that people were working together to rebuild what was lost, and that there was hope in this regard. However, they also heard that a certain number of things were unrecoverable, such as the way of life prior to the event, which has had the most impact on people from the region.

A status update on the areas under evacuation order in Fukushima was also provided during this session of the workshop. There were ca. 165 000 evacuees in total, with 41 000 people still not having returned to the area. The Japan Nuclear Damage Compensation Facilitation (NDF) continues to engage with people at the local level as part of its strategy to ensure that people concerned are kept informed on the status of the area, including decommissioning activities, in a timely and appropriate manner. It also engages with students and has been hosting annual international fora since 2016.

Presentation by a young student from
the Fukushima Prefecture.

The following points were shared from the younger generation's perspective:

- Evacuation: not enough information was made available; people were in need of more details to understand what was happening, why and what were the considerations and options, if any, available to them;

- Decontamination: co-operation with the local government should be strengthened and involve stakeholders;

- Engagement: to this day, the local community continues to talk and learn more about the issue;

- Emergency planning and recovery: stakeholders should be involved since they are an important resource to identify problems and find solutions on the ground.

Finally, the importance of education in understanding the basics of science and when engaging with youth was highlighted. Understanding under what conditions organisations can engage with future generations can determine the success of different communication strategies and tools.

Feedback received from some of the participants identified this segment of the workshop as a highlight of the three-day event, as it reinforced how important communication and engagement are for stakeholders and the power that empathy has in people's lives – it can shape their views and drive action.

Engaging in dialogue with civil society and the next generation

A panel discussion was held during the workshop with representatives from academia, NGOs, youth and a technical support organisation. The objective was to gather perspectives on how best to engage stakeholders in dialogue that would lead to a better understanding of radiological risks. The following paragraphs provide further details on these panel exchanges.

The general takeaway was that the voices of stakeholders can demonstrate broad diversity based upon the different groups involved. These voices are not in a vacuum but are part of a larger political process, which will have implications and be affected by other sectors and by governmental decisions. Certain stakeholders could be marginalised from these processes, which should be kept in mind by other stakeholders and decision makers. By bringing together stakeholders from several countries, the panel outcomes provided feedback from various national contexts and reflected new perspectives in the decision-making process, which must actively engage all stakeholders concerned.

Panel in Session 7: Engaging in dialogues with civil society and the next generation.

Today's world is often characterised by the enormous quantity of information available via social media. Those who wish to engage with the public should therefore recognise that there is intense competition for public attention. Given that it may be difficult to attract public interest in the topics of radiation and nuclear energy, organisations should be considering whether optimal conditions are in place for stakeholders to become easily involved. Ultimately, the timing was viewed by panel members as being of the utmost importance. For instance, peak holiday periods should be avoided in scheduling engagement activities, even when using simple messaging campaigns. Communication and engagement can be very long processes that take patience, humility, pragmatism, sensitivity, loyalty and transparency. Another important concept that was noted is neutrality. NGOs representatives underlined in particular sensitivities to biased information and emphasised that it is for this reason that organisations should strive to present facts with a focus on nuclear safety.

Regarding the vocabulary used when engaging with communities, the importance of using the appropriate phrasing and terminology was also mentioned. When discussing the Fukushima Daichii nuclear accident in Japan, for example, the speakers noted the importance of not referring to it as "the Fukushima accident", but rather as the Daiichi Nuclear Power Plant accident. The citizens of this area have suffered a terrible loss, but the accident was at the power plant and not in the entire region.

When engaging with younger generations, organisations need to determine the necessary conditions to create and maintain successful engagement. Ionising radiation- or nuclear-related topics may be of little interest to younger generations, who may be preoccupied with completing their education, choosing a career, finding employment or establishing themselves in society. Hence, organisations need to consider how to get them engaged in dialogue: why they should get involved; how their voices matter and what impact they can have in decision making.

Finally, this panel discussed the increase in civil society's expectations as regards public participatory processes, beyond expectations for transparency and communication. Pluralistic exchanges lead to both a shared understanding among the actors and technical capacity-building to support citizen involvement. The benefits from co-created dialogue among experts and society stem from the fact that both can learn from each other. Long-term and open interactions thus contribute to enhancing safety through the vigilance of citizens. Experts can encourage such interaction by developing territory initiatives that involve local communities. Innovative approaches and tools need to be developed in order to reach out to a larger stakeholder circle – and in particular younger generations – and foster their engagement.

Engaging with the media and influencers

During this workshop session, participants had the opportunity to hear from a panel of media representatives who shared their views on how best to engage stakeholders on the topics related to radiological risk. The audience heard that during the last couple of decades, the main source of stakeholder information has become increasingly digital, with a growing amount of information being made available. New digital technologies are changing our daily lives, and the traditional media are seeing the impact of such changes. Organisations must continue to explore the best uses of emerging communication technologies such as blogs, social media or the development of applications to reach a larger audience in a short period and to identify audience concerns in an effective way. The timing when using social media has become increasingly important. During an emergency, it will be impossible to respond to every post, but the organisations that are providing information should be aware of which platforms are the most active. It should not be a question of the organisation's preference. Organisations should be sensitive to decide when discussions are going off topic and when short, simple messages that are visually appealing in real time may work best. Direct engagement with stakeholders may be one of the best opportunities to tailor messages to the needs of individuals.

The notion of trust was emphasised by panel members as essential for both the public and the media. People need to know whom they can trust so that they can in turn believe the information that is being provided. Trust allows people to better understand and connect to the information, and to better judge the benefits and the risks associated with their prevailing circumstances. One way to establish trust and communicate more effectively is to enable

stakeholders to get to know more about the individuals providing the information – to create a conversation among people instead of a "position" or "function" speaking to a "stakeholder". This is especially relevant for bloggers, in which case the followers may have some level of personal connection with the writer. The key aspects to building a trusting relationship were expressed as follows:

- truth: be prepared to defend the message with accurate statements;

- respect: take the time to answer questions so that the public can see and understand the motivations and constraints that may have to be faced;

- discernment: distinguish "neutral" journalists and information sources from those that may have an agenda;

- flexibility: understand and have empathy for journalists, who are trying their best to provide information but who may be under extreme constraints from their own organisations;

- credibility: trust is not derived from scientific facts alone; it is also influenced by psychological bias; trust in those who are giving the information is the single biggest promoter of having that information accepted by the audience.

In order for the media to be engaged, organisations need to create opportunities to attract a broader audience and think about how to encourage that audience to be more interested in the topic. Media entities are in fierce competition, as are individual journalists at times within a single entity. With respect to communicating a broader picture, it should be understood that for the media, radiation is only a part of the total risk landscape: how the media views a risk can have a significant role in how it addresses such important issues as air pollution, habitat destruction, and above of, climate change. A holistic quality-of-life approach could help put risks into perspective and into context. Unless being asked specifically about risk and safety, it may be more effective to address both the positive and negative attributes of a situation, as well as the possible paths forward. Ultimately, the media should be seen of as storytellers and be allowed to play their role in this regard.

The panel discussion ended with each panellist sharing a key word(s) to consider when communicating and engaging with the public about radiological risks. These words were: trust, honesty, diversity, personalised information and contextual knowledge.

Panel in Session 8: Engaging with
the media and influencers.

Chapter 4. **Conclusions and recommendations**

Risk communication entails a proactive dialogue with the public, using accurate and simple language that presents a balanced view of the facts and the uncertainties. Regulatory authorities and members of the nuclear energy community – including governments, associations, operators, research organisations and project proponents – have roles and responsibilities to foster dialogues that will lead to a shared understanding of radiological risks.

The last session of the "Workshop on Stakeholder Involvement: Risk Communication" was dedicated to hearing from the chairs, vice chairs and representatives of the Nuclear Energy Agency's standing technical committees. Representatives took the opportunity to share their main takeaways from the workshop, identifying potential areas where the NEA and its member countries could enhance the effectiveness of their risk communication activities and strive towards having more dialogue with stakeholders, which would ultimately lead to a common understanding of radiological risks. The representatives voiced their support for, and agreement with, the general views that had been expressed during the three-day workshop. They added specific points as they pertain to the mandates of the committees they represented, including the following:

- The Chair of the NEA Committee on Nuclear Regulatory Activities (CNRA) emphasised the timeliness of this workshop as the committee is currently planning its next strategic objectives and determining its future communication goals. He indicated that there is a real need to agree on the goal of conducting effective risk communication activities: for stakeholders to be involved and able to make informed judgements and decisions to protect themselves from radiological risks. It is imperative that regulatory bodies clearly express their judgement when dealing with risks and identifying regulatory metrics. It is also critical that radiological risks be identified in various circumstances and that such risks be placed in their respective contexts. The regulator's mandate is, however, safety, which means that it is not within its role to provide the big picture regarding the risks and benefits of regulated activities. Regulators should of course remain sensitive, open and transparent, while at the same time maintaining both an impartial and neutral stance. It is important to be an effective communicator, and to gain and maintain the public's trust. An opportunity for the CNRA to consider would be to produce a CNRA "Green Booklet"[1] on what it takes to be a trusted regulator, an effective communicator or both. The CNRA Chair also shared his view that a radiological exposure scale, such as the RAdiation INdex (RAIN) discussed during the workshop, could be an interesting risk communication tool. The CNRA Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) could explore this tool together with the NEA Committee on Radiological Protection and Public Health (CRPPH). He concluded that the challenge remains to find new ways of providing information and meeting the needs of concerned citizens to the eternal question: "Am I safe?"

- The representative of the NEA Committee on the Safety of Nuclear Installations (CSNI) stated that the concepts of risk and safety are very much embedded in CSNI work, for example through probabilistic safety assessments (PSA) that help identify the consequences of events on the public, workers and the environment. A great deal of work is being carried out by scientists and engineers to determine the safety of a nuclear power

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1. The CNRA has produced a series of regulatory guidance reports, known as "green booklets", which are prepared and reviewed by senior regulators and provide a unique resource on key nuclear regulatory issues. The booklets examine various regulatory challenges and address the major elements and contemporary issues of a nuclear safety regime.

plant. Safety is also evolving with technological improvements – for example accident-tolerant fuels, systems to manage severe and design-basis accidents, and new fast-running tools for source term estimation that help identify the consequences of an event on people and the environment. However, information on this type of work is not widely known as it may not be broadly disseminated beyond the nuclear safety community, making it an area for further exploration. Summarising work on safety in such a way would mean sharing more knowledge with the public. New work on sensitivity and uncertainty analyses could also be shared with stakeholders in order help them to develop their own skills and to gradually build a reciprocal understanding of these analyses.

- The Chair of the NEA Radioactive Waste Management Committee (RWMC) reported on work being undertaken by the NEA Forum on Stakeholder Confidence (FSC), the working group fostering learning on how to communicate and engage with stakeholders on such complex issues as radioactive waste management and the nuclear fuel cycle. Their experience collaborating with the NEA Integration Group for the Safety Case (IGSC) on the long-term radiological safety of radioactive waste repository facilities could be shared with other NEA groups. The challenge of conveying technical knowledge to the public is an issue that continues to be addressed by these two groups, and is aligned with discussions that took place during the workshop. As such, he highlighted the need for further collaboration with other NEA committees and international organisations. It has become even more evident with this workshop that the general lack of understanding and familiarity with radiological risks requires further consideration, as does the subject of how stakeholders experience and perceive risk.

- Although the NEA Committee on Decommissioning of Nuclear Installations and Legacy Management (CDLM) is a new committee, its members have already identified risk communication and risk management as work that will be addressed under the committee mandate. Trust is key to effective communication and engagement, and it must be established early and maintained to involve stakeholders successfully throughout the process of decommissioning and legacy waste management. The Vice-chair of the CDLM noted that its members also work via the FSC to determine how best to communicate and engage with stakeholders during the final stages of the nuclear life cycle. The CDLM also looks forward to co-operating and collaborating with other NEA committees, and more specifically with the CRPPH and RWMC.

- The Chair of the CRPPH noted that the committee had been involved in stakeholder communication and engagement activities for many decades through its mandate to protect people and the environment while achieving the most good for society. Approaches have evolved over time, and they need to continue to evolve, in particular to reach the younger generation, which rapidly shifts from one information platform to another. The importance of social media has thus been rightly highlighted during the workshop discussions, as has the way in which organisations will need to be more active in leveraging this tool. Trust has arisen as an overarching theme throughout the workshop, and this topic should thus be considered more closely. He insisted, however, that not every situation requires the same level of involvement. Engaging with stakeholders can be resource intensive, and as such, organisations need to choose where efforts should be invested. Local engagement is crucial. Tools for better communicating risk, such as the RAIN scale, should nonetheless be a subject of interest.

- It is not new for the NEA Nuclear Law Committee (NLC) to consider risk communication, and the Chair noted that this workshop would further assist the committee as it considers areas related to nuclear liability, claims handling, data protection and personal information preservation. He suggested that the application of the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)[2] may have been carried out in a one-way communication manner and thus could benefit

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2. "The Espoo (EIA) Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries." (See https://unece.org)

from more stakeholder participation. Considerations should also be made in relation to potentially long consultation processes, for instance those regarding the long-term management of nuclear waste. Communication is not a one-time action, and is commensurate with the longevity of the nuclear cycle. Concerted efforts to collaborate must continue to be implemented as there are many communicating bodies whose risk communication could have significant effects on stakeholders.

- The NDC Vice-chair stated that the committee could effectively contribute to risk communication efforts as it is producing a considerable amount of data and reports geared towards government bodies. Such information is used to help understand the different energy systems and associated costs, and to show how nuclear energy is contributing to the world's energy supply, which cannot rely solely on renewable energy. New designs, such as small modular reactors (SMRs), should also be taken into account in risk communication efforts. Young researchers and scientists could also be focusing their work on issues that will help society, while stakeholders concentrate on gaining a realistic, broad understanding of technological solutions. He insisted that risk perception is an issue of importance that reinforces the need for stakeholders to be well informed.

Panel in Session 9: Opportunities for progress and next steps.

Overall, workshop discussions reinforced the notion that achieving effective risk communication for a common understanding of radiological risks in order to address concerns and to engage with stakeholders under the different prevailing circumstances is a complex issue. The key messages recurring throughout the workshop, and repeated in the written feedback from participants can be summarised as follows:

- Risk communication is a multidimensional, socially and technically complex, and resource-intensive activity.

- Communicating risk through dialogues with stakeholders is not a one-step process but a dynamic process that:
  - needs time to be established in a sustainable way;
  - has to evolve in an anticipated manner as society and stakeholders' needs and expectations evolve.

- Dialogues with stakeholders should be an institutional requirement for regulators.

- Non-governmental organisations (NGOs) and local stakeholders have specific and varying local knowledge and understanding, which can provide essential information to national, regional and local decision makers.

- Local and long-term engagement is key to obtaining and maintaining trust.

- Identifying in advance possible concerns that potentially affect stakeholders is likely, in any given circumstances, to facilitate the preparation of risk communication and engagement activities.

- A simple and visual radiation exposure scale could be a useful tool to communicate radiological risks.

- Messages should focus on addressing the concerns of the audience and should be succinct, following, for example the 3/27/9 rule of 3 messages, using 27 words delivered in 9 seconds.

- Efficient and effective radiological risk communication highly depends on:
    - the way the message and communication tools are adapted to meet the audience's needs, and address its concerns;
    - the confidence that recipients have developed for the organisation/individual providing the information;
    - experience from past situations.

- Social media is a key tool, in particular in reaching out to younger generations and identifying concerns in advance. It requires monitoring and swift responses, which can be resource intensive.

- A multidisciplinary approach that includes experts in various fields from radiation specialists, engineers, researchers and the medical community could help with communication and engagement activities. These experts would require training in risk communication techniques.

- A path forward to creating harmonisation and consistency in radiological risk communication could be to first reach international consensus on the objective attribution of the effects of radiation effects and on the potential subjective inference of radiation risk.

- Trust is essential for effective communication, and local and long-term engagement is important to building trust. Future work of the NEA could explore the characteristics of a trusted organisation.

" **To be trusted, you must communicate successfully. To communicate successfully, you must be trusted.*** "

* Mr Michael Boyd, Chairman of the NEA Committee on
Radiological Protection and Public Health (CRPPH)

In his closing statement, NEA Director-General William D. Magwood, IV encouraged NEA standing technical committees to consider the outcomes of this workshop when developing their programmes of work. He noted, in particular, that the RAIN scale might appeal to the greater regulatory community as a communication tool. He insisted that people trust other people, and not organisations, and thus impressed upon experts to engage directly with the public and interact with people, and to also engage with the medical community as a trusted entity in these communities. Gathering expertise from risk experts and from other fields can help educate the medical community so that its representatives are able to respond to questions regarding radiological risks. Experts have a deep understanding of the nuclear industry, radiation, and the regulatory framework in place to ensure the safe operations of nuclear installations and of radiological substances. It remains the responsibility of these experts to explain the nuclear science and technology to a non-technical public – it is not an easy task, but one that must be done.

Participants were invited to provide written feedback of the workshop by sharing both their main takeaways and their opinions on what else the NEA could do to help member countries in improving their risk communication activities. The written evaluation of the workshop showed that participants found the case studies presented on the second day of the workshop to be valuable, and they especially appreciated the mix of participants as it encouraged the sharing of perspectives across different expert areas. The participants noted some of the useful insights gained from the workshop, including opportunities to involve youth, the value of sharing lessons learnt, putting things into perspective and considering relevancy, as well as the importance of local engagement and providing a big picture to stakeholders. They also noted several challenges to be addressed, for example reaching a consensus on the definition of risks, defining the target audience's needs and having the resources to address them, as well as building trust with stakeholders. Participants also highlighted areas where more work could be done to enhance stakeholder involvement and risk communication, including such actions as equipping experts with the right skill sets to engage with non-technical members of the public, developing guidance to better manage social media and fake news, considering the emotions and human element alongside the science, developing ways to put nuclear risks into context, and finally engaging with risk experts and communication experts.

The NEA and its standing technical committees are grateful to have received such insights and remain committed to considering these as they develop their programmes of work for the coming years. The goal is to enhance risk communication efforts so that concerned stakeholders can better understand the risks and consequences of potential radiation exposure, and thus are able to make informed decisions regarding radiological protection options.

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Appendix A. **Workshop agenda**

Day 1: Setting the stage

Welcome and opening remarks

Angel Gurría, OECD Secretary-General

William D. Magwood, IV, NEA Director-General

Michael Boyd, Chair of the NEA Committee on Radiological Protection and Public Health (CRPPH), Director of the Center for Science and Technology Radiation Protection Division, US Environmental Protection Agency, and Chair of the Workshop

Keynote address: Risks in nuclear new build projects in Europe

H.E. Minister János Süli, Minister without portfolio, Responsible for the Planning, Construction and Commissioning of the Two New Units at the Paks Nuclear Power Plant, Hungary

Session 1: Risk communication: What and why?

Moderator: Jason Cameron, Canadian Nuclear Safety Commission (CNSC), Vice President and Chief Communications Officer

With introductory remarks on why risk communication is important

1.1. *Communicating the concept of radiation risk: The challenge of separating facts from conjectures*

Abel Julio González, Senior Advisor, Argentina Nuclear Regulatory Authority

1.2. *The linear no-threshold risk model and radiological protection: Major issues to understand for a better risk communication*

Dominique Laurier, International Commission on Radiological Protection (ICRP) Main Commission Member and Head of Department, Institute for Radiological Protection and Nuclear Safety (IRSN), France

1.3. *Insights from a nuclear regulator about the communication of risks*

María del Pilar Lucio Carrasco, Commissioner of the Nuclear Safety Council (CSN), Spain

1.4. *Discussion*

Moderated by Jason Cameron

Session 2: Developing and implementing risk communication approaches

Moderator: Petteri Tiippana, Chair of the NEA Committee on Nuclear Regulatory Activities (CNRA) and Director-General, Radiation and Nuclear Safety Authority of Finland (STUK)

2.1. *Fifteen years in radiation communications: challenges, tools, and opportunities*

Jessica Wieder, Director of the Centre for Radiation Information and Outreach, United States Environmental Protection Agency

2.2. *Risk perception and public awareness: Lessons learnt*

Lydie Evrard, Commissionner, Autorité de sûreté nucléaire (ASN), France

2.3. RAIN: New index for radiological risk communication with the public

Kun-Woo Cho, International Commission on Radiological Protection (ICRP) Main Commission Member and Principal Researcher, Natural Radiation Safety Department, Korea Institute of Nuclear Safety (KINS)

2.4. Communicating on issues that we fear: An example from the French Road Safety Authority. What methods and for which assessment?

Emmanuel Barbe, Inter-Ministerial Delegate for Road Safety, Ministry of Transport, France

2.5. Discussion

Moderated by Petteri Tiippana

Session 3: Understanding actors, roles and responsibilities in risk communication (interactive panel discussion)

Moderator: Roland Dussart-Desart, Chair of the NEA Nuclear Law Committee (NLC) and General Counsel, SPF Economie, Belgium

Panellists:

Andreas Molin, Federal Ministry for Sustainability and Tourism, Austria

Pippa Feinstein, Counsel, Lake Ontario Waterkeeper/Swim Drink Fish, Canada

Jorma Aurela, Chief Engineer, Energy Department, Ministry of Economic Affairs and Employment, Finland

Lenka Dojcanova, Associate Web and Outreach Coordinator Department of Nuclear Safety and Security, International Atomic Energy Agency

Session 4: Learning from non-nuclear sectors

Moderator: Holly Harrington, Vice Chair of the NEA Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC) and Senior Advisor, Office of Public Affairs, United States Nuclear Regulatory Commission (US NRC)

4.1. World Health Organization

Melinda Frost, Technical Officer – Lead, World Health Organization

4.2. European Food Safety Authority

Barbara Gallani, Head of Communication, Engagement and Cooperation Department, European Food Safety Agency

4.3. International Civil Aviation Organisation and Eurocontrol

Christopher Keohan, Regional Officer, Meteorology, International Civil Aviation Organization

Kenneth Thomas, Head of Network Management Operations Division, Eurocontrol

4.4. Discussion

Moderated by Holly Harrington

4.5. Wrap-up of day 1

Michael Boyd, Workshop Chair

Day 2: Sharing experience and approaches

Item

Highlights of day 1

Michael Boyd, Workshop Chair

Session 5: Dialogues around risk communication case studies

Overview and instructions

Thierry Schneider, Vice Chair of the NEA CRPPH and Director, Centre d'étude sur l'Evaluation de la Protection dans le domaine Nucléaire (CEPN), France

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Breakout A: Concurrent presentations, followed by small group dialogues

Case study 1: Normal nuclear power plant operations

Presented by Diane Screnci, Senior Public Affairs Officer, United States Nuclear Regulatory Commission

Case study 2: Legacy management in Canada

Presented by Maude-Émilie Pagé, Director, Communications and Government Reporting, Atomic Energy of Canada Limited (AECL), Canada

Case study 3: Natural exposure in Ireland

Presented by Stephanie Long, Manager of the Radon Advice and Citizen Science Section of the Environment Protection Agency, Ireland

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Breakout B: Concurrent presentations, followed by small group dialogues

Case study 4: New build projects

Presented by Leon Flexman, Corporate Affairs Director, Horizon Nuclear Power, United Kingdom

Case study 5: A nuclear power plant emergency situation

Presented by Florence Gabillaud-Poillion, Autorité de sûreté nucléaire (ASN), France

Case study 6: Long-term waste management

Presented by Jochen Ahlswede, Head of Division, President's Office, Federal Office for the Safety of Nuclear Waste Management (BfE), Germany

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Session 6: Panel on case study findings

Moderator: Andrew Mayall, Vice Chair of the NEA CRPPH and New and Operational Sites Manager, Environment Agency, United Kingdom

Panellists:

A representative from each of the six case study dialogues to share their findings in full plenary

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Wrap-up of day 2

Michael Boyd, Workshop Chair

Day 3: Engaging with stakeholders

Item
Highlights of day 2
Michael Boyd, Workshop Chair

Experiences from Fukushima Prefecture

Moderator: Mark Foy, Vice Chair of the NEA CNRA and Chief Nuclear Inspector, Office for Nuclear Regulation (ONR), United Kingdom

Overview of the Nuclear Damage Compensation and Decommissioning Facilitation (NDF)

Yoshio Kawaguchi, Head of International Affairs, Nuclear Damage Compensation and Decommissioning Facilitation Corporation, Japan

Experiences of citizens from Fukushima Prefecture

Presenters:

Yoshiko Aoki, Representative, the Group of Telling Stories on the Great East Japan Earthquake in Tomioka, Former Principal, Fukushima Prefectural Tomioka High School

Moe Harada, 2nd Grade Student, Fukushima Prefectural Asaka-Reimei High School

Via Webex:

Aoi Shibata, second year student, Fukushima Prefectural Asaka High School

Daichi Hashii, second year student, Fukushima Prefectural Asaka High School

Discussion moderated by Mark Foy

Session 7: Engaging in dialogues with civil society and the next generation (interactive panel discussion)

Moderator: Jean-Christophe Niel, Chair of the NEA Committee for the Safety of Nuclear Installations (CSNI) and Director-General, IRSN, France

Panellists:

Pippa Feinstein, Counsel, Lake Ontario Waterkeeper/Swim Drink Fish, Canada

Yves Lheureux, Director, French National Federation of Local Information Committees (ANCCLI), France

Nadja Železnick, Chair of the Nuclear Transparency Watch, Slovenia

Emmanuelle Keogh, Recent engineering graduate, Agnico Eagle Mines, Canada

Kai Vetter, Professor, University of California, United States

Keynote address: The appropriate management of radioactive waste and public perceptions: The role of Parliamentary Committees of Inquiry

Stefano Vignaroli, Member of Parliament and President of the Waste Committee of the Chamber of Deputies (Italy)

Session 8: Engaging with media and influencers (interactive panel discussion)

Moderator: Katie Day, Director, Policy and Communications, ONR, United Kingdom

Panellists:

Muriel Boselli, Journalist, Montel News, France

Monica Trauzzi, Senior Director of Communications, Nuclear Energy Institute, US and former journalist with E&E News

Ann MacLachlan, Former European Bureau Chief, Platts Nuclear Publications

Peter Bryant, President, The Society for Radiological Protection, United Kingdom

Iida Ruishalme, Blogger and European lead for Mothers for Nuclear, Switzerland

Session 9: Opportunities for progress and next steps

Moderator: William D. Magwood, IV, NEA Director-General

Panellists:

Petteri Tiippana, Chair, NEA Committee on Nuclear Regulatory Activities

Federico Rocchi, Member, NEA Committee on the Safety of Nuclear Installations

Hiroyuki Umeki, Chair, NEA Radioactive Waste Management Committee

Mitsuo Matsui, Vice Chair, NEA Committee on Decommissioning of Nuclear Installations and Legacy Management

Michael Boyd, Chair, NEA Committee on Radiological Protection and Public Health

Roland Dussart-Desart, Chair, NEA Nuclear Law Committee

Jorma Aurela, Vice Chair, NEA Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle

Closing remarks: William D. Magwood, IV, NEA Director-General

Appendix B. **Summaries of case study outcomes**

For each of the case studies in this appendix, the top two challenges are presented, along with how they could be addressed. Key areas for improvement that could form the basis for future work are also provided. The appendix includes detailed notes from the small-group dialogues regarding other challenges encountered by the participants and practices or approaches that have proven to be effective, as well as potentially innovative approaches.

The opinions provided here were obtained through group discussions. They may represent the opinions of one or several individuals or of the group as a whole. The intention is to share people's views on the topics of discussion as part of the process towards ensuring more effective risk communication activities through a better understanding of radiological risks.

Appendix B.1. **Case study 1 on normal operations of a nuclear power plant**

Identified challenges	How challenges were addressed
Audiences have different needs.	Identify your audience and adapt communication and engagement approaches accordingly. The audience can be identified by analysing and monitoring social media and television, and by analysing how many people talk about nuclear power plants, how they talk about them, who they are, etc.
Trust must be built.	Adapt your approach to the context. Have sustained communications over time. Deal with fake news. Adopt key principles of transparency and clarity of understanding, which will require a significant investment of time and resources to communicate effectively.

Most important areas for improvement – future work
Expand approaches to define and engage audiences that include youth; influencers such as doctors, teachers and scientists, as well as neighbouring countries.
International guidance on how to deal with stakeholder involvement for long-term operation.

A) Other challenges or concerns noted:

- Finding the balance for openness and security; explaining where there are limits to transparency.

- Getting the local public's interest in the subject matter. If the general public does not have a strong interest in or concern about the subject, it is difficult to effectively engage people and maintain their attention. It may be easier to attract the general public to health-related issues (e.g. iodine pills). Although the context is normal operations, public concern is often focused on long-term radioactive waste management, a subject on which they would like to hold a public debate.

- Planning very early on, since the process and associated resources can be extensive.

- Ensuring inter-agency co-ordination to give the public the whole picture and deliver an integrated message. There may be a need to seek agreement on approaches, for example between the regulator and licensees, beyond the required legal framework.

- Considering transboundary communication, especially when engaging local communities near borders.

- Designing differently local versus national debates because they are different in nature. Dialogues with the local community may be difficult in many ways. Engaging at the national level can be carried out quickly; however, it tends to be too general and less focused, failing to get the views of the public who is truly concerned by the issues.

- Recognising the political pressures. For example, even if from a technical perspective a site or operation is deemed safe, the ultimate decision will be a political one. Also, if politicians visit the communities, they may only speak of the benefits and not address people's concerns, which can create distrust.

- Acknowledging that education is required: it is important to acquire knowledge about radiation and nuclear power; however, it is a subject that is not usually taught in schools. People may know more about disasters and pure science, but not necessarily consider the social science perspective.

- Reconsidering the term "general public" in risk communication. There is a need to find a new segmentation of the general public: young, educated, global minded, living in the suburbs, spending time on social media and exposed to fake news, etc. These are all different public categories, and each category requires its own way of communication. To determine the means of communication necessary, it is important to better understand who the individual groups are and what their lifestyles and needs are in order to better interpret the target audience.

- Distinguishing between risk perception and risk behaviour. There is a need to understand the risk perceptions of the audience, since risk behaviour is the response based on the risk perception. Misconceptions should be clarified, and it is important to respond to public behaviour that may be based on misconceptions, for example apocalyptic perceptions.

- Recognising that since regulatory authorities must remain neutral, it may be difficult to have an effect on people's perceptions of risk.

- Acknowledging that sources of information are not always consistent, for example Wikipedia changes its content according to the language. It would be interesting to check what is written on nuclear risk and on nuclear waste in the different languages.

- Acknowledging changing political environments: people have different and changing perceptions of governments.

International communications:

The application of the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) in Europe was also mentioned. There was a very complicated court case in Belgium that was difficult for the Netherlands to understand. The regulatory authority in the Netherlands had to decide if they needed to communicate to their citizens regarding a project in another country. The authority was working closely with the Federal Agency of Nuclear Safety in Belgium, but there were different perceptions in the two countries, and the communication had to be adapted to the country concerned. A similar situation occurred in Fukushima for those who experienced the nuclear power plant accident.

Transparency:

It was agreed that governments need to be transparent, but the definition of transparency was raised as an issue, for example is it to upload every inspection report on the internet? Are summaries of these reports sufficient? In addition, transparency and communication are different issues; posting a great deal of information on a website does not mean that it will be understood. Explanations are needed – not from communicators but from experts, and not all experts have the right communication skills.

Cultural differences:

There can be various cultures and languages in different regions, and sometimes even different dialects within one country. Communicators have to decide the wording and the language for each region.

The need to use new instruments:

Most of the tools used for nuclear risk communication are the same as they always have been, with few exceptions. There is a clear need to use new technologies beyond Twitter and webpages. On the other hand, it is not easy to follow all of the technologies and know what kind of information sources would be the most efficient.

Receiving public attention:

It may not always be clear for the population what authority should be communicating on nuclear issues, whether it be environmental safety, public safety or facility safety, which may be under different authorities. Nevertheless, it is important to ensure delivery of the same message from all parties.

B) Other practices for effective communication and engagement:

- It is effective to show the timeline of the process (including milestones) to the general public. In this way, people can understand where the project is situated in the process.

- Key principles to follow and to communicate include: the ongoing process, continuous dialogue, the notion of time, any step-by-step approaches and various feedback.

- It is important to have a continuous dialogue with stakeholders, explaining the events during various situations, on a permanent basis and not just when it is needed. This continuous communication will help the regulatory authority and technical support organisations (TSOs) to build credibility.

- The local community should be involved in a formal way, for example by creating an association of chairs from local communities with local authorities being widely involved in the process, and having rights to inform the public and make decisions.

- The regulator can upload on its website all of the incidents and inspection reports.

- Although everything is being done to prevent an accident, it should be clear that accidents can happen and that people should be prepared for this, which may be difficult for older generations to accept (i.e. accidents will happen).

- If there are more benefits than risks, the public accepts the risks more easily, for example even in the face of cancer risks, we know that "cancer can be cured". That said, even in the medical area, people are afraid of radiation at very low levels.

- People want to hear from both sides (i.e. what are the risks and what are the benefits).

- A good opportunity for the public to ask questions is during a licensing renewal or issuance, where all stakeholders – utilities, developers, the regulatory body and local environmental officers – are gathered to talk about all of the issues.

- In many countries, communication is mainly carried out through trained technical experts. Communication specialists can help technical experts with presentations, preparing slides and speeches. Facts and figures in the form of infographics are useful as such visuals can make it easier to talk to people.

- Social media, such as LinkedIn, Twitter and Facebook, is widely used, but workshop participants agreed that it can be resource intensive and too general at times.

- Contacts can be provided on the organisations' website, and people can receive written responses to their questions.

- "Microsites" on the web can be used to exchange information on very specific topics.

- Trustworthy figures can be used to help disseminate messages.

- Regular public forum discussions with key players such as industry, the regulator and government agencies to connect with local communities and interested stakeholders is also useful.

- Different means of reaching target audiences can be another tool and could include holding after-work events, using infographics and virtual reality. Understanding of risk could be framed by using every day examples (e.g. visiting the dentist).

C) Innovative or new approaches to consider:

- Hold focus groups with both pro and anti-nuclear populations and encourage debate among them.

- Use visuals and infographics; icons with the same words to be used by everyone.

- Create a local communication centre.

- Introduce games:

  - Develop gamification for children: a game that allows them to sit inside a virtual nuclear power plant and play different roles.

  - Aim to explain the nuclear plant and global electric system, to show the complementarity of different energies, show the blackouts for different energy mixes; show which steps to take when the plant is old, how much money and time you should spend on each step.

- Have dedicated "engineers for school" that go into classrooms to present nuclear technology.

- Show video clips to young people, available on the regulator's website.

- Consider using the "nudge concept" – although it is not used in the nuclear field, it can work well in risk communication. This concept consists of gently pushing - "nudging" - the public to take positive action by touching upon human emotion, belief and culture to convey risk-related messages.

- Use online maps to identify risks in different regions. By entering your postal code, you can see the risks in your neighbourhood. It is a visual tool that provides information and emergency centres. It can be downloaded and mailed, or made available at the town hall.

Appendix B.2. **Case study 2 on legacy management**

Identified challenges	How challenges were addressed
Trust and understanding concerns: all input should be judged equally.	– Trust must be earned: transparency, openness, listening, etc. – The public trusts in government, but the government must trust in the public. – Trust of experts. – Trust in non-governmental organisations (NGOs).
Presentation of "the big picture".	– Do not focus on "risk alone". – The consequences of choices should be addressed. – Risks should be put into perspective.

Most important areas for improvement – future work
Guidance for the use of social media: – Should organisations encourage employees to use social media on an individual basis? If so, what guidance and monitoring is needed? At what level should issues be addressed? What key messages can be prepared in advance?
How to respond to vocal opposition and "self-proclaimed experts"?
A simplified, graphic, radiological impact scale can be explored.

A) Other challenges or concerns noted:

- Instead of undertaking a decontamination project that is not necessary from a safety perspective, can educating or communicating better with the public regarding low or no health risk be an option? In other words, can a campaign change the public's perception?

- What is driving fears of radiation, particularly when the dose levels are very low? It is vital to acknowledge these concerns and answer questions when possible and acknowledge when it's not possible so as to build trust. What tools be used, however? How can we understand peoples' fear of radiation?

- The media plays a role in creating fear/stories about the consequences of living in an area, with cancer used as a means to create fear.

- The focus or concerns may not necessarily be legacy management, but rather long-term waste management solutions, including a deep geological repository. It is very difficult to manage from a communication perspective, with high levels of pressure from communities and politicians – people become emotional and "personal" with regard to deep geological repository and waste facilities.

- How much is the national community going to spend to clean up legacy waste? Who decides? How is it decided? Clearly it is a political decision. If a great deal of resources are spent on a project that has little or no risk, then the problem can be viewed as bigger than it may be from a health perspective.

- Would you have to make this a national debate or discuss it implicitly in parliament?

- Debates on waste management are difficult because people are generally not knowledgeable, not interested and not taking part in the debate. It is mainly a discussion between scientists, nuclear communities and environmental groups – essentially a debate between experts only. It would be useful to identify key people at the local level, who are well-known and trusted – not from the government or from the project team – and who can support the project and speak positively as an advocate.

- Difficulties arise in defining who the stakeholder is: what connection should individuals have with the region: physical, monetary, tax paying? A stakeholder is anyone who is interested in or feels concerned by the topic?

- Public authorities and public decisions are questioned more today than in the past.

- Maintenance of "critical knowledge" over the long term is a challenge.

- With social media, the decisions made at local levels quickly become global. People will make connections between sites in their countries and those in other countries, for example.

- Social media is both a help and a hindrance in terms of the entire stakeholder involvement process. It can be very resource intensive, and there is a need for guidance: should organisations encourage employees to use social media on an individual basis? If so, what guidance and monitoring is needed? At what level should social media issues be addressed? What key messages can be prepared in advance? How should individuals respond to vocal opposition and "self-proclaimed experts"?

- Twitter accounts are anonymous. However, in a debate about waste management or a nuclear situation, institutions and their representatives are prepared to put their faces on whatever they are saying. At the same time, you have an army of people that are anonymous, usually the most ferocious in their opinions, and you cannot connect with them because you do not know who they are. Many of these misinformed people cannot be tracked down to engage with them as you do not know who they are or what their backgrounds are.

B) Other practices for effective communication and engagement:

- Clarification of the level of radioactive waste is very important in risk communication.

- It is important to engage people through their neighbourhoods or communities as they hold social and economic points of view. Cross-neighbour dialogues are absolutely vital and fear of radiation is a completely natural concept. Work should be carried out on a community basis, as well as on an individual basis.

- Some stakeholders could even be invited to Sweden or to other countries that are well advanced in their projects so as to talk to communities that have already undergone similar processes and changes.

- It might be simpler to engage with a few individuals, as peer pressure within groups must be taken into account. Different circles of stakeholder involvement are also productive and necessary.

- It is important to engage with local influencers and visit local spots, such sports clubs.

- A continual engagement is necessary: the community is informed from the beginning and kept involved in or informed throughout the process.

- Social media has become central to information distribution, and is becoming increasingly interactive (the IT evolution is inevitable). It can be used to gauge how an organisation is doing in terms of its communication efforts.

- Stakeholders are experts in their own behaviour and environment – this must be recognised.

- Responses to stakeholder concerns need to be fair.

- Focus discussions and information be based on the audience, e.g. residents versus non-residents, individuals versus groups. Listen and account for stakeholders' opinions, considering cultural differences as well.

- Co-construction of solutions with the stakeholders is important.

- Local actions should be communicated broadly (nationally), and national input may be needed, e.g. situations involving federal spending.

- Public opinion surveys can help gauge people's knowledge, interests and fears, as well as the impact of communication activities.

- Fact sheets may help with both simplified and detailed information.

- Building trust in a community takes time. Develop trust and understand concerns (using empathy): ask questions, consider the personality (build a connection), have continued interactions, be proactive, provide information in timely manner; discuss impacts before taking actions.

- Locals have a key role. Close communication with residents is important, as well as with groups such as NGOs, Chambers of Commerce and schools.

C) Innovative or new approaches to consider:

- A scale, perhaps colour-coding calls for action at different levels of radiation, could be helpful as long as there are no firm numerical boundaries between levels. The proposed scale, RAdiation INdex or RAIN (presented on Day 1 of the Workshop) should be further explored; however, it will be a challenge to get consensus on different levels to identify general boundaries. If the index is only adopted by one country and not globally, it could also create problems. Work to harmonise scales or the use of scientific terms must be a priority, along with how such a scale could be promoted to the public. Introducing another tool may create more problems for these reasons.

- Learning from NGOs that have initiated effective campaigns can be interesting.

Appendix B.3. **Case study 3 on natural exposure**

Identified challenges	How challenges were addressed
Communicating risk in perspective and providing context	– Considering radon risks versus non-radon risks Framing the risk in relation to other, more familiar subjects (smoking cigarettes, natural background radiation, chest X-rays)
Specifying the stakeholders and tailoring the message to who needs the information	– Identify the demographics, focusing not only on geographic location but also on who lives in the area (mothers, workers, etc.)
Most important areas for improvement – future work	
Education and school activities could help to improve risk communication on radon, although such processes should be carefully framed. One key point to consider with regard to schools is that if the process is not secured, it can lead to increased anxiety for children and families. Such processes should be framed in ways that allow people to remedy the situation.	
The use of social media for two-way communication should also be pursued. It should not be seen as only a one-way source of providing information to the public, but as a means of broader exchange among stakeholders.	

A) Other challenges or concerns noted:

- One of the key challenges noted is that of how to influence people's behaviour, even when these people are aware of the existence of a health risk caused by radon.

- In the case of radon, the risk is competing with larger risks related to smoking. In order to avoid situations of competing risks, there could be a holistic approach on indoor air quality, including the effects of indoor smoking.

- It is difficult to communicate long-term risks as opposed to acute risks. Risk from radon exposure is probably comparable to the risks associated with smoking.

- It is important to identify the right audience to optimise the communication strategy and engage with a broad plurality of stakeholders (e.g. general practitioners, the housing or building community, local institutions).

- There is a need to articulate strategies at different levels (national, local, etc.).

B) Other practices for effective communication and engagement:

- The activities carried out with local, elected officials and other local actors should be considered as potentially good practices, as part of an overall risk communication strategy.

- Providing robust regulations on radon is helpful for effective risk communication strategies, taking into account the national context.

- Social media is a two-way communication tool, not just a one-way information source, and it should elicit both input and provide responses. It should be a platform for exchange among a broad range of stakeholders and involve influencers as well. There are also limitations to social media: if you post a message, you have to be prepared to

engage and respond to questions; otherwise, it might be perceived in the wrong way as a means of withholding information or ignoring the question.

- It is important to consider what aspects can confuse stakeholders when they are learning that different metric schemes exist, for example, the new report published by the International Commission on Radiological Protection (ICRP) changes the depiction of radon and is different from the Porto Declaration. The scales are different, and the standards are changing.

- Risk safety should be discussed in a more general way. In other words, there should be a common discussion about all risks (chemicals, nuclear energy, construction), framing them in the current context.

C) Innovative or new approaches to consider:

- Having comparisons of the risks in context would help with understanding the current risk.

- Children can be educated from their early years. They can also propagate the information on radon and natural exposure through the community. However, discussions in schools should be framed carefully to avoid creating anxiety.

Appendix B.4. **Case study 4 on new build projects**

Identified challenges	How challenges were addressed
Engagement and empowerment of stakeholders in decision-making processes can be challenging.	– Understand and plan stakeholder involvement roles, timing and processes. – Economic and social issues were seen as generally more important than radiological issues. – A clear identification of stakeholders is important.
Mobilise and build relationships.	Work with local "ambassadors" and to ensure that they are well informed, in order to expand stakeholder dialogues and optimise resources. – social media, focus groups, local forums.
Most important areas for improvement – future work	
Focusing on the broader context; explore the value of Social-Economic Impact Assessments as part of the new build decision process.	
Explore approaches to engage the "disinterested middle", for example using modern communication technology.	

A) Other challenges or concerns noted:

- Opposition often tends to come from those who live further away from the (planned) installation site for a new build project (i.e. from those who are not very familiar with or involved in the project). These populations tend to perceive the risks of the installation, but do not expect to enjoy its benefits.

- National-level stakeholders (government) and financing bodies deserve more attention:
    - The government steps in and provides the needed support only if nuclear energy has a social licence – which it must acquire via stakeholder engagement (e.g. at the local level).
    - Events such as the Fukushima Daichii accident also have had an impact – because of the loss of trust in the nuclear field following the accident, many countries' governments have been less keen to provide support for the nuclear industry.
    - There is a need for a national-level approach when considering waste transport issues: what implications do different site-selection decisions have on waste transport and the associated risks?

- Economic and political risks – as opposed to those associated with ionising radiation – should be considered:
    - political risks can be changes in the political situation or outside events (accidents);
    - economic risks are the most important factors influencing new build.

- There has been increasing opposition towards nuclear power, and a great deal of misunderstanding prevails as well, e.g. 80% of the public considers that nuclear energy contributes to climate change. This is particularly true among the younger generation.

- It is a challenge to properly identify stakeholders: at the local level, or those further away who could potentially be affected but not directly benefit from the installation, as well as the broader public in the rest of the country.

- The broader context is crucial; for example, the quicker than expected fall in the cost of renewables has greatly affected the attractiveness of nuclear new build projects.

- In some cases, nothing has been gained by holding a public debate on waste management issues, largely because of the interventions of media and non-governmental organisations (NGOs). In some cases, only 10-15 persons actually contributed to such debates.

- Although it is generally agreed that stakeholder engagement is important and desirable, there are always pros and cons. There is also a large population that is "in-between", i.e. people who are not vocal about their beliefs but who are not necessarily against nuclear energy; they simply remain quiet. This segment of the population is often disengaged or disinterested, and so the question is: should we engage with such groups as well, and if so, how do we reach them?

- National-level politicians should communicate with national-level stakeholders. There is a need for a national debate on deliverability and the costs of projects, which would enable the industry to demonstrate that society needs these power plants.

B) Other practices for effective communication and engagement:

- For effective communication and engagement, be situation specific and know what stakeholders need or want to hear. Consider the diversity of concerns that need to be taken into account – it is not only about what the authorities think are the key risks in terms of safety, economic and other issues, but it is also about the concerns of the stakeholders.

- Use a lessons-learnt process, trying to draw lessons from earlier experience and also looking to other countries' experiences. One question to contemplate is: does one learn more from mistakes than from successes?

- Make enough time for engagement and do things in the proper order. In the United Kingdom, two potential new build sites got struck out from government plans because the project proponent got engagement wrong: it did not take the time to talk to the local community, because the company directors were busy with other priorities.

- Do not surprise people. Although engagement can be exhausting for those participating, not engaging is not an option. The downsides of "exhaustion" are less significant than those of failing to engage with people at all.

- Use a whole-systems approach with the technical support organisation (TSO), the regulator and the proponent, each of whom should engage stakeholders independently, by establishing clear roles and being well trusted by the public.

- Use community information centres as a forum for discussion and a mean to "familiarise" local people with the plant.

- Be careful to the message conveyed in risk communication: it should not be "this installation will create many of jobs, and hence you should put up with the risks". Rather, the message should be that we are constructing a plant that provides net zero-carbon electricity.

- Start from a "clean slate" as much as possible: ask people what kind of engagement they would like to have:

  – Have a kick-off workshop that is open to everyone in the community, with the general theme: "what can we learn from you, what are your concerns and what types of engagement do you wish to see?"

- Set up an independent project website to inform people about the project and collect citizen views.

- Remember that trade unions can be advocates of nuclear projects.

- Adjust engagement approaches according to the audience:

    – The geographical situation of the stakeholders must be taken into account: those living close to the plant and reaping the benefits (jobs, in particular) versus those affected but not directly benefitting from the project versus the broader public elsewhere in the country.

    – Some participants nonetheless underlined the need to communicate to all, instead of differentiating between different types of public, i.e. equal treatment is mandatory.

- Prioritise your key stakeholders.

- Recognise that it is easier to advocate for a project (or defend an existing one) if "the messenger" can explain that he or she lives close to the installation and can clarify the benefits to the audience.

- Acknowledge that not engaging in social media is no longer a viable option:

    – When used correctly, social media is an asset since it can promote a healthy debate on a project and get everyone involved at the national level.

    – You can mobilise potential "ambassadors" who can speak on behalf of the project.

    – The recent Chernobyl mini-series generated a balanced debate in the social media.

    – You can no longer tell people (i.e. your employees) to not engage in social media – the days when you could have control over such an issue have gone.

    – You must identify a group of people in your organisation who can be responsible for social media and give them a mandate to talk – you must trust your own people, but train them correctly first.

    – Wasting one's time on the wrong media can also be risky (e.g. Facebook is no longer being followed by youth).

C) Innovative or new approaches to consider

- The report entitled *The Costs of Decarbonisation: System Costs with High Shares of Nuclear and Renewables* (NEA, 2019) can be a very promising tool to demonstrate how nuclear and renewable energies can coexist. Some use climate change as a topic to be addressed in stakeholder engagement efforts. Overall, the industry tends to use climate change arguments, but regulators do not.

- Climate change is not a perfect solution as a topic to engage the public. Although climate change is powerful as an argument, it does not mobilise everyone: e.g. in the Baltic countries, and Eastern Europe more generally, energy independence and security of supply are more important topics.

- It can be useful to create a "focus group", by selecting members – including experts – who can express their concerns to address decision makers.

- Consultation documents for the public should be prepared, in which people can make comments that the authority takes into account.

- Virtual reality tools can be used, e.g. to allow virtual visits to a power plant and help show that a nuclear power plant is (almost) like any other industrial facility.

- Community learning programmes can be developed:

– Meeting municipalities in other countries, learning directly from the mayors of other cities, or from other countries, about how they have organised their engagement around a nuclear power plant and waste disposal site.

– Taking representatives of the local community to Japan has been useful – to inform them about the Fukushima situation.

– Being clear and transparent about the ways in which this nuclear power plant is organised – who is paying, etc.

Appendix B.5. **Case study 5 on a nuclear power plant in emergency situation**

Identified challenges	How challenges were addressed
To include key actors, such as members of the medical community, in the response system, and to use public communication/social media to increase the effectiveness of this approach.	The implementation of this approach during preparedness, response and recovery requires: – The provision of training and support to health professionals concerning specific questions – Efforts of the authorities to connect with health professionals, with the aim of recruiting a minimum number of representatives from the medical community.
To include local communities and use local languages (including those of neighbouring countries).	Establish, during planning, contacts with local governments in areas with nuclear installations, with long-term government individuals responsible for providing ongoing contact and information.

Most important areas for improvement – future work
Provide consistent information to the affected population and establish trust between the affected population and members of the response system by including medical doctors who are considered as trusted experts. This includes the need to test communication materials with stakeholders and to develop simple communication tools, such as a possible radiation exposure scale.
Social media provides good options to overcome many of the underlying challenges in communication, but it also requires preparedness initiatives to ensure that the tools can be used in an optimal way.

A) Other challenges or concerns noted:

- Maintaining (or establishing) trust.

- Being consistent in communication.

- Dealing with psychological stresses.

- Mobilising people for accident preparedness; some representatives of the anti-nuclear community want to prevent accident preparedness because they cannot accept the possibility of an accident.

- Involving neighbouring countries, as there might be trans-border contamination issue. How can you integrate this broader community, beyond borders? It is challenging to co-ordinate and integrate them into a national exercise.

- Explaining terminology between scientists and terms used with the public.

- Getting people involved and interested in "peacetime".

- Explaining roles and responsibilities: the responsible agency will depend on where you are and the specific issue under consideration (e.g. food, health, the environment, transport, water).

- Knowing that insufficient information will lead people to search elsewhere.

- Recognising that doctors may not get involved voluntarily, unless there is a major accident. It is also unknown if doctors will be trusted by the evacuees and the public during such circumstances.

During the Fukushima Daichii accident, the evacuation created a high risk for the elderly in terms of both the psychological effects of the evacuation and the accessibility of medical experts once displaced. There was also an issue beyond the trust in professional experts, as parents, for instance, kept their children indoors with the intent to protect them even though it was not absolutely necessary. Workshop participants agreed that the approach regarding risk communication should be balanced and consider quality of the life beyond the effects of radiation, e.g. must children be kept indoors? Hence, it is important to consider a balanced approach between the need to protect the public from radioactive exposure so as to maintain the healthy activities of daily life and minimise psychological effects.

Other considerations that were raised included the following:

- How to put accidents/risk into perspective when compared to other industries?

- How to deal with vocal opposition? Local versus national?

- How to address the communication gap between administrative staff and technical people?

B) Other practices for effective communication and engagement:

- Use one-to-one communication.

- Use information technology (websites).

- Make documents publicly available.

- Use social media, which should be complementary.

- Use mixed groups from different disciplines and backgrounds to get varied opinions.

- Provide information to health professionals and school principals.

- Take into consideration psychological effects.

- Conduct exercises for emergencies on a frequent basis, including with local authorities, and then to communicate about the exercise.

- Develop communication hubs and involve influencers.

- Create small groups for engagement activities, as it seems easier and more effective to do so.

- Define responsibilities for all phases, from preparedness to accident response.

- Use social media: if an emergency occurs, social media connects people. For example, in Japan, social media platforms provided Q&A, which were well followed, notably by health professionals. The question therefore is to prepare in advance in the case of an accident, and to know how to connect with a social network in order to inform the public of the situation. Even better, the information could be made available in several languages. Social media is not the magic solution, but authorities should make efforts to connect with health professionals to prepare communication material, keeping in mind that social media is not the unique voice that should be used as a source of communication.

- Use other digital tools too, such as telemedicine, which helps people who do not have face-to-face medical services. Currently in Europe, there is a project to develop mobile phone applications to help address health issues in the case of an accident; however, it is still very challenging to understand which information to include on these applications. It is clear that social media should not be ignored. There are blogs of

medical professionals and a limited number of doctors, and so social media is very useful for risk communication.

- Acknowledge cultural differences and beliefs.

- If trust is established, make sure it is maintained.

C) Innovative or new approaches to consider:

- Explore the use of a radiological exposure scale (for consistency) such as the RAdiation INdex or RAIN scale, while considering the following:

  – There are many factors behind the numbers. People generally would like to know how the numbers were derived. Exposure situations are diverse and there are many parameters. The scales may be most useful at the lowest levels.

  – The worst scenario would be to have three competing scales, which would also compete with the international nuclear event scale.

  – The scale might not work in the same way in every country because processes are embedded in cultures.

  – Input should come from those with a medical background, and documents for stakeholders should be prepared with the stakeholders, not simply prepared for them.

- Communication between doctors and governmental officials should be ongoing so that medical doctors can be aware of municipal orders (e.g. evacuation orders).

- Develop a programme, application or television show that can trigger people's interests; possibly focusing on risk alone (and not necessarily on the nuclear energy issue).

Appendix B.6. **Case study 6 on long-term radioactive waste management**

Identified challenges	How challenges were addressed
An emotional public discussion can often take precedence over scientific facts and regulatory procedure.	– Non-governmental organisations (NGOs) can play a role in the expression of these emotions. – Having compelling spokespersons. – Highly engaged local municipalities can prevent politics from hindering the siting process.
How to communicate something that will take place in the distant future.	– The actual facility has to exist for an inconceivable amount of time – how can the basis for the decision support something so far into the future? – Storytelling, virtual reality and modelling to give people an idea of what the facility will look like are important in this regard.

Most important areas for improvement – future work
Engage younger generations: – Develop a joint project involving virtual reality with NEA member countries. – Introduce the topic of nuclear power and radiation, including the full nuclear life cycle, into the school curriculum.
Incorporating the values into the decision-making process for long-term projects: – Holding discussions so that action can be taken now and not left for future generations.

A) Other challenges or concerns noted:

- Raising awareness and interest in the topic:
    - understanding that this is an issue that must be dealt with now, and not leaving it to future generations (intergenerational equity);
    - the issue of dealing with general waste: "once you finish your nuclear programme, then we will look at how you deal with the waste"; however, stakeholders do not understand that it is not an option to manage waste that has already been generated; something has to be done with it;
    - being reactive rather than proactive.
- Finding the appropriate individuals that can support your message.
- Recognising that politics can play a big role on the path towards building a nuclear waste repository, but political change without community support can derail projects.
- Avoiding improper messaging to the public.
- Recognising that different views from the public on different radioactive sources (commercial, military and medical sectors) can be a challenge.
- Knowing how to communicate to the different generations of audiences.

- Taking into consideration that the media often misses the nuances in the ideas that are being conveyed.

- Trying to correct misinterpretations.

- Building trust, and sometimes regaining trust.

- Ensuring that communication is carried out with all municipalities, schools, etc., and that the focus is not only on the opposing views.

- Recognising that political and public discussion (debates) have those who are in opposition to a project propose solutions that take precedence over the scientific facts and the regulatory procedure.

- Considering how a decision can be made following a stepwise approach, for the process to move forward, and how stakeholders can be incorporated in these steps.

- Explaining irreversibility:

    – Understanding the mechanism that makes the decision final (irreversible), to the extent possible, while maintaining the flexibility to update or change the process if a newer technology emerges. How can this new technology be incorporated into the process if the site selection or solution is outdated?

    – How to engage stakeholders in such a process?

    – What and when is the point of no return? (i.e. in terms of expenses.) How permanent can the decision be?

- Determining who is responsible for early communication on the general topic of radioactive waste and its management from a political perspective.

- Acknowledging that representation of women and youth may be lacking.

- Considering stakeholders' main concerns:

    – safety: this is particularly true regarding the safety of water. The criteria for site selection do not necessarily always answer questions about the short-term safety of the facility;

    – the value of nature and heritage sites that may be impacted by a nuclear waste repository;

    – time frames considered for deep geological repositories, which can be centuries or thousands of years; and the timing of the process for site selection;

    – the economic consequences of siting decisions;

    – trust in authorities, including in the regulatory body.

- Taking into consideration the overall debate regarding the use of nuclear energy, which makes discussion on risks related to waste repositories more complicated.

- Recognising that the distribution of funds - if compensation is made available – can be difficult.

- Recognising that processes are often driven by policy frameworks adopted in a political context.

- Ensuring that different level of detail are provided to different stakeholders, for example confidential discussions with the municipalities and only the outcomes and decisions to the public.

- Preparing for resource-intensive communication and engagement activities.

- Considering regulatory framework and requirements versus acceptance:

- There is the law and then there is practice. It is difficult for people to be satisfied with agreement on a decision even if they cannot legally refuse it. The perception of the risk and fear is a problem.

- The legal risk of the appeal to an administrative court, meaning that everyone would need to be involved.

- There is a need to better explain the acceptance criteria so that the public can understand it.

B) Other practices for effective communication and engagement:

- Recognise that the participatory process is extensive, but the goal should not be to expect the community to unanimously agree on a specific site, but rather to build trust in the process.

- Ensure people do not feel targeted, and be clear that there is no specific region or city in the siting process.

- Use social media to monitor the social climate of the opposing organisations.

- Consider the following three factors as crucial: community buy-ins, job creation and transparency.

- Invite and engage NGOs prior to delivering information to the media, although this can prove to be difficult since there may be a reluctance to attend or participate in such discussions.

- Hold a national debate to openly discuss "what the problem is" in the process from the very beginning in order to gather information and opinions on the possible solutions.

- Engage with academia.

- Engage with trusted advocates.

- Engage locally.

- Train scientists so that they can effectively communicate with the public. Develop a programme such as "Talk to a Scientist", where anyone can call in (or email) to ask questions.

- Use storytelling techniques.

- Use humour, while recognising that there is a time and place for this.

- Consider the following stakeholders:
  - people who live along the transport route and within the emergency zone;
  - members of national NGOs;
  - neighbouring countries;
  - younger generations.

- Ensure face-to-face engagement with representatives of national NGOs, all in one room, to consult and exchange on issues and concerns.

C) Innovative or new approaches to consider:

- Use virtual reality to explain the concept of radioactive waste management and to engage the younger generations; provide scenario-based examples, use 3D simulation tools.

NEA PUBLICATIONS AND INFORMATION

The full catalogue of publications is available online at www.oecd-nea.org/pub.

In addition to basic information on the Agency and its work programme, the NEA website offers free downloads of hundreds of technical and policy-oriented reports. The professional journal of the Agency, NEA News – featuring articles on the latest nuclear energy issues – is available online at www.oecd-nea.org/nea-news.

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Towards a Shared Understanding of Radiological Risks

The decisions made about exposure to ionising radiation tend to be driven by subjective judgements about the health risks that radiation exposure may cause. In order to reach decisions that are effective and sustainable, it is essential for nuclear safety regulators, governments, nuclear facility operators and other nuclear energy decision makers to communicate scientific, technical and regulatory information regarding radiological and other risks to all stakeholders. Communicating such information can be complex since people judge and evaluate risks differently depending on the context and on their perceptions of risk.

In this context, the Nuclear Energy Agency (NEA) organised the "Stakeholder Involvement Workshop on Risk Communication: Towards a Shared Understanding of Radiological Risks" in September 2019. The workshop provided an opportunity for participants to share perspectives and lessons learnt in risk communication, identifying what has been effective and what has been less effective in the various cases. By understanding how situation-specific factors influence risk communication, a common framework addressing such circumstances can begin to emerge.

This report attempts to capture the collective wisdom generated over the three days of interactions in the hope that the knowledge gained from this workshop will benefit governments and citizens alike.