IRPA

INTERNATIONAL RADIATION PROTECTION ASSOCIATION

PRACTICAL GUIDANCE FOR ENGAGEMENT WITH THE PUBLIC ON RADIATION AND RISK

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Preface

Public understanding, trust and consent are absolutely central to implementing effective and proportionate radiation protection. Without this we, as radiation protection professionals, will not fully achieve our aim of adequately protecting the public without unduly limiting the safe use of medical, scientific and industrial radiological practices for the benefit of mankind.

IRPA strongly believes that all radiation protection professionals and radiation protection societies ('Associate Societies') have a duty to engage with the public, to play our part in helping to address and alleviate concerns, and to ensure that solutions put forward really do take account of the issues, perceptions and concerns of all interested parties. This can only be achieved by approaches based on active listening and engagement, developing empathy, transparency and building trust.

The objective of this guidance document is two-fold. Firstly, it is to enthuse all radiation protection professionals to become more active public advocates for radiation protection. Secondly, it is to provide information, experiences and techniques to help all of us in our profession to become more effective and comfortable in this challenging task.

"Science will not be implemented without trust".

Ryoko Ando, Gardener and community leader, Fukushima Prefecture

Short Summary

- Radiation protection professionals have a duty to engage with the public and to put their expertise at the service of the public good.
- Radiation protection societies are well placed to play a key role in engaging with the public as trusted sources of unbiased information.
- Local culture has a strong influence on how to engage effectively; advice in this document is only a starting point based on international best practice.
- The system of radiation protection is based on science, but individual perception of risk and benefit is a legitimate and important factor, as behaviour is strongly driven by perception.
- Keys to successful engagement include: preparation, clear and accurate messages, empathy and active listening, and authoritative spokespersons.
- An engagement strategy should define objectives, audience, messages, engagement methods, resources, timing, and evaluation.

Table of Contents

		Page
1. Why engage with the public?		7
2. Who are 'the public'?		8
3. Three underpinning considerations		
3.1	Radiation risk science	8
3.2	Risk perception	9
3.3	Benefits and risks	9
4. Communications and engagement strategy		9
5. Good practices in communication – including face to face engagement		11
5.1	Lose the scientist, become a human being	12
5.2	Key common issues in face-to-face engagement	14
5.3	Is it safe?	15
6. Use of different media		15
6.1	Media interviews and discussions (TV, radio, newspapers)	16
7. Guidance for specific situations		18
7.1	Medical exposures	19
7.2	Non ionising radiation	21
7.3	Radon-related situations	22
7.4	Radioactive waste management	23
7.5	Radiological and nuclear emergencies	24
7.6	Malevolent use of a radioactive source	28
7.7	Post-accident and long term recovery situations	28
8. The role of radiation protection Associate Societies		29
8.1	General public information	30
8.2	Public engagement on specific topics	30
8.3	The conventional media	30
8.4	Wikipedia	31
8.5	Government and Political Liaison	31
8.6	Liaison with other professional organisations	32
8.7	Schools programmes	32
8.8	Student and STEM engagement	35
8.9	Science outreach	35
8.10	Training radiation protection professionals in public engagement	35
9. The role of individual radiation protection professionals		35
10. Supporting information and general references		36
11. Acknowledgements		37

		Page
Appendices		
Appendix 1	IRPA Guidance on Stakeholder Engagement	38
Appendix 2	Factors Influencing risk perception	39
Appendix 3	Science outreach and related research policies	40
Appendix 4	Citizen science	42
Appendix 5	An example of an Associate Society's communication and engagement strategy	43

1. Why Engage with the Public?

It has become very clear that public understanding, trust and consent are central to ensuring effective and proportionate radiation protection without unduly limiting the safe use of medical, scientific and industrial radiological practices for the benefit of mankind. One only has to look at the potential impact of public concern over issues where fears and perceptions can have a large (and often rather negative) influence. Clear examples are radioactive waste disposal, nuclear power in general and emergency situations in particular, radioactivity in the environment, and also high radon areas, paediatric medical imaging or the presence of mobile phone masts or electric power lines. These emphasise the importance of working to address the concerns and perceptions of 'the public', and what seems to be a natural fear of radiation exposure in some quarters, which otherwise will prevent or dilute the societal benefits of the responsible management and use of radiation and radioactive material in the future.

IRPA strongly believes that all radiation protection (RP) professionals and the radiation protection societies ('Associate Societies' - AS) have a duty to engage with the public. We must play our part in helping to address and alleviate concerns, and ensure that solutions put forward really do address the perceptions, concerns and interests of those affected and involved.

But this is not an easy topic for many of us as RP professionals. Experience in many different fields has made very clear that perceptions of the public are not easily changed by simply presenting scientific facts and information. There has to be much more of a two-way process, of listening to concerns and demonstrating a real empathy with their viewpoints, working to develop trust and respect between the parties. However, as scientists and RP professionals, many of us feel ill-equipped to take these steps.

The objective of this guidance document is therefore two-fold. Firstly, it is to enthuse all RP professionals to become more active public advocates for radiation protection. Secondly, it is to provide information, experiences and techniques to help us to become more effective and comfortable in this task. The guidance document takes the learning from risk communication science and many practical experiences in communication and engagement, both good and bad, and presents these in a simple format to help us on this journey.

Essentially, the guide aims to provide the 'how' to engage and communicate, not the 'what' to say. It is aimed at RP professionals who know and understand the science and philosophy of radiation risk and protection, but who may be wary and uncomfortable in venturing into the real and complex world of public concerns, understanding and perceptions.

It is recognised that local culture and accepted practices can have a very strong influence on the effectiveness of communication/engagement strategies and techniques. Thus the guidance in this document, which is based on best international practice, must be interpreted and judged locally so that implementation is aligned with the culture and accepted practices of the country.

2. Who are 'the Public'?

We often refer to 'the public' as though it is a single entity, but in reality there are many differing groups and types of people involved, and in particular many different types of situations where there is a need for active engagement. As individual humans we are unique in how we learn, in our life experiences, how we perceive risk, and what we value. Overall this makes quite a complex picture. While there is no "one size fits all" answer, a number of strategies, skills and techniques can be utilized for successful interactions.

Public engagement can include providing scientific knowledge and stimulating interest in radiation, for example to schoolchildren and students. It can involve working with individuals and communities to provide a firmer basis for empowered decision making, including the engagement with relevant media, politicians and other key influencers. Of course there is engagement with patients, carers, and healthcare professionals in the medical sector so that there is a greater understanding of the benefits of medical exposure. Emergency situations involve what are termed 'crisis communications', where the emphasis is on explanation and persuasion relating to a necessary rapid course of action.

Each situation can have a different social dimension, ranging from a relaxed 'educational' context such as a school programme, through situations of somewhat more personal and social stress, for example related to a realisation of high radon or a proposal for a waste repository in the community. In extremis there are possible situations involving very significant fear and concern, together with the potential for real harm, such as the Chernobyl and Fukushima Daiichi emergencies, and a 'dirty bomb' terrorist incident would almost certainly be similar.

This guidance document aims to provide help in addressing all these eventualities. In several of the situations referred to there will be a need to involve an ongoing strategy of engagement with stakeholders, the majority of whom will not be experts in radiation protection. IRPA has previously issued guidance on Stakeholder Engagement (see Appendix 1) which provides some principles for establishing such longer term engagement with affected and interested parties. For addressing these situations this current guidance on public engagement should be read alongside the earlier stakeholder engagement document.

3. Three Underpinning Considerations

3.1 Radiation risk science

The system of radiological protection for ionising radiation used world-wide is developed by the International Commission on Radiological Protection (ICRP). A key assumption of this system is the Linear No Threshold (LNT) model of risk vs dose. Of course there is direct scientific evidence of harm at significantly high levels of exposure. However, it is very important to note that whilst LNT is a prudent approach for the purposes of establishing a protection regime, it is not a confirmed scientific fact at low dose exposure of less than around 100mSv. It must be recognised that the overwhelming majority of exposures in practice are at the level of 'a few' mSv/year or less, and as such are dominated by natural background.

At this level of exposure there is no direct evidence of harm, and the assumed LNT nominal risk factor for protection purposes is a matter of conjecture based on incomplete information. Whilst there is radiobiological and epidemiological science which indicates support for the LNT model, there is also some evidence against. All that is known for sure is that if there is a risk at these low exposure levels, then it is what would normally be regarded as very low and bounded. If there was to be a significant risk we would be able to detect it scientifically.

At levels of most practical relevance (around a few mSv/y), the current knowledge about radiation is that if there is risk, it is very small and comparable to commonly-accepted risks in society

3.2 Risk perception

As scientists, RP professionals are familiar with the risks of radiation as expressed above. However, there is extremely strong evidence that the public perception of radiation risk is very different from the scientific understanding, and is much more averse. It is also very clear that it is perception that drives behaviour and attitudes. The whole basis of effective engagement with the public, as developed in this guidance, is to understand and recognise these perceptions, concerns, fears and aspirations, to openly acknowledge them with empathy, and to move the dialogue forward on that basis.

3.3 Benefits and risks

There is often discussion around what is an acceptable level of risk. However, in reality it is not risk itself that is either acceptable or unacceptable; it is situations or activities that are judged acceptable or not, and each such situation or activity has elements of benefits and risks that combine to allow the overall judgement on acceptability for an individual. At the same level of exposure, a situation may be considered as acceptable or not depending on the context.

In fact the whole practice of radiological protection is based around considerations of benefits and risks, including for example the fundamental principle of *justification*. We have to weigh all the elements that characterize an exposure situation. Hence it is not helpful to focus solely on risk during our public engagement – RP professionals should always seek as far as possible to develop engagement in a framework of benefits and risks.

4. Communications and Engagement Strategy

Before commencing any engagement activity it is essential to define the strategy and develop implementation plans, including what you hope to achieve. Where possible this should be done in association with communications experts who bring a complimentary skill set to the process. The following suggestions should be taken into account in a proportionate way in developing the strategy and plan for each specific activity.

Define your objectives

Any strategy and plan must be focussed around defined objectives, and every individual engagement should also have its own specific objective. There are many possible objectives, for example including:

- Building trust
- Supporting stakeholders to make informed decisions related to radiological risks
- Informing about radiological risks
- Dispelling myths
- Establishing two-way communication and joint problem solving
- Inspiring young people on science and radiation
- Assist in optimising exposures – e.g. for patients, radon, etc

Identify the audience

- Who is directly affected?
- Who is indirectly affected?
- How do different stakeholders feel about the situation?
- Who makes decisions?
- Which other agencies, actors, institutions, experts, NGO's are involved in this radiation protection topic?
- Who can be trusted partners and advocates? Who are vocal opponents, and why?
- Who can help to develop a detailed description of your main audiences?

Develop messages, examples of text or graphics and select key communications and engagement methods/channels

After listening and identifying any concerns, describe the forms that your messages and engagement will take. Where different agencies are involved it is advised that messages are consistent across all parties ("One message, many voices"). Different situations and audiences need different processes, texts or graphics. In any given situation consider what is the best balance between *dissemination* (giving out information) and *engagement* (active two-way communication). Think about how the messages will be disseminated, including details about mailings, social media platforms, media destinations, etc. For example:

- Personal communication: face-to-face or letter/email
- Traditional media: posters, leaflets TV, radio, newspapers, webpage
- New social media: Facebook, Twitter, SMS, Instagram, YouTube and other social networking platforms.

There is ample guidance available on the internet on to use these types of messaging platforms and tools - for example WHO Guidance: https://www.who.int/mediacentre/communication-framework.pdf

Empathy must be included in the engagement processes. Recognising emotions during audience engagement is important because you are more likely to be heard if you can acknowledge concerns and validate feelings before giving facts. Validation of feelings is critical because you can acknowledge and say that feelings are reasonable and understandable even when they are scientifically unwarranted.

Plan your work, resources and timing

Describe the human and budget resources that you will use to support your communications strategy, including projections of future activities and costs. Provide a time-line for the implementation of your strategy, and identify milestones.

Evaluate and improve your strategy and plan

Propose methods for evaluating the success of your communication strategy/plan: surveys, results at certain dates, website analytics, responses from other RP professionals or media. Ensure that there is a definite way to gauge whether your strategy has failed or succeeded. Identify ways in which your strategy and plan can be adapted to changing conditions, and improve where necessary.

Stakeholder engagement strategy

Where it is clear that there needs to be a longer term stakeholder engagement process, then further more detailed guidance is available - Appendix 1 and via the IRPA website: www.irpa.net/docs/IRPA%20Stakeholder%20Engagement%20Guiding%20Principles%20(2008).pdf

5. Good Practices in Communication - including Face to Face Engagement

Since human behaviour is strongly driven by perception rather than by facts themselves, risk perception is a concept of great importance when developing sound and successful risk communication. Some of the factors which can strongly influence risk perception are given in Appendix 2.

Experience over many years and in many fields has shown that perceptions are not easily changed simply by presenting scientific facts and information. And other people's perceptions may well be an important part of the eventual solution. To be successful there needs to be an approach based on two-way dialogue, active listening, transparency, showing empathy and ultimately developing trust and respect between the parties. 'Empathy' implies a connection that goes beyond communication and understanding – it means that there must be an emotional engagement, a full understanding and recognition of how parties feel about the issue, and it is central to an ability to move forward.

"Some things can only be understood via the heart"

"Sympathy/Empathy"

By A Fernot ©

An illustration of the difference between **Sympathy** and **Empathy**

5.1 'Lose the Scientist, Become a Human Being'

The above skills necessary for effective interaction with the public are not always common in the skill set of radiation protection professionals, whose background and training are generally based in the physical sciences rather than the social sciences, which are more oriented towards human behaviour, psychology and cultural issues.

The importance of recognising and responding to perceptions and emotions, rather than simply sharing our professional scientific knowledge, means that many RP professionals need to learn new skills. We need to become more 'human oriented' and, whilst of course still respecting our scientific tradition and knowledge, we need to recognise that many of the public with whom we are seeking to engage will not be receptive to scientific information, at least until they begin to have confidence in our ability to listen and understand their concerns. And we also need to recognise that solutions will not necessarily be solely based on science.

"People need to know that you care before they care what you know".

Case Study: Professor Niwa and the Fukushima Dialogue

Prof Niwa

Some early interactions with local communities in and around Fukushima Prefecture which aimed at presenting the science of radiation, failed totally, resulting in scepticism and distrust of scientists. When Prof Niwa visited Fukushima Prefecture immediately after the nuclear power plant accident occurred, at first he thought that fortunately the radiation dose was low so that it would not cause any health effects and it would not be so difficult to recover people's composure. However, after he witnessed that the accident completely destroyed people's daily lives everywhere, he realized that science alone can't help people since it is clear that the Fukushima issue is not only about health effects but also about social problems.

Many people were very anxious about radiation, regardless of the low dose. He thought that if we biologists clearly stated that they had no health effects, we could solve a few social problems, but that was wrong and a conceit. He realized that 'No matter how well-founded science is, it is absolutely useless if no one can take and understand it '. This is a quite important lesson. It was necessary to be a human being first, not be a scientist. He eventually realised the central importance of meeting real people in their own environment, talking and listening, generating a dialogue, eventually realising that the accident had a major impact on relationships and daily life. Only at this stage, when trust and mutual respect had started to be developed, could any progress be made with helping the community come to terms with radiation and risk.

Date dialogue (Fukushima prefecture)

Hippo dialogue (Miyagi prefecture)

'It's not really about radiation, it's the impact on our lives'

5.2 Key Common Issues in Communication and Face-to-Face Engagement

As noted above there is a wide range of situations and contexts where we need to engage with the public. However, whilst noting the range of communication and engagement strategies which can be applied across a range of situations, there are many common factors which must be taken into account. These factors are generally relevant to all (or most) communication situations, but must be intelligently adapted to the specific context.

Prepare in advance

- Be clear on what you are trying to achieve. Focus on a few key message(s) and be as concise as possible. Messages should address the target audience, their concerns and social context, and provide an appropriate level of empathy/understanding to acknowledge and validate the audience's feelings.
- Be aware what the audience might have already seen, heard or read in the news or social media
- Learn and rehearse the delivery of key messages.
- Anticipate and prepare for questions. Most questions can be predicted in advance.
- Note that in specific situations some participants may have a political agenda: if this seems likely, then careful thought is needed on how to respond.

Provide clear and accurate message content

- Know your stuff. Conduct background research on unfamiliar issues and consult with technical experts when developing message content.
- Use simple, clear language. Avoid technical terminology, acronyms, fear inducing and highly-charged words and phrases.
- Address the underpinning science and be straightforward. Present only the known facts, put any risk in perspective and acknowledge where uncertainties exist. Note the balance of benefits and risks where applicable.
- Beware of radiological units. If you must use a unit, then stick to one (e.g. mSv) and give a brief context (e.g. natural background).
- Don't speculate, guess, assume, or make promises you can't keep. Don't stray onto meaningless information, statistics or probabilities.

Be a clear and authoritative spokesperson

- Focus on delivering the messages in a calm and coherent way. Avoid verbal and physical distractions that take the focus away from the message. Avoid humour, distracting body language or "ticks", and repeated use of verbal crutches ('eh', 'um', 'like').

- Positive body language taking account of local cultural norms: for example maintaining frequent eye contact, using a well-modulated voice, keeping your hands in view; sit forward in a chair or lean slightly towards the audience. During stress people are more attentive to visual stimuli than audible ones.

- Develop a memorable but cohesive 'story'. Remember that emotion is extremely powerful in helping messages to be retained and understood. The 'story' should avoid sudden switches of subject and end by summarising the key facts and messages.

- Listen, engage and respond to the audience. Acknowledge their concerns, issues, and questions. Avoid saying 'no comment' - it can be construed as if you are hiding something. Acknowledge when you don't know an answer and let the audience know what you will do to respond.

- Speak on authority from your organisation or the profession. Minimise referring to yourself, rather use 'we' in your responses. Also be aware of your own limits, if you don't know what you are talking about – stop talking.

5.3 Is it safe?

This is a key question, which is highly likely to be asked. There must be a thought-out answer, prepared in advance. Note that many organisations avoid using the word 'safe' in their communications because it is a judgemental and perception-based concept – what seems safe to you may not be safe to others. Also there is a common perception that 'there is no safe level of radiation', of course based on the Linear No Threshold (LNT) model assumption.

Analogies such as with the risks of crossing the road or travelling to a meeting, i.e common activities which are generally regarded as 'safe' even though there is a residual risk, can be perceived as trivialising people's concerns if not handled sensitively. The chosen answer to 'Is it safe?' could depend on the situation and the level of trust and respect that has been developed. For example, in some circumstances it may be acceptable to say 'I believe it is safe, but I acknowledge that you may feel differently', and then have a conversation from there.

Every good conversation begins with good listening

6. Use of Different Media

The media do more than simply provide information about radiological risks and benefits or radiation protection in general. Print, audio/visual and digital media are not simply a neutral intermediary of information between an information source and a recipient. The media modify the information in the process, and this might influence the recipients of their messages. On the other hand, there is an opportunity for information sources (such as scientists, authorities, experts, politicians and interpersonal networks) to frame the information in the way that they prefer.

Emerging and evolving communication technologies, such as social media, offer the possibility of improved communication, as these technologies have the potential for increased information capacity, dependability, and interactivity. Moreover, the rise of social media has enabled users to demand more transparent, high-speed communication and accountability from governments, public institutions and emergency managers. Besides their obvious advantages, social media can potentially become a tool for misinformation and manipulation, as well as spread anxiety. These actions create high time pressures and an additional personnel burden as well as the need of the competent skills, training and resources. Recent non-nuclear and radiological emergencies have shown the growing importance of social media as a key information channel during emergencies. It is important to see this as an opportunity for Associate Societies to become a meaningful communicator in such cases.

Social media can have a significant impact on the public's opinions and concerns, with the possibility that any Twitter account holder appears free to issue 'expert opinion'. Social media has been used to gather support for anti-nuclear or anti-radiation petitions: proactive and measured stakeholder engagement by RP professionals is sometimes necessary to deal with those 'non-experts' voicing concerns. The speed with which Twitter and Facebook can respond to adverse news reports is phenomenally quick, with the number of negative posts escalating within minutes of an incident or event. However, there needs to be careful judgement before engaging in uncontrolled social media 'debates' – it could be counter-productive.

In developing a communications and engagement strategy it is important to consider the full range of available tools, including their strengths and weaknesses in the context of the intended audience. The range covers the traditional options of booklets and leaflets, through website options and the more modern and flexible Twitter, Facebook, YouTube and newer platforms. This field is changing rapidly, and further information and advice is widely available on the web.

Tips for web and social media communication:

Associate Societies should develop integrated strategies for the use of social media – consider which platform is best for different types of situations and messages.

- Depending on the context it might be better to communicate first on social media because it is faster than traditional media and rumours of lack of transparency in releasing information may be avoided.
- The design of the website should be nowadays adapted to different mobile applications and devices (e.g. responsive design for tablet, smartphone).
- Whatever medium is used it must be kept active and up to date. Beware being silent on social media – issues will go on without you!

6.1 Media interviews and discussions (TV, radio, newspapers)

Mainstream media provides an opportunity to reach a large audience rapidly, but there are challenges regarding the potential loss of control of the message. As RP professionals we may find

ourselves facing the media to explain radiation protection issues and our role. It is important to prepare thoroughly for such an encounter.

There are several additional important considerations to take into account. The pressure on time and/or space means that the message must be very focussed and direct. This is very important both for live interviews and for situations where there will inevitably be a process of editing beyond your control. Make life easy for the interviewer and editor by having a clear and focussed input.

Consider using the '27-9-3 rule', which requires the communicator to make a persuasive point in no more than 27 words within a time frame no longer than nine seconds with no more than three points discussed. These limitations help a communicator to focus on understanding how to connect to the listener or reader, and thus the listener to understand the message. For examples of this technique see the reference to a presentation by Covello in section 10 below.

When taking part in a discussion with other parties, again it is important to have a clearly prioritised and short key message which you need to put across. Where another party makes a comment or assertion that you clearly disagree with, then it is important to respectfully state your disagreement, with concise reasons.

Be prepared to compose yourself for media interviews, if necessary taking a few seconds to reflect. In a television interview situation be calm and if you don't understand the question ask politely for it to be repeated. Be clear in what you say as it may be misquoted. Also remember it may not end when the camera turns off. Always remember your audience, be sympathetic to their concerns, and listen. Do not show any indication of bias e.g. saying things that could be construed as pro-nuclear.

Tips for media/press conference:

Basic things that an engager has to be clear on before a conference are:

- Anticipate questions – some will be tricky.
- Who is going to mediate a press conference?
- What messages are you going to say?
- Who will explain actions taken? (identify clear roles and responsibilities)
- What kind of supporting material can you use?
- Where will you organize it and how will your message be supported?
- How long can it be?

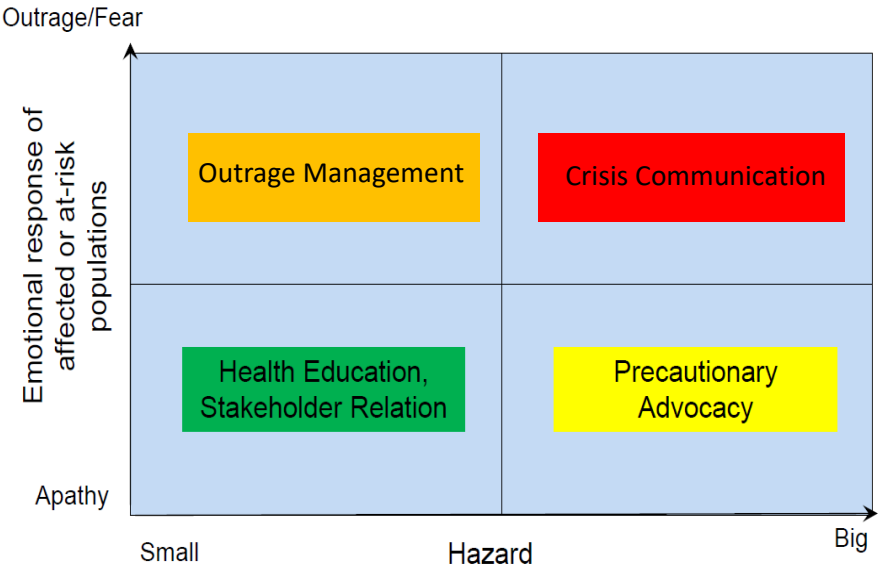
Prepare a media kit:

A media kit contains all the background information important for a journalist e.g. the agenda of the press conference and names with affiliations of speakers, information about the event. It should contain visual material on paper and an electronic version, photos, graphic/video material, facts about the IRPA AS, contact details, written media releases with statements.

7. Guidance for Specific Situations

The differing types of situations, and the related communication strategies, can be illustrated by the following diagram developed by WHO[1] in the context of health emergencies.

[1] https://www.who.int/global_health_histories/feig_presentation_communicating_health.pdf?ua=1



This relates both the actual risk and the emotional response of people against the hazard, leading to a 'risk v perception' matrix and the choice of the most appropriate of the four illustrated communication strategies (although in reality there is a continuum of situations).

Public apathy – Small risk: Education may be effective. Examples from WHO campaigns (patients, parents, carers, doctors). Patient centred communication to secure voluntary consent for diagnosis or treatment. Anticipate questions and prepare answers.

Public apathy – Large risk: Precautionary advocacy – arouse emotions. Required to prevent secondary crisis. "WATCH OUT!" Examples include radon and UV radiation. Needs dissemination of information via a variety of channels e.g. public information bulletins and campaigns.

Public outrage – small risk: Outrage management – listen and acknowledge feelings. Provide facts about why there is no danger. Note that uncertainty is often perceived as risky. Examples include siting issues for a waste repository or nuclear facility.

Public outrage – large risk: Crisis communication: build or repair trust, inform the public about the risks and protective actions, and gain agreements with stakeholders. Examples include major radiation/nuclear emergencies.

Noting that it is necessary to align the engagement approach to the nature of the risk and the level of possible concern, the following guidance provides further information on a range of specific situations.

7.1 Medical exposures

There is some evidence that in the public mind medical exposures can be a significant radiation concern. For example, experience from the Spanish Society's public website shows that most questions received from the public are concerned with medical exposures (58%), whilst only a few related to concerns about nuclear power.

One of the central tenets of the Bonn Call-for-Action, developed in 2012 under the leadership of IAEA and WHO, is to help improve the benefit/risk-dialogue with patients and the public, by:

a) increasing awareness about radiation benefits and risks among health professionals, patients and the public;

b) supporting improvement of risk communication skills of health care providers and RP professionals (involving both technical and communication experts) in collaboration with patient associations, in a concerted action to develop clear messages tailored to specific target groups;

c) working towards an active informed decision-making process for patients.

Shared decision making is seen as one of the highest potential levels of patient involvement. For example, the European Patients Forum (2015) states 'when a patient gains all the knowledge s/he needs to understand her/his condition, her/his life goals and the benefits and risks of different therapeutic options, s/he can reflect what therapeutic choice will be most suitable in her/his personal situation, and participate actively in the therapeutic decision-making process with her/his doctor.' Or as stated by the World Medical Association – 'the patient has the right to the information necessary to make his or her decisions'.

However, there are still a lot of challenges related to communication, dialogue and engagement in radiation protection in medical exposure situations. Key challenges include different hospital policies, lack of time, shortages of staff, patients' lack of information, and attitudes of health professionals, which are seen as important challenges of enhanced interaction with patients.

In addition, paediatric healthcare professionals continue to face negative public perceptions of medical imaging radiation risks, and these perceptions are often disproportionate to the medical benefits. Increasing awareness related to radiological risks and enhancing efficient dialogue with the parents or guardians of a patient can help establish open, effective, and trusting communication, which if conveyed properly should enable patients for informed-decision making.

Limiting the use of technical radiological jargon, describing risk using familiar comparisons, providing graphical visual aids using pre-emptive informational handouts, and maintaining awareness of how medical imaging and radiation risks are portrayed in the news media can also benefit communication objectives. In radiotherapy, information support for cancer patients in this setting has been found to reduce patients' fears and inclinations to decline treatment, and increase coping. There is a huge importance of informed consent, which should be viewed and implemented as a process of ongoing dialogue about anticipated benefits and risks of ionising radiation, and not only as an administrative procedure.

In addition, RP professionals must be aware that it is not just patient engagement that is important. There is an assortment of other healthcare professionals who are not RP-specialists (such as paramedics and nurses) and yet they may be proactively involved with exposed persons either as part of routine imaging and treatment or in the event of an incident. For example, nurses who might be caring for patients undergoing therapy or imaging with unsealed radioactive materials, or paramedics attending to casualties who may be potentially contaminated and being transferred to Accident and Emergency departments in ambulances. Successful engagement with such healthcare professionals who are not RP specialists can have a profound effect on the wellbeing of the public and lead to better overall protection.

In a medical setting a higher proportion of engagements can be one-to-one (with a patient) and/or one-with-a-small-group (patient accompanied by a few close family members) than in other exposure situations.

In addition, health care workers are dealing with a person who will receive, or has received, a radiation dose and the associated detriments and benefits of that dose. It is an emotive encounter, particularly in paediatric imaging or therapy where parents or guardians are understandably concerned about the potential radiation damage to the patient. Probably more than in many other situations the patient and their family are looking for understandable and accurate information delivered sympathetically by the trustworthy expert.

Tips for effective communication in medical applications of ionising radiation

- Be consistent and accurate. Avoid ambiguity and speculation.
- Clarity is crucial. Don't stray onto meaningless information or statistics or probabilities. Do not use technical terminology.
- If appropriate, talk about the benefit/risk instead of the risk/benefit. This frames the conversation in a more positive direction. Do not make any guarantees.
- Choose your words very carefully. Avoid phrases like 'risk of death'.
- Keep messages concise and simple: Remember that the patient is likely to be sick and stressed already due to their illness or condition. Similarly, parents are likely to be stressed where the patient is their child. When under considerable stress, remember that people don't listen very well and can jump to irrational emotionally-charged opinions or conclusions. Under stress, people can only comprehend three to five messages at a time.
- Do not try to be humorous, but remain positive.
- Collaborate with and get help from your medical colleagues.

Specific support reference material for medical exposure

- Bonn Call for Action 2012: https://www.iaea.org/sites/default/files/17/12/bonn-call-for-action.pdf
- Communicating radiation risks in paediatric imaging (WHO 2016): https://www.who.int/ionizing_radiation/pub_meet/radiation-risks-paediatric-imaging/en/
- Communicating Radiation Benefit and Risk Information to Individuals under The Ionising Radiation (Medical Exposure) Regulations (IR(ME)R): SCoR (UK): https://www.sor.org/sites/default/files/document-versions/communicating_benefit_and_risk_to_patients_under_irmer.pdf#search=%27•+Communicating

+Radiation+Benefit+and+Risk+Information+to+Individuals+under+The+Ionising+Radiation+%28Medical+Exposure%29+Regulations%3A+SCOR+%28UK%29%27

- ICRPaedia "Guide to Radiological Protection in Healthcare http://icrpaedia.org/Guide_to_Radiological_Protection_in_Healthcare
- IAEA Radiation Protection of Patients (RPOP) website https://www.iaea.org/resources/rpop

7.2 Non-Ionising Radiation (NIR)

Large portions of the population do not know the difference between ionising and non-ionising radiation. They expect all radiation professionals to be experts in all forms of radiation, although many within the profession specialise in either ionising or non-ionising branches. Non-ionizing radiations correspond to electromagnetic radiations with energy lower than the ionization threshold of hydrogen and oxygen (i.e. ejecting electrons from an atom). It covers from static fields to frequencies up to 3.10^{15} Hz.

Guidelines regarding the safe exposure to NIR radiations/electromagnetic fields have been provided by two independent organizations: the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the International Committee on Electromagnetic Safety (ICES) of the Institute of Electrical and Electronics Engineers (IEEE). Two main biologically relevant effects may result from exposure to NIR radiations: magnetic induction in the low frequency range, energy deposition and possibly heating in the high frequency range (especially, for example, in the case of lasers). Both effects may occur in the intermediate frequency range (100 kHz to 5 MHz).

The NIR range includes many different forms of radiation devices common to our daily life, among which (in order of increasing frequency): magnetic resonance imaging, power-line magnetic fields, induction plates, microwave ovens, mobile phones, visible light and UV (including lasers).

Given the well-known common concerns about mobile phone masts, electricity power lines and several other NIR examples it is helpful for all RP professionals to become familiar with the key concepts and science of NIR risk. Whilst detailed engagement on this topic is perhaps best dealt with by NIR specialists, all RP professionals should have enough knowledge to confidently discuss the key NIR issues.

When talking about NIR it is important to:

- Explain uncertainties: What we know, what we don't know as a community
- Give a sense of control: Time, Distance, Shielding works for all forms of radiation
- Know where to go for more information

Specific support reference material for NIR

- Institute of Electrical and Electronics Engineers (IEEE). IEEE standard for safety levels with respect to human exposure to electric, magnetic, and electromagnetic fields, 0 Hz to 300 GHz. IEEE Std C95.1-2019. 2019. https://standards.ieee.org/standard/C95_1-2019.html
- IEEE: Synopsis of IEEE Std C95.1TM-2019 IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300GHz.

https://www.researchgate.net/publication/337809714_Synopsis_of_IEEE_Std_C951-2019_IEEE_Standard_for_Safety_Levels_With_Respect_to_Human_Exposure_to_Electric_Magnetic_and_Electromagnetic_Fields_0_Hz_to_300_GHz

- ICNIRP. Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz). Heal Phys 2010/11/12. 2010;99(6):818–36 https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf
- ICNIRP: Guidelines for limiting exposure to electromagnetic fields (100kHz to 300GHz). Health Phys 118(5), 483-524, 2020. https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf
- WHO. Extremely Low Frequency Fields Environmental Health Criteria Monograph No.238 2007. https://www.who.int/peh-emf/publications/Complet_DEC_2007.pdf?ua=1
- Electromagnetic fields and public health: Base stations and wireless technologies https://www.who.int/peh-emf/publications/facts/fs304/en/

7.3 Radon-related issues

Exposure to indoor radon is believed to be a significant cause of lung cancer worldwide. Both the IAEA and European Basic Safety Standards require Member States to develop National Action Plans to address long-term risks from radon exposures. Among others, these plans should include the development of a "strategy for communication to increase public awareness and inform local decision makers, employers and employees of the risks of radon, including in relation to smoking".

In addition, several studies within the field of communication about radon have shown that stakeholder involvement is beneficial to the implementation of radon risk protection actions. WHO also recognise that key elements for a successful radon national programme include stakeholder engagement and collaboration with other health promotion programmes (e.g. indoor air quality, and tobacco control) and the training of building industry professionals and other stakeholders involved in the implementation of radon prevention and mitigation.

Tips for effective communication about radon

- The radon related message is short, it calls for action – it is proactive, it is clear, it is personalized, and it addresses the stakeholder directly: e.g. test, fix and protect your family. Structure the message in three short sentences. For example:
  - Radon is a colourless, odourless, tasteless, radioactive gas. It escapes from the ground, and can accumulate in buildings. Presence of radon has to be measured by special equipment.
- You can expel radon from your home by technical means. This can be relatively cheap and not difficult. New houses especially in radon areas should be built incorporating these methods – this is particularly cost-effective.
- Include radon related topics on the Associate Society website
  - Cross-link national and local radon webpages.
  - Publish and communicate basic radon information for instance, where to get radon self-test kit, how much does the kit cost, where are results published.
  - Publish the radon action plan online.
  - Radon subventions and applications are published online.

  - Tenders for radon mitigation activities are published online.
  - National legislative documents directly or indirectly linked to the radon issues.
- Use already developed outreach documents, such as brochures, posters. (Obtain permissions to use any third party materials).
- Radon mapping activities and plans are easy to find and follow.
- Prevention and mitigation activities are regularly and transparently reported.

Specific support reference material for radon

- Radon: Is it in your home? (Health Canada 2014): https://www.canada.ca/en/services/health/publications/health-risks-safety.html
- Public Health England advice: https://www.ukradon.org/
- Training material on radon risk communication (IAEA): https://www.iaea.org/resources/webinar/communicating-radon-risk-irelands-experience https://www.iaea.org/topics/radiation-protection/radon/webinars https://www.iaea.org/topics/radiation-protection/radon/training-material
- WHO Handbook on Indoor Radon (2009) https://apps.who.int/iris/bitstream/handle/10665/44149/9789241547673_eng.pdf

7.4 Radioactive waste management

Radioactive waste management is an extremely emotive topic with stakeholders and members of the public. It appears to be an issue that enlists many different views, with different approaches across different countries, with few approaches achieving any reasonable success. The topic not only involves the perceptions about radiation but also the impact on the local area and the timescales involved, including consideration of future generations.

Extensive research on stakeholder engagement in radioactive waste management brings valuable insights into best practices for engaging with local communities. Experience indicates that a volunteer-based approach, whereby local communities engage in a long term staged process which gives the right to opt out of consideration, is likely to have the greatest success. Experience also cautions that pragmatism is necessary. It is not always possible to directly involve all stakeholders (e.g. future generations, large stakeholder groups, certain vulnerable groups or the environment) so this requires careful identification and engagement with representatives of specific stakeholders. The reflection on the meaning of 'affected community' draws attention to the need to understand and respect the ways in which people define their own communities, and what precisely may be affected.

The engagement programme will normally be led by a governmental organisation (or equivalent body) who will determine the strategy and key stages of engagement. Individual professionals will need to become involved, for example in support of their employer, in support of a community or when approached to give an independent professional viewpoint. As such, note the general guidance on engagement above and elsewhere in this document.

Specific support reference material for waste management

- Communicating the Safety Case for a Deep Geological Repository (NEA 2017) http://www.oecd-nea.org/rwm/pubs/2017/7336-comms-safety-case.pdf
- Evaluation of Public Dialogue on Community Involvement in Siting a Geological Disposal Facility (DECC, UK) 2016: http://sciencewise.org.uk/wp-content/uploads/2019/05/Geological-Disposal-Dialogue-report-2.pdf

7.5 Radiological and nuclear emergencies

Crisis communication is applied in an emergency where the message aims at convincing people to behave in a specific way. Crisis is an event in which safety or security is at risk because one or more vital interests are at stake, and regular structures and resources are not sufficient to maintain stability.

Responsibility for emergency communications lies with the national authorities (including the regulator) and the operating organisation, although many different parties must cooperate. The overall strategy falls into two distinct phases:

- Planning and preparedness
- The emergency phase (note that the post-accident recovery phase is addressed separately below)

Much has been learned and written about emergency communications, particularly in the context of the Fukushima Daiichi accident. This guide cannot reproduce all the important lessons arising, and readers are referred to the authoritative literature listed below. However, there are two key issues worth emphasising:

- **The importance of a coordinated message:** It is acknowledged that in nuclear emergencies much can be done to improve the co-ordination of public engagement. There are difficulties in making a coordinated communication approach due to the dispersion of information sources, the broad and dispersed focus of the reported information and the partially subjective and often conflicting media reporting. It should be noted that inconsistent information can be sent to the media and public by not only the official sources but also by other experts/influencers.

  In Fukushima, the affected people were really confused with the conflicting information stemming from the 'various voices' communication approach provided by various experts whose backgrounds and experiences, apart from radiation protection, were in various fields such as medicine, physics, biology, epidemiology, and nuclear engineering. This contributed to the distrust of the experts since the public got the wrong impression of experts and professionals who scientifically should have had 'one-message, many voices'. So the public became confused and came to think "Who should I trust?"

  RP professionals should note that experts, depending on their backgrounds, might have different understandings of radiation risks, in particular of the biological effects at low dose exposure of <100 mSv. Whilst it is possible that various actors will seek to present different perspectives, none the less the emergency phase, where urgent action may be necessary, is

NOT the time to debate health effects at low doses. It is the time to emphasize that health effects of radiation at these levels are bounded and likely to be quite small, whilst also recognising that other consequences such as personal and social disruption are necessary in the circumstances.

The key issue here is:

One message, many voices

- **Information must be timely**: Lessons learned from the Fukushima nuclear accident showed that the speed of information provision in the evacuation and sheltering areas varied significantly. Residents received no further explanation of the accident or the evacuation directions, or were unable to understand communicated messages about protective actions applied. Hence, it is of utmost importance that such information is given in clear language without jargon or technical terms. Otherwise, necessary information is not understood, remembered or acted upon.

Studies have demonstrated that communication about radiological risks between the experts and the general public presented a huge gap in mutual understanding. For instance, research confirmed that the use of a variety of units and technical terms in public communication about Fukushima contributed to misunderstandings and confusions worldwide. Due to this, a number of mistakes and misrepresentations appeared in public communication.

The key issue here is:

Information must be timely, accurate, simple and jargon-free

Some tips for communicating during a nuclear or radiological emergency

In addition to the key issues outlined above, the following tips are important for emergency communications:

- **Choose your spokesperson quickly and wisely**
  - All those involved with 'public' engagement in these situations should try to respond very quickly to the need for public information related to radiation protection.
  - If possible use established communication channels and collaborate with authorities to give consistent and non-contradictory messages.
  - Be aware that in an emergency situation some regular communication channels may be disrupted.
  - Recognise that in the case of a major crisis many people, among them non-specialists of radiation, will be mobilised to face the flow of questions raised by the public. They should

be rapidly prepared to answer properly to the questions. A system should be in place to redirect difficult questions to specialists.

- **Convey Empathy**
  - Communicating in a crisis situation can be daunting. Emotions will be charged and stress levels will be high.
  - In delivering your messages convey empathy and caring – this is paramount. When people believe that you care about them they are more likely to accept your guidance. But empathy must be backed up with facts and actions in order to build credibility.

- **Anticipate and address concerns**
  - Choose your words carefully. The right words delivered with authority can foster trust and build credibility. The wrong words can lead to heightened anxiety within the public cohort. You must aim to build trust and credibility.
  - Understand the audience's specific concerns. Anticipate that concerns can be at the highest where children may be exposed.
  - Be aware of previous news media coverage and Twitter feed related to the emergency. It is useful to understand what the public might have previously seen, heard or read.

- **Keep messages simple using the 27-9-3 rule**
  - In an emergency communication situation it is particularly important to apply the '27-9-3 rule' (see above section 6.1 on media interviews). These limitations help a communicator to focus on understanding how to connect to the listener and thus the listener to understand the message in a stressful situation. This message is not the place to present your entire appeal – just enough to hook the listener into behaviour that s/he needs to apply in order to follow protective actions and protect against radiation.
  - Use simple language and keep messages organised and to the point. Remember that in a high stress situation people only remember what they hear first and last, so put your most important message first, you second most important message last and you're the other message in the middle.

- **Work with journalists in support of the response**
  - The radiation protection community should acknowledge that journalists have an indispensable role to play in swiftly communicating factual information to the public about details of a radiological emergency as well as the protective behaviours the public should observe.
  - In times of crisis the public turn to the news media – TV, radio, newspapers, and websites – for information about what has happened and what they need to do. Radiation Protection Associate Societies and their members may very well engage with community groups, face-to-face forums, and news media.

- Understand that the media have deadlines, limited time and space, and they are competitive. In this last aspect give information equally and avoid 'exclusive' engagements.
- Provide the media with information in a timely manner.
- Have easy-to-read materials with important information prepared and ready for distribution.
- Provide readily available points of contact for the Associate Society.

- **Be a credible, authoritative voice**
  - Exhibit competence and commitment – be the voice of authority. The public are looking to the radiation protection expert for help.

Be First, Be Right, Be Credible

Specific support reference material in emergencies

- Crisis and Emergency Risk Communication (CERC) Manual : Centers for Disease Control and Prevention (CDC) 2018: https://emergency.cdc.gov/cerc/manual/index.asp
- IAEA guidance on Emergency Communication to the Public:
  - https://www.iaea.org/publications/8889/communication-with-the-public-in-a-nuclear-or-radiological-emergency
  - https://www.iaea.org/publications/10866/method-for-developing-a-communication-strategy-and-plan-for-a-nuclear-or-radiological-emergency
  - https://www.iaea.org/sites/default/files/19/01/cn-265-report.pdf
- E-learning course on Communication with the Public in a Nuclear or Radiological Emergency: https://www.iaea.org/newscenter/news/learning-online-how-to-communicate-with-the-public-during-a-nuclear-or-radiological-emergency
- Communicating Radiation Risk: Guidance for emergency responders (US EPA):

  https://nepis.epa.gov/Exe/ZyPDF.cgi/500025HA.PDF?Dockey=500025HA.PDF
- European Project PREPARE: Perko T etal. (2016). Communication with media in nuclear or radiological emergencies: general and practical recommendations for improvement. *Radioprotection*, **51**, S163-S169. DOI: https://doi.org/10.1051/radiopro/2016057
- European project CONFIDENCE:
  - How to communicate about uncertainty? Selected CONFIDENCE guidelines. https://eu-neris.net/library/archives/concert/confidence/confidence-dissemination-workshop-2-5-december-2019/211-confidence-reccomendations-communicaiton-uncertainty-final.html
  - Perko T et al (2019, p. 9-12): *Guidelines on tools for communication of uncertainties*, D9.29, Ref. Ares(2019)6806809 - 04/11/2019, CONFIDENCE, EC, Brussels, Belgium. https://www.concert-h2020.eu/en/Publications

7.6 Malevolent use of a radiation source

The response to an increased threat of malevolent use should take place in close cooperation with the competent national authorities and the emergency agencies. There should be pre-arranged procedures with law enforcement regarding intelligence information and use of secure communications, as well as the reactions to an increased threat.

Communication practice will be similar to that for emergencies as discussed above. Radiation protection professionals may be asked by the authorities to take part in this cooperation and coordinated public communication, or may otherwise be approached for information.

7.7 Post-accident and long term recovery situations

Responsibility for the management coordination of these long term exposure situations normally lies with the governmental authorities. In particular it is important that local government is actively supporting the local communities in their efforts to address recovery.

There are many types of situations, and as for the emergency situation addressed above there is much documented experience which cannot be fully addressed in this guide. In principle the situations align with the guidance for stakeholder engagement (see Appendix 1), and building long term relationships based on trust and mutual respect is absolutely essential.

Experiences from post-accident and long-term recovery situations, where people recover their lives coping with anxiety about exposure, highlight that developing and fostering radiation protection (RP) culture for the public is one of the most important challenges. For these situations, the training of RP professionals on communication of radiation risk can be very helpful. RP professionals must be aware that some interaction with wider stakeholders can assist in the development and application of RP culture, whose goal is providing people with practical RP advice that will help them to regain control of their situation.

For example, to foster RP culture for returnees in Fukushima, an 'Information booklet for returnees' was developed by the group of experts and local authorities, whose expertise are RP, social psychology, agriculture, healthcare, and medicine, etc. This booklet introduced frequently asked questions from residents and their families who considered returning to their home and corresponding answers to them with practical advice and tips. Questions were about daily life such as 'can we open the window?', 'can we use furniture and tableware that we left home during evacuation?', etc. Answers were made based on scientific facts. The booklet has been distributed to supporters (local government staff, counsellors, etc.) who live and work in each local region and respond to requests from residents for consultation.

This process of interaction, generally known as 'co-expertise', goes beyond the traditional role of an expert who assesses the situation and provides technical advice. It is important to take into account the particular needs and expectations of those affected, as well as a plurality of challenges beyond radiation protection issues alone.

One particular aspect which has come to the fore in such circumstances is the role of 'citizen science'. Further guidance is given in Appendix 4.

Specific support reference material in recovery situations

- Ministry of the Environment. Government of Japan website, "Information booklet for returnees". https://www.env.go.jp/chemi/rhm/shiencenter/public_relations.html
- Schneider T et al. (2019). The role of radiological protection experts in stakeholder involvement in the recovery phase of post-nuclear accident situations: Some lessons from the Fukushima-Daïchi NPP accident. *Radioprotection*, 54(4), 259–270. DOI: https://doi.org/10.1051/radiopro/2019038
- ICRP Publication 146 : Radiological Protection of People and the Environment in the Event of a Large Nuclear Accident. Ann ICRP 49(4), 2020

8. The Role of Radiation Protection Associate Societies

Noting the importance of engaging with the public as emphasized in this guidance document, it is essential that national (and regional) radiation protection societies – the IRPA Associate Societies (AS) – take responsibility for their part in this activity. Indeed, many AS already have well developed public information and engagement programmes, and in many cases this follows naturally from the Founding Objectives or Statutes of the organization which may require activities in support of the 'public good'.

The AS are very well placed to play a lead role in the interface with the public. Experience has shown that such professional bodies have the potential to be a trusted source of unbiased information, especially in issues where there are significant public sensitivities. For example, in the challenging communications environment following the Fukushima Daiichi accident, where trust in authorities became an issue, the Japanese Health Physics Society immediately began a programme of internet-based 'Ask the Expert' for the public, which received many questions and requests for basic information on radiation and risk, and responded to all of them.

The important point here is that the AS are independent of all government, regulatory and commercial pressures, with the sole priority of promoting safety in the control and use of radiation and radioactivity. The AS must not promote or advocate the use of any particular technology, for example nuclear power, but where such technologies are applied the AS have an emphasis on supporting and assuring that safety is paramount so that wider society can safely benefit from them.

Public outreach aims at attracting people's attention, nurturing their interest, and inspiring their curiosity, rather than simply transferring knowledge to them. Memorable vivid images can help capture attention. Storytelling is also one way of understanding and learning about sensitive issues, and communicating dreams and values with more appeal and persuasiveness. Storytelling can be the most effective way to convey a message in the sense that it is not simply a piece of information, but rather a living feature which makes it easier to understand and remember, with emotional commitment and empathy.

There are many different activities that the AS can consider engaging with in this role, many of which have already been addressed in this guide, and further suggestions are developed below. However, societies must recognize that many aspects of public engagement can be expensive,

both in terms of human resources and financial requirements, and any AS programme must be realistically assessed and prioritized prior to engagement commencing. Consideration should be given to a defined 'media protocol'; who within the AS is authorised to communicate on what, and which verification or validation processes are necessary prior to publication or delivery.

An example of an overall communication and engagement AS strategy is given in Appendix 5. Examples of good practice for AS programmes, together with relevant resource materials, are presented on the IRPA website http://www.irpa.net/ .

8.1 General Public Information

There are many opportunities for direct and indirect engagement with the public. In undertaking these activities it is important that AS define who is authorised to make or approve any statements made in the name of the society.

- Society websites can have general information on radiation, or links to relevant authoritative information on other sites aimed at the public.
- AS can offer a Question and Answer (Q&A) service for members of the public via the website.
- A list of Frequently Asked Questions (FAQs), together with the answers, can be posted on the website
- There are occasions when specific radiation-related topics become newsworthy. AS can respond to these situations by posting relevant information on the website in a timely manner. Where false information is circulating an AS can assist in providing a more balanced perspective in response.
- The AS can develop and publish on the website Position Papers on key issues relating to radiation protection which are of potential wider interest.

8.2 Public Engagement on specific topics

Section 7 above identifies several specific situations where an AS should consider engaging in communication activities with the public. It can be helpful to look for 'teachable moments' – situations which arise that make the public more interested and receptive to information on radiation. This could be from a recent TV programme, an event in the news or a local activity etc.

For example an AS should play a role in radiation emergencies and incidents. AS can have a very powerful voice in an emergency as a seconder (a supporter of response authorities), helping people by encouraging them to follow instructions of responders (understanding that not all response decisions are going to be specific to the radiation). News media will be looking for people to talk about the radiation issue. AS can help fill that void with credible, supportive information.

8.3 The Conventional Media

The conventional media, i.e. TV, radio and newspapers, are important sources of information to the public. Societies should seek to establish long-term relationships with key media players and specialist reporters so that journalists are aware of the authoritative expertise available through the AS.

Specific AS members can be allocated to respond to the media on specific topics. A key issue here is timeliness – in many cases the journalists have very short deadlines to meet, so it is important to be able to support this need. Develop and continuously update a list of contacts and other resources for journalists to access quickly and easily in the event of an emergency or urgent issue arising.

Tips for traditional media communication:

- Organise media training for the AS management and dedicated experts.
- Identify journalists in your area responsible for medical and health issues, environmental matters, nuclear energy topics and general science journalists. Establish a relationship with these journalists during non-crisis times.
- Identify public science journals that may publish special issues on different radiation protection topics.
- Engage with specialised magazines to increase their attention to radiation protection topics, for instance about radon in a specialised journal for builders, architects or home buyers.
- Make a list of contacts and regularly update it.
- Prepare your materials: don't rely too heavily on slides, reports or information leaflets during your first communication with a journalist, where you are seeking to establish a relationship – but have them available or provide them afterward.

8.4 Wikipedia

You will no doubt be aware that the on-line Wikipedia resource plays an important role in this 'information age'. It is often the first port of call for non-specialists wanting to find out about radiation – and this is certainly the case for journalists when something of relevance happens which impacts the news. It is therefore very important that what is written on Wikipedia is accurate and reliable, and Radiation Protection Societies can all play our part to help ensure that this is the case.

What is not widely understood is that changing a Wikipedia entry in one language does not automatically carry through into other languages – there is no translation system. For example, changing the entry on 'Sievert' in English has no impact on the 'Sievert' entry in German, Japanese or Chinese etc. Each language is independent.

The process for interacting with Wikipedia and amending an entry may appear daunting, but in fact it is quite reasonable. IRPA therefore recommends that Associate Societies review what is currently written on radiation topics in their natural language, and consider whether it is appropriate or whether it would benefit from amendment. For further guidance on how to engage with Wikipedia contact the IRPA Executive Officer [exec.off@irpa.net].

8.5 Governmental and Political Liaison

Associate Societies are able to act as 'the voice of the profession', and should set out to develop relationships with relevant government departments and political leaders, and take all opportunities to comment on developing policy proposals, giving specific attention to those which impact the

profession such as recognition process for RP professionals, education and training requirements, tasks and responsibilities of experts.

8.6 Liaison with Other Professional Organisations

There are usually several other professional organisations which have an interest and involvement in radiation matters, especially in the medical field. It is helpful to establish close working relationships with these organisations so that the combined public-facing output is aligned and mutually supportive.

8.7 Schools Programme

Forging links with schools and opening up conduits to educate and inspire young persons is a key route to engaging with the public on topics related to radiation and its safe use. In some places it is possible to liaise through science teacher coordinators, who arrange continuing education for teachers and share good practices. It is recommended that each AS does what it can to ensure that the 'adults of the future' receive robust and balanced information about radiation risks and benefits in a proactive, interactive and stimulating way. In this way we can aim to produce a future generation of the 'public' who are well-informed in an unbiased way and thus enabled to make better informed decisions on topics such as medical exposures and nuclear power.

Radiation protection professionals can collaborate with schools in many ways, including:

- Organise radiation protection awareness days that tie in with the school curriculum.
- Contribute to the design and development of museum exhibits or 'science clubs'.
- Organise a best radiation poster or song or essay competitions in schools.
- Provide an expert for a day into a school where they could organise experiments, radiation protection related activities or 'games' and demonstrate radiation measurement tools like GM counters.
- Engage with local education authorities to contribute to curriculums.
- Recruit volunteers (either young AS members and/or local university science students) to help deliver talks and demonstrations.

Any school engagement activity should be published in newsletters and on the AS internet page (Note: permission must be obtained for any photography involving children!). Attempts could be made to engage with children's educational TV programs and suggest radiation protection topics.

It is worth emphasising the value of legacy assets from the school events, such as the UK SRP's projects, posters and DVDs of lectures (see the case study). These can be re-used for other events and may link into wider strategies for careers information and informing the public. Also keep in mind that engaging with children in schools also has some carry-over to influencing their parents.

Tips for engagement with schools:

- **Keep it age and curriculum appropriate:**

- Consult with teachers to ensure the lecture or activity content is relevant to the current school curriculum. Draw in current topics that have received recent media attention.
- Gather feedback after the event and use it to plan and improve future engagements.

- **Choose your presenters to resonate with the audience:**
  - Experience shows that events aimed at school-aged students benefit from a team of RP professionals in the role of 'engagers' who are nearer to the ages of the students involved. This has provided an opportunity for the members of IRPA's Young Generation Network to become involved with this type of 'outreach' work. Such a young community will be vital in providing a relatable link with young students and providing manpower to push these endeavours forward. Also try and ensure a mix with respect to gender and race.
  - Present the engagement team as normal people who happen to work with radiation, avoiding the stereotype of science 'geeks'. The engagers should be 'role models'.
  - Engagers should be good 'actors', prepared to ad-lib confidently as necessary.

- **Rehearse!**
  - Ensure any support crew is familiar with the content of the engagement exercise and what is expected of them.
  - Rehearse the entire activity/lecture, including any special effects, in the venue with the venue's staff. This includes any audio-visual contractors integral to the activity or presentation.
  - Ensure any computer systems to be used are functioning correctly and operators are rehearsed. Media display failures are distracting and don't build audience confidence in the whole endeavour.
  - Brief any volunteers managing students' movements in an exhibition.

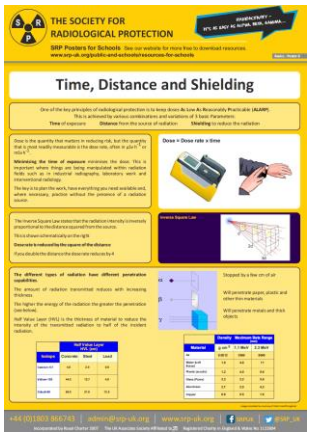
- **Grab and keep the student's attention:**
  - Give any lecture or activity a continuing story-line.
  - Plan to grab the audience's attention right from the start with special effects and striking images or statements, and continue to use striking content throughout.
  - Plan to involve students on stage or in activities and promote interaction with the audience or group e.g. by debates.
  - Include visual and practical demonstrations.
  - Link where possible to any associated exhibition to see examples of what's covered in the activity or talk.
  - Avoid sudden switches of subject.
  - End by summarising the key facts and messages.

Case Study: SRP Schools Programme in the UK

In the UK, the Society for Radiological Protection (SRP) have invested heavily in a schools (and public) outreach programme, mainly aimed at students who are typically 14 to 15 years old, together with their teachers and/or parents. Over many years the SRP's dedicated Outreach Committee have developed a bank of schools outreach resources. These resources, including a paper on "strategies for engaging with future radiation protection professionals" (Cole et al, 2015), are freely downloadable from their website https://srp-uk.org/public-and-schools/resources-for-schools

The resources include: 6 lesson/demonstration plans relating to radiation and radiation protection. For example, in one demonstration students, usually a group of 5 to 6, play a game where they have to rank a number of 'household' objects from most radioactive to least. The objects are typically, and in order: smoke detector; luminous dial wrist watch; welding rods; lo-salt; Brazil nuts and bananas. Students get to use both a GM and a scintillation counter to help them make their ranking decisions, and following their attempt they can engage in a discussion with SRP volunteers regarding the activities of which radioisotopes are present in each object. This highlights that radioactive substances in small concentrations are all around us in the world.

To add to the interactions available through the demonstrations, a bank of over 30 colourful posters of radiation protection information have been produced, and a selection of these are displayed on the walls around the demonstration area. In order to persuade the students to read the posters, a quiz of ten simple questions has been developed and each student is given a quiz sheet, an SRP pen and encouraged to do the quiz. The answers to the questions are all contained somewhere within the text of the displayed posters. As an added incentive, the winner, drawn from a 'pot' of '10 correct answers' quiz sheets, wins a prize.



Attempts have been to measure the 'impact' of SRP's school engagement work. Simple metrics have so far included the number of 'visitors' to the SRP stand at engagement events. This has been estimated by: performing a 'head count' of persons on the stand at various times during the day, a count of the number of completed quiz sheets; a count of the number of 'further information' request slips, and a count of the number of post-event Twitter 'likes' @SRP_UK.

8.8 Student and STEM (Science, Technology, Engineering and Mathematics) Engagement

In many ways this is an extension of the schools programme discussed above. It aims to encourage young persons to consider STEM subjects as a career choice through presenting radiation-related topics in an exciting and challenging way. There are opportunities for involvement at Careers Fairs, Science Fairs or equivalent events, including university events. As well as the general promotion of STEM topics there is an opportunity to give information on careers in radiation protection, and hence support the future of our profession.

8.9 Science Outreach

It can be helpful to stimulate wider public interest in topical research work in radiation protection. Further suggestions are given in Appendix 3.

8.10 Training radiation protection professionals in public engagement

As noted above, many RP professionals feel ill-equipped to effectively engage with members of the public on radiation and risk. The AS should consider offering training courses and conference sessions aimed at supporting and developing our professionals so that we are more comfortable, effective and enthusiastic in undertaking this important role.

9. The Role of Individual Radiation Protection Professionals

This guidance document emphasises the importance of engaging with the public on radiation and risk so that decisions are made on the basis of understanding and not on the basis of fear, so that society can obtain the benefits of the safe use of radiation technologies.

It is a duty of individual RP professionals to play their part in this activity. This can be developed as an individual initiative, or in association with an employer's programme or the activities of the radiation protection Associate Society. Professionals should seek to equip themselves for this task by becoming familiar with the underlying principles, science and experiences of risk communication and public engagement, including those outlined in this guidance.

It is much better to have a skilled RP professional engaging with the public, either as an individual or as a representative of an organisation, rather than leaving such communication to a 'PR' representative or a non-specialist. The corollary to this is that the RP professional must be competent and confident in the science and art of engagement.

Code of Conduct for Radiation Protection Professionals on Public Engagement

1. As a radiation protection professional there is a duty to engage with the public for the benefit of society.
2. Ensure that you are familiar with the key principles and experiences in effective public communication and engagement
3. Always be truthful and well balanced
4. Do not go beyond the limits of your own knowledge and experience
5. Always show respect for the views of other parties
6. Do not openly challenge the views put forward by your employer or by the authorities – but challenge internally if necessary
7. When representing the radiation protection professional perspective, avoid making statements that could be regarded as supportive of specific technologies (such as nuclear power or mobile phone technology)

10. Supporting information and general references

Communication and engagement with the public is a very wide topic, and there is a very large literature and guidance available which cannot be fully reflected in this guidance document. Some additional relevant experiences and information are presented on the IRPA website http://www.irpa.net/index.asp.

'Engaging with Society' was the special theme of the IRPA13 International Congress in Glasgow, 2012. It is highly recommended to view the podcast of the key session on this topic, which includes a major presentation by V Covello: http://www.irpa.net/page.asp?id=54544

Other useful general references on public engagement are given below:

- Radiation: Effects and Sources (UNEP 2016): http://wedocs.unep.org/handle/20.500.11822/7790
- Risk Communication in Action (US EPA 2007): https://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi/60000I2U.PDF?Dockey=60000I2U.PDF
- ICRPaedia: http://icrpaedia.org/Main_Page
- WHO Strategic Communications Framework for effective communications: https://www.who.int/mediacentre/communication-framework.pdf
- Joint European Project: EAGLE Recommendations 2016 https://eagle.sckcen.be/
- Risk Communication: EU Scientific Seminar 2015, Radiation Protection No 184 (EC) https://ec.europa.eu/energy/sites/ener/files/documents/rp184.pdf

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Appendix 1 IRPA Guiding Principles on Stakeholder Engagement

Radiological protection professionals should endeavour to:

1. Identify opportunities for engagement and ensure the level of engagement is proportionate to the nature of the radiation protection issues and their context.
2. Initiate the process as early as possible, and develop a sustainable implementation plan.
3. Enable an open, inclusive and transparent stakeholder engagement process.
4. Seek out and involve relevant stakeholders and experts.
5. Ensure that the roles and responsibilities of all participants, and the rules for cooperation are clearly defined
6. Collectively develop objectives for the stakeholder engagement process, based on a shared understanding of issues and boundaries.
7. Develop a culture which values a shared language and understanding, and favours collective learning.
8. Respect and value the expression of different perspectives.
9. Ensure a regular feedback mechanism is in place to inform and improve current and future stakeholder engagement processes.
10. Apply the IRPA Code of Ethics in their actions within these processes to the best of their knowledge.

The full Guiding Principles for Radiation Protection Professionals on Stakeholder Engagement can be found at:
http://www.irpa.net/docs/IRPA%20Stakeholder%20Engagement%20Guiding%20Principles%20(2008).pdf

Appendix 2 Factors Influencing Risk Perception

Some qualitative characteristics	Explanation of influence	Explanatory scale	Some comparable risks	Possible communication approach
Personal Control	Increases risk tolerance	controllable – not controllable	Driving car vs. flying in the airplane	Practical and emotional involvement in risk governance.
Institutional control	Depends upon confidence in institutional performance	trust, confidence in institution	Accident in high trusted company vs. accident in low trust company	Building social and institutional trust in risk management.
Number of exposed	Decreases risk tolerance	catastrophic – chronic	Plane accident – car accident	Preventive actions e.g. exercises and transparent risk management.
Voluntariness	Increases risk tolerance	voluntary – involuntary	Smoking vs. food poisoning	Stakeholder process
Mortality	Decreases risk tolerance	fatal – not fatal	Aids vs. angina	
Knowledge	Increases risk tolerance	new technology – established technology	Genetically modified food vs. using pesticides	Communication program for increasing knowledge and experiences.
Familiarity	Increases risk tolerance	familiar – not familiar	Medical X rays vs. nuclear waste disposal	Communication campaign makes it familiar
Dread / fear	Decreases risk tolerance	fear – no fear	Nuclear accident vs. Radiation of mobile phone	Since feeling of helplessness triggers fear give the instruction what to do …
Artificiality of risk source	Amplifies attention to risk Often decreases risk tolerance	natural-human	Nuclear installation vs radon	Clarify the meaning of "natural" e.g. using preservatives in food, or explain natural radiation.
Blame	Increases quest for social and political responses	Degree of legal or social responsibility	Deliberate release vs. accidental release from nuclear installation	Since more than risk is seen as unfair the more is judged as severe and unacceptable the sharing the responsibility and stakeholder process are good comm. approach.
Benefit	Increase risk tolerance	Benefit to self-vs. unclear or inequitable	Worker exposure vs. public exposure	Dialog with the local community
Effect on children	Decrease risk tolerance	Children specifically at risk	Higher cancer risk	Recognition of differences in the risk incurred, and modification of policy accordingly

Appendix 3 Science outreach

How do radiation protection professionals reach out to the public regarding radiation protection science, news and the work of the profession?

Innovative research organizations have science press officers, and IRPA AS may have a working group on communication or science outreach. Whatever the resources available it is in the benefit of an AS and its members to promote their research and radiation protection developments.

In science outreach the engager should first identify the audience(s).

- What might the audience be interested in related to a particular topic?
- What commonalities does the engager have with the audience?
- What questions might the audience ask?

The detailed and complex material of a research or radiation protection development should be translated into a clear, streamlined structure. This can be done by answering the following questions:

- Which are the three things that the engager wants the audience to remember and respond to? E.g. for RP research: how to safely use these sources and applications, to better understand the detrimental effects, to find new applications and benefits for society.
- What are the three focuses of the research and development?
- What are the three reasons why this research is important?

Radiation protection professionals should endeavour to help journalists to make the story scientifically correct. It is useful that AS and their members use the following guidelines when reporting their scientific results to a non-expert public. The Science Media Centre from UK has developed guidelines, drawn up in consultation with scientists, science reporters, editors and sub editors, to ensure that the reporting of science and health stories is balanced and accurate. For this IRPA guide, the guidelines are adopted to be useful for IRPA AS and their members.

When you report your scientific results to the non-expert public then focus on three key questions:

- What was the conclusion
- What makes it new or different
- Why is it important

Note that this is not the usual format for a paper or presentation to scientific peers. In addition the following points should be addressed:

- State where the research has been published or presented or reported e.g. conference, journal article, a survey, etc. Ideally include enough information for readers to look it up or a web-link.
- Specify the size and nature of the study – e.g. who/what were the subjects, how long did it last, what was tested or was it an observation? Mention the major limitations.
- When reporting a link between two things, indicate whether or not there is evidence that one causes the other.
- Give a sense of the stage of the research e.g. new dosimeter, clean-up stage, cells in a laboratory or trials in humans, and a realistic time-frame for any new technology to reach fruition.
- On health risks, include the absolute risk whenever it is available in the press release or the research paper i.e. if 'low dose exposure increases the cancer risk' state the outright risk of that cancer, with and without particular exposure.
- Especially on a story with public health implications, try to frame a new finding in the context of other evidence e.g. does it reinforce or conflict with previous studies? If it attracts serious scientific concerns, they should not be ignored.

- If there is space, quote both the researchers themselves and external sources with appropriate expertise. Be wary of scientists and press releases over-claiming for studies.
- Distinguish between findings and interpretation or extrapolation; don't suggest health advice if none has been offered.
- Headlines should not mislead the reader about a story's contents and quotation marks should not be used to dress up overstatement.

For a complete and original guide look at https://www.sciencemediacentre.org/wp-content/uploads/2012/09/10-best-practice-guidelines-for-science-and-health-reporting.pdf

Opportunities:

- Make news on recently published peer-review articles authored or co-authored by an AS member.
- Encourage members to publish visuals and graphics by using AS communication channels to disseminate links. Radiation protection professionals may share the published research, 'like' it, comment on it, and discuss it.
- An AS may support citizen journalists or citizen scientists by organizing events for them.
- The AS may support open source articles.
- The AS may prepare experts to meet journalists at an event.
- Encourage AS members to include links to IRPA and AS documents and publications in their e-mail signature templates.
- Radiation protection professionals may share a lecture or presentation with a wider audience, explain the background to the event (blog posts about research, footage of the lab, and frequently-asked-questions into a video), record and review e.g. compile recordings of a public talk, appearing at a science café, going to a conference, or travelling into the field to tell a visual story about your research to give audiences a special 'behind-the-scenes' look.
- Supplement presentations with videos which can add depth, showing context – especially for field research – and bringing in additional voices, such as IRPA members. Enhance blogs or websites by introducing people, research, books, projects – tell personal stories. Shoot video footage that shows radiation protection science in action. Post videos to social media sites.
- In collaboration with other stakeholders, an AS may set up a training session for science press officers at radiation protection institutions and members' organizations, and introduce media seminars for the AS members.
- Secure more access for journalists to scientific articles and reports authored by IRPA and the Associate Societies.
- Recognize and reward radiation protection work and science by nominating prizes and getting included in major national awards ceremonies. Appoint experts to be available to support journalists before the headlines appear.

Appendix 4 Citizen science

'Citizen science' is a form of science developed and enacted by citizens, with citizen volunteers collecting or analysing various kinds of data. Citizen science following the Fukushima Daiichi accident demonstrably contributed to filling information gaps after nuclear or radiological emergencies, as citizens monitored radioactivity in their own environments (e.g. self-assembled Geiger counters) and communicated their thoughts about radiation and risks. This approach could be termed 'citizen science centred radiation protection'.

Experience has shown that such 'citizen science' projects will develop in various contexts, irrespective of any support from authorities or the radiation protection profession. It is therefore better for the profession to recognise this and to consider what role we can take to help bring these activities closer to our science community, to make the activities more useful and scientifically-based, with the outcomes more meaningful for the public.

An AS may help citizen scientists in many ways, in particular through lending fundamental radiation protection knowledge to help non-experts to understand the significance and context of their results - such as to comprehend "dose" based on measurements. Related to "dose", readings with both environmental monitoring (ambient dose equivalent) and with personal dosemeters (individual dose) take the same unit (Sv), which might be easily misleading. However, it is difficult for lay people to distinguish between these two different dose quantities, and the public struggle to understand their definitions and meanings. In order to obtain robust individual dose measurements by citizen scientists and to avoid over-estimating the external exposure doses from ambient dose equivalent, wearing a personal dosimeter with an explanation of the meaning of these dose quantities by RP professionals would be helpful.

There are studies that show that citizen science initiatives for radiation measurements can prove to be useful communication and engagement tools between experts, policy-makers and the public. Also, a number of European projects (e.g. SHAMISEN-SINGS: https://radiation.isglobal.org/shamisen-sings/) recommend to nuclear emergency authorities that they should take steps to enable citizens to perform measurements and the support citizens to collect and share measurement data with authorities. IRPA AS are invited to participate in this work.

Tips for Associate Societies in their collaboration with citizen science and citizen scientists:

- Check which citizen science platforms, groups and projects are active in your area.
- Be open for mutual learning.
- Help empower citizens to perform radiation measurements and share results.
- Collect radiological results and help citizens to interpret conclusions
- Organise open-door days for citizen scientists: offer training for a specific project and invite citizen scientists to AS scientific meetings.
- Establish an AS point of contact for citizen scientists, register as a supporter for citizen science projects, and participate with citizen science discussion forums.

Appendix 5 An example of an Associate Society's communication and engagement strategy

This strategy has been developed by the Korean Association for Radiation Protection (KARP).

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