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PIANOFORTE Partnership

European Partnership for Radiation Protection Research

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D 2.6 Guidelines on integration of Social Sciences and Humanities in R&I

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Abstract

This document includes Guidelines for integration of Social Sciences and Humanities (SSH) in radiation protection research projects. Integration of SSH is expected to: i) improve the assessment and response to radiation protection challenges (e.g. increased exposures) and opportunities (e.g. new medical technologies); ii) improve the governance of radiological risks and clarify the societal views on radiological protection issues; and iii) ensure that radiation protection Research and Innovation (R&I) is situated within, and contributes to, addressing broader societal challenges (e.g. health and wellbeing, sustainable development, climate change or inclusive societies); and iv) ensure meaningful and long-lasting impact of R&I activities. Integration of SSH thus contributes to specific PIANOFORTE objectives and outcomes.

The Guidelines include guiding principles and recommendations for the effective integration of SSH in radiation protection research. They also provide insights into the diversity of SSH research and related disciplines.

The Guidelines should be used as a tool for PIANOFORTE project proposal partners and the applicants to future PIANOFORTE open calls, in developing their research in socially robust and responsible ways.

Contents

1. Introduction

Under Horizon Europe, "*the effective integration of SSH in all clusters, including all Missions and European partnerships, is a principle throughout the programme*" (European Commission, 2022a). As such, SSH make up "*a key constituent of research and innovation*" (idem).

Various types of projects may be envisaged, that include SSH in radiation protection research; these generally fall under two broad categories:

- Projects led by SSH research where issues are framed mainly from the SSH perspectives and most project partners come from SSH disciplines, while other scientific disciplines may be integrated;
- Projects including an SSH component, where SSH expertise is an integral, though not exclusive, part of the research design of topics, and solutions to the problem are generated by integrating knowledge of both SSH disciplines and non-SSH disciplines from natural sciences, medicine, engineering and technology.

While these guidelines address primarily the second type of projects, they can also inform inter- and transdisciplinary projects of the first type.

1.1 Why integrate Social Sciences and Humanities in radiation protection Research and Innovation?

Social Sciences and Humanities (SSH) are needed in radiation protection research for a variety of reasons, including:

- improving the assessment and response to radiation protection challenges and opportunities (Impens, Salomaa et al, 2020; European Commission, 2022a);
- ensuring that radiation protection Research and Innovation (R&I) is situated within, and contributes to, addressing broader societal challenges, such as health and wellbeing, sustainable development, climate change or inclusive societies;
- improving the governance of radiological risks and clarifying the societal views on radiological protection issues (Perko et al, 2019);
- ensuring meaningful and long-lasting impact of R&I activities (European Commission, 2021, 2022b).

Additionally, in the context of PIANOFORTE, SSH research is key to:

- addressing the PIANOFORTE research priorities of "*understanding existing approaches to RP research and associated systems at the explicit level of societal values, needs and expectations*"; "*identification of barriers and routes to better alignment between RP research and innovation and those societal dimensions*"; and "*new methods to effect RP integration with society*";
- fulfilling the PIANOFORTE objective of supporting regulations and implementation of the BSS and improving practices in the domain of low dose exposures of humans and the environment by better understanding and reducing uncertainties in risk estimates;

- achieving the PIANOFORTE expected outcome of *"delivering on citizens concern and better addressing societal challenges by inclusion of Social Sciences approaches in the definition, conduct and dissemination of knew knowledge and participatory approaches*".

1.2 Guiding principles for socially responsive research

Four guiding principles should be at the core of funding applications for projects submitted to the PIANOFORTE partnership. These principles have been synthesized and adapted for PIANOFORTE based on PIANOFORTE objectives, recommendations from research policy makers (e.g. Horizon Europe), radiation protection stakeholders and broader scholars.

1. Projects must consider the social, economic, behavioural, institutional, historical and/or cultural dimensions, as appropriate for the topic addressed. For this purpose, a trajectory of dialogue should be set up from the beginning, allowing all involved to reflect jointly on the integration of SSH at each phase in the project. Contributions from one or more SSH disciplines may be required to ensure the validity, reliability, social robustness and social impact of the research and innovation chain. Different disciplines of SSH may be included at different stages of R&I.

2. Projects should strive towards innovation for and with society, through involving citizens, public authorities, business and industry, and academia in the design, development, and implementation of project products, methods and services. This "*engages and empowers citizens, enhances the resilience of communities, increases the relevance, acceptance and uptake of innovation, and helps foster lasting changes in social practices*" (European Commission, 2022a).

3. Projects are encouraged to use appropriate interdisciplinary approaches, notably involving collaborations between, and integrating knowledge created by, different SSH disciplines and non-SSH disciplines from the natural sciences, medicine and technology. Suggestions concerning inter- and transdisciplinary research projects are provided in section 4.

4. Projects should apply appropriate rigorous scientific research methods for both SSH and non-SSH research. The rigour of the research procedures is a key aspect to be considered, for instance the reliability and validity for quantitative studies; or the credibility, dependability, confirmability, transferability for qualitative methods or components (Guba, 1994).

1.3 Examples of research questions addressed by SSH

SSH cover a very diverse range of disciplines, which can contribute to addressing a variety of research questions and topics. The formulation of the research questions should therefore be problem-focused and be informed by the current state-of-the-art of knowledge and practice.

SSH research may, for instance, address questions such as:

- What are the values and expectations of stakeholders from radiation protection products, policies and practices?
- How to design project products or outcomes that take into account stakeholders' values and expectations?
- What are the social and economic impacts/ benefits of research and its outcomes?

- Who is included / benefits from the research outcomes and who does not?
- Which psychological, social, economic, legal, political or cultural factors impact the effectiveness of radiological protection policies and practices?
- What are the ethical implications raised by the developments foreseen and how could they be accounted for in an early phase of the research?
- How do research assumptions and results hold within particular social, cultural and political contexts?
- How to engage citizens in the production of knowledge and co-development of solutions?
- Which participatory methods are suited for specific contexts and objectives?
- How are relevant facts, values, interests, scientific developments, hypotheses, hopes, beliefs and concerns taken into account in decision-making? What trade-off mechanisms are at play and how can integration be encouraged?
- What are effective communication methods and means in specific situations?
- How to develop and disseminate radiation protection culture in a participatory way, in different contexts?
- What are the trends in research topics and prioritisation? What driving forces or pulling factors are at play?

To answer such questions, different research methods can be used[1], depending on the type of problem investigated, the frameworks employed and their underlying assumptions. As an example, a wide collection of social science research methods, databases, scales, protocols and other tools currently used in radon research is illustrated in Tomkiv et al. (2021).

1.4 List of SSH disciplines

An (incomplete) list of SSH disciplines can be found below[2].

Social and behavioural sciences: economics, economic history, political science, sociology, demography, anthropology (except physical anthropology), ethnology, futurology, psychology, geography (except physical geography), peace and conflict studies, human rights.

[1] Qualitative approaches are particularly suited for research on concepts or phenomena for which there are little or no prior studies. Qualitative research methods rely on direct observation, communication with research participants, or the analysis of words, objects, or artefacts.
Quantitative approaches are used if the goal is to test or explain (aspects of) an already established theory. They focus on numerical, measurable relationships and often rely on statistical analysis. For instance the analysis of numerical data is used to establish and test a hypothesis that is provable by mathematical or statistical means. Experiments can also be used to generate such hypotheses.
Mixed methods are suitable in situations where the exploratory nature of SSH research, the complexities of the phenomena studied, and the limitations within the aforementioned categories of methods make that a phenomenon cannot be described in its entirety using a single type of method. By combining qualitative and quantitative research components, mixed methods allow exploring the concepts and then making interferences on a larger scale

[2] European Commission, https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/ssh_en.htm#:~:text=List%20of%20SSH%20disciplines,-Social%20sciences%2C%20education&text=Social%20and%20behavioural%20sciences%3A%20economics,and%20conflict%20studies%2C%20human%20rights.

Education science: curriculum development in non-vocational and vocational subjects, educational policy and assessment, educational research.

Journalism and information: journalism, library and museum sciences, documentation techniques, archival sciences.

Business and administration: retailing, marketing, sales, public relations, real estate, finance, banking, insurance, investment analysis, accounting, auditing, management, public and institutional administration.

Law: law, jurisprudence, history of law.

Humanities: religion and theology, foreign languages and cultures, living or dead languages and their literature, area studies, native languages, current or vernacular language and its literature, interpretation and translation, linguistics, comparative literature, history, archaeology, philosophy, ethics.

Arts: fine arts, performing arts, graphic and audio-visual arts, design, crafts.

2. Guidelines for integration of SSH

2.1 Guidelines for the elaboration of a research project proposal integrating SSH

The following points support work across disciplinary boundaries and a meaningful integration of SSH:

- Development of formal and informal research relationships between organisations, groups and individuals, in order to establish trust relations and confidence in the potential to collaborate successfully[3];
- An approach or mechanism to enable early, open discussions between disciplines/teams/project contributors on broad topic foci;
- Proposals developed from these relationships and discussions clearly state the role, purpose, outcomes and added value of SSH contributions, as well as the SSH research actions required, and specify the participants and disciplines involved;
- Foreseen SSH contributions are reflected throughout the text of the proposal and specifically under “Excellence”;
- Contributions from SSH are integrated at all relevant stages of the proposed research (i.e. not only in communication and dissemination activities);
- The resources (PMs and budget) dedicated to SSH research and innovation is proportionate with the stated SSH research objectives and the importance of the social, economic, behavioural, institutional, historical and/or cultural dimensions of the topic;
- Inclusion of SSH should support the objectives of radiation safety research and EURATOM/PIANOFORTE objectives.

[3] The SHARE platform for Social Sciences and Humanities in Ionising Radiation Research can provide support for radiation protection researchers looking to extend their networks to SSH researchers at universities or research centres. https://www.ssh-share.eu/

Details on research practices supporting the substantive integration of SSH with natural sciences and engineering are summarised in section 3.

SSH research in radiation protection can take different forms: i) disciplinary (involving one SSH discipline, e.g. psychology), ii) multidisciplinary (multiple disciplines including SSH working in parallel, but not integrated), ii) interdisciplinary (integrating knowledge from several SSH and/or natural sciences disciplines), and iv) transdisciplinary (integrating knowledge from several SSH and non-SSH disciplines and from various actors, including non-academic stakeholders).

Examples of SSH contributions in radiation protection research can be found in recent projects illustrated in the Annex. Potential PIANOFORTE applicants may use these or other examples as a guide, although this would not be a substitute for direct engagement of relevant SSH researchers for the new projects.

2.2. Guidelines to ensure the quality of the proposed SSH research

SSH research that is proposed is subject to the excellence, impact, quality and efficiency of implementation requirements stated in the Horizon Europe framework programme.

The following points are of particular importance:

- The research design and methodology underlying SSH R&I activities must be described in the project proposal;
- The theoretical background of SSH R&I activities must be described in the proposal: SSH research proposed should either have a strong theoretical underpinning or contribute to developing novel theories or concepts;
- The potential contribution to the relevant knowledge base must be evident in the research proposal;
- Research should state how ethical approval will be obtained and which guidelines for Ethics in Social Science and Humanities will be followed;
- Research should be relevant to the country in which it is carried out and sensitive to the local environment, and the cultural and political contexts;
- Researchers should follow the key principles of equitable partnerships to address inherent power imbalances when working with partners in resource-poor settings[4;]
- Researchers involved in SSH research and acting as Principle Investigators have relevant, proven expertise (e.g. by specific publications in SSH journals) in the disciplines relevant for the proposal;
- The project gathers systematic evidence about the production, dissemination and impact of SSH research[5];
- Suitably qualified experts should assess the contributions made by researchers in SSH[6].

[4] A description of key principles for equitable partnerships can be found here: https://www.ukri.org/about-us/policies-standards-and-data/good-research-resource-hub/research-in-a-global-setting/
[5] https://enressh.eu/wp-content/uploads/2017/09/Guidelines_SSH_final.pdf
[6] https://eassh.eu/Position-Papers/heuconsultation20092019fnlapproved.pdf

2.3 Guidelines for appropriate governance of research projects

The level of SSH involvement in research projects is expected to vary. Regardless of the level of engagement with SSH research, projects must ensure appropriate governance of the societal dimensions via mechanisms such as:

- inclusion of representatives of relevant stakeholders in the design, development, implementation of project products, methods and services, as well as in monitoring and evaluation;
- diverse representation in stakeholder advisory boards, including SSH expertise, civil society organisations and representatives of relevant research user groups;
- identification of stakeholders that are *"hard to reach"* (who are difficult to contact or engage with, for instance because they do not have specific resources needed to participate, or they distrust the process), those that have *"low-engagement"* (e.g. those with low interest) and those that represent *vulnerable groups*.

Projects need to acknowledge which relevant stakeholders are not involved or represented and clarify the reasons.

3 Practices supporting the substantive integration of SSH with natural, physical and medical sciences

Cooperating across different disciplines and with actors outside of academia comes with some challenges, such as communication gaps between disciplines, lack of the SSH capacity in a consortium, or the building of trust-based relationships.

The communication gap between disciplines arises from the increasing level of specialisation and fragmentation of science.

Lack of SSH capacity in a consortium, may result from various factors including:

- technical focus of the proposal and limited dialogue with SSH in the project conception phase, resulting in limited involvement of SSH researchers;
- inclusion of SSH expertise as an add-on, in a box-ticking fashion;
- lack of understanding within the consortium of the role of SSH partners;
- lack of acknowledgement of the diversity of SSH disciplines and their specificities;
- lack of connections between SSH researchers potentially interested in joining interdisciplinary consortia;
- lack of connections between non-SSH and SSH researchers.

In terms of inter-sectoral partnerships, building trust-based relationships with policy makers, industry and NGOs particularly in the context of opening critical debates is challenging. Moreover, lack of understanding of the objectives of SSH research activities may raise concerns with some stakeholders, or lead to frustration on both sides.

Following Balmer et al. (2016), the following practices support substantive integration of SSH with natural, physical and medical sciences:

1. **Collaborative experimentation**: there needs to be joint commitment (time and resources) not only from social scientists, but also from natural scientists and engineers to experiment with new ways of producing knowledge and developing technical innovations within an interdisciplinary environment;

   What does this mean in practice? Project and resource planning need to specifically account for these interactions, for all natural and social scientists involved. Projects might foresee a "diverse range of outputs (single disciplinary and interdisciplinary academic papers, synthesis papers, non-academic outputs and events)" (Prager et al, 2015).

2. Be willing to **take the risks** inherent to engaging with novel research practices; this might involve experimenting, for instance with how research is presented. In particular, differences in language and methods used by different disciplines bring about specific challenges for publishing interdisciplinary research;

   What does this mean in practice? Pohl et al (2015) identified four categories of success factors for interdisciplinary publications:

   a. *Scientific resources: previous joint publications; working in parallel for multiple manuscripts in order to coordinate and avoid duplication; ideally, basic understanding of other disciplines;*
   b. *Human resources: strong coordinator with previous experience and openness towards the perspectives from different disciplines; involving additional researchers, if this is needed to cover gaps; availability of senior researchers or professors with deep disciplinary background who are interested to take part in the publication process;*
   c. *Integrative resources*: the team develops a joint vision on how to integrate and link the disciplinary and interdisciplinary research and choose the form of publication accordingly;
   d. *Feedback resources:* Internal reviews should ensure that the paper does not become a collection of separate disciplinary contributions.

3. **Collaborative reflexivity:** engaging all partners in reflections on how collaboration is experienced and what its added value is, how it relates to the specifics of the research context, and how risks are being addressed;

   What does this mean in practice? Projects should ensure spaces for regular reflection on how collaboration is enacted in daily research practice and how it can be improved.

4. **Clarifying un-shared goals:** being open about the goals of social science research and the goals of collaboration, which may or may not align with the expectations from natural scientists;

   What does this mean in practice? Projects should foresee time and a forum for regular interactions where researchers can work together towards negotiating differences in expectations from collaboration;

5. **Recognise and respect differences between disciplines**, working together to identify commonalities and differences, explore vulnerabilities and consider the impact of power

relations involved in collaborative work and how they might be shifted to enable more fruitful collaboration.

What does this mean in practice? Projects should foresee strategies to facilitate trust and good working relationships. Effort should be invested in developing a common language across the team and jointly determined research questions.

Schummer (2008) argues that cross-disciplinary communication is key to successful inter-disciplinary collaboration, highlighting cognitive and social strategies that may be used to improve communication. Cognitive strategies might include the development of a common knowledge basis into which knowledge from other discipline can be translated to; development of special jargons or creoles; modularization of the project and reducing communication to restricted interfaces; or the use of mediation or facilitation. Social strategies include for instance multi-disciplinary education activities, formal and informal exchanges on a regular basis, collaboration in research grants requiring interdisciplinary collaborations. According to Schummer (2008, p. 6):*"Social strategies alone cannot directly enable cross-disciplinary communication because they cannot overcome the cognitive gaps between disciplines. However, they can establish social conditions under which mutual learning and understanding are improved and they can weaken the social commitments of scientists to their specific discipline to increase mutual openness."*

4 Towards inter- and transdisciplinary research

Interdisciplinary research "*integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice*" (NAS/NAE/IOM 2005:2, in Pohl et al., 2015). While it "*welcomes disciplinarity and requires a strong disciplinary foundation*", interdisciplinary created knowledge is integrative, and results from the fusion of different disciplines (Clark and Wallace, 2015). Interdisciplinarity highlights gaps in scientific knowledge and provides new insights into the relationships between the different dimensions (e.g. social, ethical, environmental, technical) of a problem.

In what concerns research design, interdisciplinary research proposals should be goal-oriented and aim for synergies between methods and disciplines (Lyall et al., 2007; Frodeman et al., 2017; Klein, 2021; Hadorn et al., 2008). To this end, an initial scoping phase is recommended, which should take place before the writing of the proposal or be part of the proposal itself. This phase should explore the problem formulation, including the boundaries of what will be addressed in the project, in order to obtain the desired interdisciplinary outcomes. The outputs of this analysis should be the basis for decisions on which disciplines will be involved in the project.

Lyall et al (2007) propose the following guiding questions for reviewers evaluating interdisciplinary proposals:

- *" does the proposal specify clearly why an interdisciplinary approach is needed, which type of interdisciplinary approach is envisaged and which disciplines should be involved?*

- *does it describe how the disciplines involved will be integrated (in the design and conduct of the research as well as in subsequent publications) and how this relates to the type of interdisciplinarity involved; does it demonstrate how the quality of integration will be assured?*
- *is the leadership role and management strategy to deliver the desired outcomes clearly articulated?*
- *do the researchers involved have demonstrable interdisciplinary skills and experience? In particular, is there evidence of interdisciplinary leadership?*
- *is there an appropriate plan for stakeholder/user engagement from the outset of the project (this will usually be more of an issue for problem-focused interdisciplinary projects)?*
- *does the proposal budget for, and justify, the additional resources needed?*
- *is it clear how interdisciplinarity will be reflected in the project outputs and outcomes?"*

In addition, *trans*disciplinarity recognises the value of "co-creation" through the close collaboration between researchers and extra-scientific actors, for instance citizens, practitioners, industry or other end-users, in order to include their knowledge and experiences in the research process (Jahn et al., 2012). Such collaboration has the potential to strengthen the responses to complex problems in radiation protection, particularly when it takes place along the entire research process, from problem definition to implementation and evaluation of project outcomes.

Resources that can guide researchers when designing inter-disciplinary or trans-disciplinary projects can be found in:

- Hall, K. L., Vogel, A. L., & Croyle, R. T. (2019). Strategies for team science success. Springer International Publishing. doi, 10, 978-3;
- https://naturalsciences.ch/co-producing-knowledge-explained/methods/td-net_toolbox (Td toolbox with different methods to encourage/reflect/design co-creative and transdisciplinary projects);
- https://fotrris-h2020.eu/wp-content/uploads/2018/08/FOTRRIS-Cookbook-RRI.pdf (RRI cookbook);
- https://www.ecsite.eu/activities-and-services/news-and-publications/roll-rri-dice (game)
- https://ccn.waag.org/navigator/ (navigator to construct projects).

5 Quantitative indicators for SSH integration

The usefulness of quantitative indicators is still open to debate. However, quantitative indicators were developed by the European Commission (Directorate-General for Research and Innovation, 2020) to assess the level of integration of SSH into European Research. These considered the performance of each project against four criteria and associated thresholds, assessing whether:

- the proportion of SSH partners is higher than 10% (or 20%);
- the proportion of the budget going to SSH is higher than 10% (or 20%);
- the proportion of person-months by SSH partners is higher than 10% (or 20%);

- SSH contributions came from at least two distinct SSH disciplines.

The SSH integration in each project was then assessed according to the following scale:

1. **None** - No threshold met for any of the four criteria;
2. **Weak** - Threshold met for one criterion only;
3. **Fair** - Threshold met for two or three criteria;
4. **Good** - Threshold met for all four criteria.

The indicators above set minimum thresholds on resources allocated to SSH in order to allow meaningful contributions. Regardless of the quantitative aspect, good research and innovation integrating SSH is reliant on the ***quality*** of the relationships between disciplines and the research done.

Annex: Examples of SSH research integration in recent projects in the field of radiation protection

Working together with citizens for improved management of indoor radon risks in the H2020 project RadoNorm

The H2020 project RadoNorm recognises that insights from, and collaboration with, citizens are key to improving radon risk management, with particular focus on remediation measures. For this reason, a call for citizen science projects has been included in the project, allowing citizens to develop and implement their own research project related to radon. Social scientists are supporting citizens in the implementation of their research projects. In the same project, communication researchers engage with citizens in the development of communication tools on radon testing and remediation using interdisciplinary research methods such as Design Thinking.

Type of the project: Projects including an SSH component where SSH expertise is an integral, though not exclusive, part of the research design of topics, and solutions to the problem are generated by integrating knowledge stemming from both SSH disciplines and non-SSH disciplines such as dosimetry, epidemiology, radiobiology, engineering and technology.

Concepts and methods from the SSH disciplines: Sociology, communication sciences, psychology, marketing, ethics, political science, architecture and design.

Good practice: Integration of SSH in a multidisciplinary project as a dedicated WP and as such a key contributor to improved radon risk management. Mobilising citizens' knowledge, insights and experiences in the research process. Adequate financial and expertise resources dedicated to SSH work, enabling meaningful contributions.

Outcome: The project is currently ongoing but initial findings show the added value of developing radon risk mitigation actions with the input of citizens (Martell et al., 2022).

Link to project website: https://www.radonorm.eu

EURAMED ROCC-N-ROLL joint reflections on strategic research needs for medical applications of ionising radiation

In defining a strategic research agenda (SRA) in the field of medical applications of ionising radiation and related radiation protection, the project included wide stakeholder input and consultation (integrating also SSH perspectives) and paid special attention to addressing the question of how ethics and data protection issues related to medical applications and RP research need to be addressed in future projects.

Type of the project: Projects including an SSH component where SSH expertise is an integral, though not exclusive, part of the research design of topics, and solutions to the problem are generated by integrating knowledge stemming from both SSH disciplines and non-SSH disciplines such as radioecology, radiobiology, engineering.

Concepts and methods from the SSH disciplines: multiple SSH disciplines (for the elaboration of SSH aspects in the SRA); philosophy and STS (ethical aspects)

Good practice: Identification of ethical challenges is an integral part of the project. The project organised joint reflections with digitisation researchers, health experts and the radiation science community, including SSH, to discuss the ongoing digital revolution in healthcare in the particular context of radiation applications in diagnostic and therapeutic medicine. It also produced two reports in the domain of AI and ethics that can inform future projects.

Outcome: Strategic research needs for SSH research in the medical field were synthesized, in collaboration with SHARE, the platform for Social Sciences and Humanities in radiation protection research. Ethical challenges to be addressed in future projects were identified.

Link to project website: https://roccnroll.euramed.eu/about-rocc-n-roll/

Integration of social and ethical considerations into radiation protection research on long term exposures in CONCERT-TERRITORIES

Within the CONCERT TERRITORIES project, social scientists observed and interviewed natural sciences researchers in the lab by applying the Socio-technical integration research (STIR) protocol (Fisher, 2007). It aimed at i) identifying how radiation protection researchers address and manage uncertainties through models and monitoring in long-lasting exposure situations and ii) integrating social and ethical considerations into research in/on radiation and radiation protection (Van Oudheusden et al., 2019).

Type of the project: Projects including an SSH component where SSH expertise is an integral, though not exclusive, part of the research design of topics, and solutions to the problem are generated by integrating knowledge stemming from both SSH disciplines and non-SSH disciplines such as radioecology, radiobiology, engineering.

Concepts and methods from the SSH disciplines: in this task: Science and Technology Studies.

Good practice: This SSH task was integrated into a work package combining different natural sciences and SSH. Adequate resources dedicated to SSH work, which enabled meaningful contributions.

Outcome: STIR facilitated collaborative encounters between natural and social scientists, encouraging reflections on uncertainties involved in their research, such as measurement uncertainty and communication uncertainty.

Link to project website: https://territories.eu/publications

Socio-technical approaches to the study of protective actions and communication of uncertainties in the CONCERT-CONFIDENCE project

A main objective within the CONCERT CONFIDENCE project was to research technical and social uncertainties related to protective actions in case of a nuclear emergency, and their interaction. It paid special attention to the uncertainties that citizens and emergency responders faced I case of an emergency or in the transition phase, and how they react to these. It also researched ways to communicate uncertainties to emergency management stakeholders, including citizens.

Type of the project: Projects including an SSH component where SSH expertise is an integral, though not exclusive, part of the research design of topics, and solutions to the problem are generated by integrating knowledge stemming from both SSH disciplines and non-SSH disciplines such as physics, radioecology, radiobiology, mathematics.

Concepts and methods from the SSH disciplines: psychology, communication studies, philosophy, political science, sociology.

Good practice: Adequate resources dedicated to SSH research, which enabled meaningful contributions. Exchanges and collaborations between natural and social scientists in courses and joint publications.

Outcome: Researching uncertainties related to protective actions, from both a technical and socio-psychological point of view, which helped identify potential gaps in emergency planning. It demonstrated for instance that public understanding and compliance with advice on the intake of stable iodine could be improved by communicating numerical and narrative information (Turcanu et al., 2020). SSH research also pointed attention towards and potential uncertainties faced by various actors in nuclear emergencies based on the non-participatory observation (Hoti et al., 2021) and helped identify effective ways to communicate uncertainties with visual information using maps (Nagy et al., 2020).

Link to project website:

https://portal.iket.kit.edu/CONFIDENCE/index.php?action=confidence&title=objectives

Unpacking the notion of "engagement" and formulating recommendations for inclusive radiation protection in ENGAGE

ENGAGE investigated the meanings, values and expectations from "engagement", as understood by different stakeholders. It traced the prescriptions and practices for "engagement" in three contexts: nuclear emergency preparedness, response and recovery; exposure to indoor radon; and medical exposures to ionising radiation.

Type of the project: Projects led by SSH research where issues are framed mainly from the SSH perspective and most project partners come from SSH disciplines.

Concepts and methods from the SSH disciplines: Science and Technology Studies, political science, sociology, communication science

Good practice: The project welcomed the engagement of a broad range of stakeholders in contributing to the knowledge developed in the project.

Outcome: As it recognised the plurality of engagement concepts and the continuum between institutional and citizen-led participation and took into account the meanings and expectations from different stakeholders, the project could identify the roots of gaps between prescriptions and practice. Among others, it identified several forms of engagement that constitute resources authorities can tap into (Turcanu et al., 2019), for instance informal engagement, such as bottom-up citizen led initiatives. The project also evaluated radon websites from a stakeholder engagement perspective providing recommendations health communication practitioners in support of improved radon risk mitigation (Perko et al., 2020)

Link to project website: https://www.engage-h2020.eu/

SHAMISEN recommendations addressing ethical issues of health surveillance

SHAMISEN mobilised the ethical principles of radiation protection (well-being; dignity/autonomy; justice/equity; prudence/precaution) to examine interventions aimed at health surveillance and monitoring of populations in case of a nuclear accident.

Type of the project: Projects led by SSH research where issues are framed mainly from the SSH perspectives and most project partners come from SSH disciplines.

Concepts and methods from the SSH disciplines: philosophy

Good practice: It was one of the first projects in nuclear emergency management to develop recommendations that specifically addressed ethical principles.

Outcome: It developed ethical recommendations for nuclear emergency management, showing that "ethical analysis can help make assumptions and dilemmas more transparent." (Oughton et al., 2021; pp. 106537)

Link to project website: https://www.isglobal.org/en/-/shamisen

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