



Intergenerational connections in radioactive waste management: Involving children and youth

Intergenerational equity

Science-based solutions that are safe and acceptable for future generations need to be developed for all the radioactive waste being produced. Indeed, the sustainable management of radioactive waste must ensure the protection of the environment and social well-being, while respecting equity between present and future generations. For the sake of this intergenerational solidarity, it is therefore logical and necessary to pay special attention to young people in working out decision-making processes lasting several decades. Today's young people are tomorrow's policymakers and they will have to take responsibility for the further management of radioactive waste.

Initiatives for young people aim to provide the next generation with sufficient knowledge to be able to deal flexibly with decisions made today. The challenge is not only to raise their interest in radioactive waste management, but also to share the necessary information to ensure the long-term safety of the disposal facilities and to involve young people in a process that will last for decades.

A specific approach to young people

Many countries are developing specific initiatives to involve young people in radioactive waste management, from informing and communicating to dialogue. Both the content of the message (which needs to be in line with young people's knowledge and values) and the communication channel (how the message is conveyed) need to be adapted to this stakeholder category. The most frequently used methods involve the use of social media but face-to-face interactions remain valuable, in particular by co-operating with educational institutions (schools, colleges and universities). Creative forms of communication are often used, such as games or role playing.

This flyer, developed by the NEA Forum on Stakeholder Confidence (FSC) provides practical examples of how

some countries are seeking to involve young people in this process. The list of initiatives presented here is not exhaustive but seeks to provide inspiration to radioactive waste management organisations, nuclear authorities, federal organisations and schools. A distinction is made between age groups by educational level: elementary school (6-12 years), secondary school (12-18 years), university (18 years and up), and young adults.

Elementary school-aged children (6-12 years)



RWM, United Kingdom

For this age group, the objective is to raise the interest of the children by using fun communication materials, and to provide basic scientific and technical knowledge by using simple words.

Radioactive Waste Management (RWM) in the **United Kingdom** developed four "characters" to help tell the story of geological disposal: Rocky (representing a

rock, a key component of geological disposal), Shell (representing waste transport), Ray (in reference to gamma rays), and R.O.B (for “robot”, which may be needed to handle the waste). These four characters have been used in different communication formats, such as an introductory leaflet (“Let’s talk about radioactive waste”), a quiz, a set of peel-off stickers (shown here), a folded paper “fortune teller” (also known as a “cootie catcher” or “chatterbox”) to help share the information in a fun way.

RWM also produced an augmented reality app, which allows the children to access short information videos with a phone, when pointing the camera on the characters (<https://vimeo.com/395415214/a8ba331061>).

The National Agency for Management of Radioactive Waste (Andra) in **France** provides schools with educational and factual answers to simple questions: What is radioactivity? What is radioactive waste and who produces it? Is it dangerous? What is done with it?

The main target is local audiences near regional facilities. Communication activities seek to promote face-to-face interactions, such as class talks and on-site educational exhibitions, supported by specific communication materials. Here are two examples:

- Two videos (30 minutes each) in partnership with L’Esprit Sorcier (www.andra.fr/esprit-sorcier-stockage-profond-lavenir-des-dechets-les-plus-radioactifs), a French Internet platform that popularises science, and posted on their YouTube channel to maximise the audience. As of July 2021, the videos had attracted 120 000 views and over 600 comments:
 - 1) www.youtube.com/watch?v=dBw-sPgFSwc;
 - 2) www.youtube.com/watch?v=QvBBc5HHyaY
- A special edition of *Les Incollables* in partnership with *Playbac*, a publishing group for young readers. Four thousand copies of this question-and-answer game were printed, and a digital version was also released.

In **Japan**, the Nuclear Waste Management Organization (NUMO) supports school teachers in developing teaching plans and materials for students aged between 6 and 18. Between 2014 and 2020, more than 250 lessons have been organised by school teachers, for approximately 8 000 students. In order to share experience among teachers, NUMO organises regional and nationwide workshops every year. It developed standard teaching materials for elementary school students (aged 6-12) and junior high school students (aged 13-15) and distributed them to schools and Boards of Education nationwide. These teaching plans and materials are available on NUMO’s dedicated website: <https://numo-eess.jp/> (in Japanese).

Russia’s State Atomic Energy Corporation Rosatom created programme for nuclear knowledge sharing including exchanges of experience, knowledge generation, and translations into other languages. It developed the “Rosatom School” project, which is implemented in Russia for school children, as well as a network of multilingual schools in other countries, namely Finland, Hungary, Indonesia and South Africa (<https://rosatom.ru/en/sustainability/project-rosatom-school/>). Since 2016, about 1 000 children from 25 countries have participated in this programme.

Secondary school students (12-18 years)

In addition to initiatives such as class debates, presentations by experts, on-site exhibitions and web conferences, some NEA member countries developed (or are developing) creative ways of engaging with this age group, notably with board games and computer-based games.

In **Belgium**, EIG EURIDICE - the Economic Interest Grouping between the Belgian National Agency for Radioactive Waste and Enriched Fissile Material (ONDRAF/NIRAS) and the Belgian Nuclear Research Centre (SCK CEN) - developed a role-playing game for students aged 16 and older: “The Disposal Mayors”. During the game, students discuss the possible construction of a geological repository in their municipality and the challenges around this issue. They take different roles successively, from the mayor or municipal councillor to the local citizen. The themes addressed during the game are very diverse. Is such a waste repository safe enough? Is it technically possible to build one? Are there no better ways of managing or processing waste? Does the local population have enough say in this project? Are there advantages for the local community? And who is going to cover the costs?

The aim is to allow young people to reflect on this socially important theme through an interactive simulation, and to endorse different points of view with convincing arguments. The students process the information related to such a project, look for additional inputs in the exhibition area, consult in small groups (between 12 to 25 participants), and debate their arguments. No technical knowledge is required to play this game, since the focus is the social and political dimension of the repository project. Between April 2019 and March 2020, 28 school groups played the game, in which 766 students took part.



Cards used during the game

ONDRAF/NIRAS, Belgium



Poster panels used as an introduction to the game

ONDRAF/NIRAS, Belgium

In **Spain**, a game called “Escape Box” was developed by the National Organisation for Radioactive Waste (Enresa) for high school students in the province of Cordoba, where the El Cabril facility for low- and intermediate-level waste (LILW) disposal is located. This game begins with a presentation of Enresa’s activities, El Cabril’s disposal centre and the concept of radioactive waste. After the presentation, students have 45 minutes to condition the waste and accommodate it in the corresponding disposal vault. In order to do that, they need to open five boxes using codes or keys and instructions provided as they answer questions related to radioactive waste management. The game helps them understand in a fun way how LILW is managed in El Cabril. It was planned to be played during the students’ visits to the facility. During the COVID-19 pandemic, the student visits at the facility have been suspended and an online version of this game was developed. The game received very positive feedback from both students and teachers.

project. In 2020, the magazine organized a competition festival for young journalists.

Social media are also a powerful tool to communicate with secondary school students. In **France**, Andra set up partnerships with science and technology YouTubers, namely AstronoGeek (<https://www.andra.fr/decouvrez-la-video-dastronogee-descend-500m-sous-terre>) and Dave Sheik (www.andra.fr/node/958), in order to produce educational videos on subjects related to radioactive waste management, such as history, environment, ethics, medicine and industry. A significant increase in the audience of Andra’s videos has been noticed: with about 100 videos over five years, Andra’s YouTube channel (www.youtube.com/user/andrafr/) went, in barely two years, from 100 000 views and a few comments to several million views and thousands of comments, mainly from younger audiences.



One of the boxes of this “escape-box” game

Enresa, Spain

Russia first implemented the “Rosatom School” project in 2011. This project includes contests for children, participation in “excellent Rosatom” (a ten-day summer camp for school children to talk about ecology and radiation safety issues), and other activities. In addition, educational books and interactive digital games are distributed to introduce activities in the field of nuclear and radiation technologies, including the issues related to waste management and waste disposal (picture attached). From 2017 to 2020, the magazine “Cool Rosatom” has published 30 issues and 12 special issues dedicated to the activities of the Rosatom School

University students

In **Japan**, NUMO organised a video production contest for university students. Students are given the opportunity to learn the ins and outs of video and animation production around one topic: enhancing public understanding of geological disposal for high-level radioactive waste. A total of 37 innovative videos were produced between 2016 and 2019 based on ideas from young contributors. These videos can be viewed on NUMO’s YouTube site (www.youtube.com/channel/UCWkXz0HwsaabNZluCzgQwLg).

In **Russia**, a “Nuclear Pool” of Russian universities (i.e. a consortium of Rosatom reference universities) has been created in 2011, which train specialists in the nuclear industry and propose internships for young professionals in nuclear industry sites and foreign universities. Dedicated work with students was carried out to attract interest in these Russian universities. Each university in this Nuclear Pool has specialised departments focused on different competencies, and together they offer Russian and foreign students a wide range of skills and knowledge in the field of nuclear and radiation technologies. Today, the consortium gathers 18 specialised universities, and 9 of them are included in the top-20 of the best universities in Russia according to the ranking of Forbes magazine published in June 2021.

The tendency towards personal commitment and personalisation currently widely identified with this generation can be addressed by being active in places that are conducive to opening up a constructive debate. For instance, Andra in **France** invites students to its sites within the framework of partnerships with universities that can, in return, organise debates within their walls. Andra also participates in conferences or debates organised by third parties. A particular effort is placed on students (and alumni) of French higher education institutions (“grandes écoles”) with engineering schools, via the alumni networks of Andra’s employees. The partnerships also target universities that are training tomorrow’s policymakers.

Young adults

In **France**, digital and social media (in particular Twitter, Facebook, LinkedIn and Instagram) play a key role in reaching young adults. That is why Andra is using innovative ways to raise the interest of this audience in radioactive waste management: plays, photo/video/writing contests, podcasts, webinars and conferences. In June 2019, a web conference was organised in partnership with Youmatter on the theme “How do we talk about subjects that frighten us?” (in French), gathering three speakers and over 200 live participants (ten times more on replay). Numerous questions were asked on YouTube and Zoom during this two-hour live session. The subject of radioactive waste management was a highlight of the discussion (<https://youmatter.world/fr/debattre-sujets-peur-societe-democratie>).

In **Germany**, youth involvement is a major goal in the context of the radioactive waste site selection process. With the aim of better understanding the needs and expectations of young people, the three main actors – the Federal Office for the Safety of Nuclear Waste Management (BASE), the Federal Company for Radioactive Waste Disposal (BGE mbH) and the National Civil Society Board (NBG) – jointly conducted a workshop in October 2019. This three-day event gathered sixty-three participants aged from 15 to 30. The objective was to discuss their expectations and ideas regarding youth involvement. In order to provide room for their own approaches and recommendations, the workshop was designed as an open space format

where participants themselves set the topics of the agenda. A total of 13 sessions took place focusing on a wide range of topics, such as the role of social media and storytelling, new approaches to youth participation as well as nuclear waste disposal in the context of environmental protection. This format delivered valuable input for BASE, BGE mbH and NBG. All three actors took the results into account and transparently reported on the ways and the extent to which they would implement these recommendations. Additionally, in order to share the results with a larger audience, a group of participants presented the findings of the workshop at the annual BASE conference on final disposal of radioactive waste (“Statuskonferenz Endlagerung”).

Conclusions

Specific efforts are needed to involve young people in nuclear waste management and engage them in a dialogue. Radioactive waste management organisations have to actively approach the next generation through targeted actions that are adapted to their age, their environment, and their way of communicating. Through creative communication and teaching materials, games, role-playing, videos, podcasts, conferences, webinars, and partnerships with social media influencers and youth associations, NEA member countries have developed different ways to involve younger stakeholders.

Although youth involvement is important at each step of a nuclear energy programme, the long time frames of policies and disposal projects in radioactive waste management require a particularly strong engagement with younger generations. Successful communication at an early stage can encourage young people to share the information and continue the dialogue, particularly on the currently prominent medium of social media. The objective of the initiatives listed in this flyer is both to raise interest by successfully explaining the technical and social issues related to radioactive waste management, and to engage in a trustful dialogue. It is crucial to take young people’s input seriously and report transparently on how and to what extent recommendations will be implemented.