Milestone 83: Annual event n°2 summary

Work Package 1

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Executive Summary

The second annual event was held from 08 to 10 September 2026 in Dublin, Ireland. More than 250 persons (EURAD-2 members, end-users and invited speakers) were physically present over the three days.

The first day was dedicated to plenary sessions, starting with a stakeholder panel on the needs of small inventory programmes. Strategic Studies shared lessons learned and insights, while the External Advisory Board provided its reflections on EURAD-2. Two spotlight on cutting-edge science sessions showcased ongoing scientific work, and discussions involving EURAD-2 governance bodies highlighted next-generation perspectives.

The second day focused on climate change and technical exchanges. The morning consisted of plenary session on the topic followed by breakout sessions exploring the impacts of climate change on radioactive waste management, addressing societal and governance implications, existing facilities, operational needs and post-closure safety. In the afternoon, seven parallel topical sessions brought together the EURAD-2 Work Packages to present and discuss technical results.

The final day opened with a side event co-organised with the European Economic and Social Committee, focusing on closing the fuel cycle and the potential contribution of circular economy approaches (not reported in this document). The afternoon featured further Spotlight on cutting-edge science presentations, followed by a session dedicated to Knowledge Management and the Young Generation network.

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1. Day 1 – Plenary sessions

1.1 Stakeholders panel discussion on needs of small inventory programmes

Rapporteur	Erika Holt (VTT)
Key speakers	David Fenton (Environmental Protection Agency) Felicia Dragolici (IAEA) Gianfranco Brunetti (EC DG ENER) Dr. Geraldine O'Reily (St James's hospital) Dr. Ruairi O'Donnnell (Univ. College Dublin)
Objective	Learn current practices and challenges perspectives from Small Inventory Member State (SIMS) country Ireland, as hosting country for the annual workshop
Number of participants	ca. 250.

This session built on previous annual workshops to highlight the waste management perspectives of the host country, Ireland. Following brief introductions, the panel—featuring the Environmental Protection Agency (EPA) as the Irish regulator and St James's Hospital Dublin and University College Dublin as representing local end-users. The panel engaged in a moderated discussion across six key points. Panellists detailed the challenges of managing short-lived and long-lived radioactive materials, such as Disused Sealed Radioactive Sources (DSRS), low level legacy waste generally U and Th salts and orphan sources, which lack clear disposal routes. Currently, Ireland's inventory of radioactive waste is very small comprising 14 DSRS. Radioactive waste generated in Ireland is generally short-lived medical waste which is held locally under EPA licence until decayed to background. The longer lived DSRS are also held locally under EPA licence pending their return to the supplier. The panel noted this process can beset with inflated costs resulting in delays. Long-term programmatic hurdles were also noted, specifically clearing or disposing legacy waste mainly U and Th salts. Against the background of Ireland's very small radioactive waste inventory it can be challenging to prioritise radioactive waste especially regarding incentivising competence development for future experts and ensuring future sustainable expertise in this field.

From an international perspective, panellists from EC DG ENER and the IAEA highlighted cooperative efforts among Member States to establish common or joint waste management practices. IAEA emphasized the need for concrete guidance and successful case studies regarding the handling of very small volumes of materials. Addressing regulatory evolution, the EPA shared lessons from recent IRRS Peer review mission to Ireland, outlining the need for a national framework for the management of radioactive waste in Ireland, including targets for improved practices. The EPA expressed strong openness to collaboration, noting its appreciation for the EURAD-2 network. The session concluded with an audience Q&A covering ideas around clearance of DSRS and the implications of new technologies using radioactive substances.

1.2 Lessons learned and Insights from Strategic Studies

Rapporteur	Elke Jacops (SCK CEN)
Key speakers	Elke Jacops (SCK CEN) Marja Vuorio (COVRA) Timothy Schatz (VTT) Alexis Geisler-Roblin (NTW) Philipp Herold (BGE) Réka Szoke (HUN-REN EK) Stéphane Brassinnes (NIRAS)
Objective	To present the technical outcome of the first wave strategic studies and to highlight the leassons learned, including recommendations for future StSt activities.
Number of participants	ca. 250.



- Main themes / topics

Technical outcome of following StSt: OPTI? DITOCO2030, DITUSC, CLIMATE, ASTRA, FORSAFF

General views on the role of StSt

- Outcomes

Strategic Studies are a valuable EURAD-2 instrument

- Facilitate networking and knowledge exchange on common strategic challenges.
- Support national programmes beyond purely RD&D objectives.

Success depends on clear focus and expectations

- Well-defined scope, SMART objectives, and expected outputs are essential.
- Strong leadership and active stakeholder engagement are critical.

Strategic Studies should be tailored to their purpose

- Not every study needs to lead to a future RD&D Work Package.
- The format, participant profile, and expected outcomes should fit the specific strategic question.

Future Strategic Studies should be more agile and impactful

- Smaller, focused expert groups.
- Earlier review and stronger dissemination of outputs.

- Follow-up actions

Focus Strategic Studies on delivering actionable strategic guidance through clear objectives, targeted expertise, effective collaboration, and meaningful engagement with end-users and stakeholders.



1.3 Reflections from the External Advisory Board

Rapporteur	Simon Morgan (ONR)
Key speakers	Simon Morgan (EAB Chair representing WENRA) Ali Awada (representing CONNECT-NM Partnership)
Objective	Share External Advisory Board's view
Number of participants	ca. 250.

- Strong recognition of EURAD-2 as a unique European platform for collaboration and knowledge sharing in radioactive waste management.
- Need for stronger external visibility, clearer demonstration of impact and closer links with wider European initiatives.
- Stakeholder engagement identified as a key impact driver, with a call for more continuous and inclusive participation.
- Positive collaboration culture acknowledged, alongside the need to simplify governance and clarify KM/IM/DM roles.
- Future priorities include improved communication, stronger stakeholder integration, enhanced knowledge management and greater focus on societal trust and long-term sustainability.

1.4 Spotlight on cutting-edge science

Rapporteurs	Xavier Pintado (ClayTech), Simona Sandalova (Polimi), Marta Lopez (Amphos 21), Vaclav Znaminko (UJV REZ)
Key speakers	Zoe Emory (KTH) Zhangrong Liu (CNRS/NAVIER) Filip Babcicky (CVUT) Lidia Generelo Casajus (UGR) Fabio Fattori (POLIMI) Carla Garcia (CSIC)
Objective	Highlight studies and state-of-art research conducted within the EURAD-2 partnership. The session aimed to highlight state-of-the-art research on the processes that influence the performance of engineered barriers, canister materials and waste forms, as well as their implications for radioactive waste management and geological disposal.
Number of participants	ca. 250.

The Engineered Barrier System is a complex system in which different materials, with very different behaviours, share a common purpose: preventing radionuclides from reaching the biosphere and causing contamination.

The first part of the session was focused on quite special issues related to the EBS: the stability of the Studite for avoiding the release of Uranium in the fuel cycle, the impact of the salinity in the groundwater that hydrates the bentonites, one of the components of the clay barriers in HLW repositories, and the measurement of radionuclides in concrete, main component in LILW repositories.

The three presentations can be considered cutting-edge science because were focused on issues related to nuclear waste that are not solved yet. The spent fuel is the main source of radionuclides in HLW repositories, the salinity of the groundwater and its changes might modify the behaviour of the clay barriers and the presence of radionuclides in LILW concrete is necessary to quantify in order to know the level of contamination.

The second part of the session presented three complementary studies addressing current challenges in radioactive waste management and geological disposal. The first examined microbial activity and copper corrosion in irradiated FEBEX bentonite, showing that corrosion occurred even when microbial viability was suppressed and highlighting the combined influence of radiation, microbial processes and mineralogical changes. The second demonstrated the potential of Fenton oxidation to increase the loading of ion-exchange resins in conditioning matrices, although further optimisation and validation against Waste Acceptance Criteria are required. The third compared MKPC and low-pH Portland

cement waste forms, finding that MKPC performed favourably over shorter timescales, whereas low-pH Portland cement with silica fume offered better long-term stability.

Overall, the session illustrated the diversity of coupled biological, chemical and physical processes that need to be understood and controlled to support the safe management and disposal of radioactive waste. All presentations were delivered by young researchers, highlighting the important role that the next generation will play in the future development of spent fuel repositories and the continued improvement of LILW management and disposal solutions.

The discussion following the presentations addressed the implications of the results, remaining uncertainties and priorities for further research. Particular attention was also drawn to the challenge of communicating such complex scientific topics to civil society and wider scientific audiences, as some of the processes discussed may be difficult to understand even for researchers working in other fields.

1.5 EURAD-2 through its governance bodies: next-generation perspectives

Rapporteurs	Francesco Rizzo (Sapienza University of Rome)
Key speakers	Moderators: Simona Sandalova (Polimi) and Arthur Rousset (NTW) Jimena de Hita (ENRESA) Sami Naumer (VTT) Georges Matta (ASNR) Gauthier Fontaine (NTW) Abhishek Mishra (GSL), could not attend
Objective	The session gathered young professionals actively involved in EURAD-2 WPs to reflect on the first two years of the project: what has worked well, where the experience of early-career researchers could be further supported, and how the next generation can contribute to the way the programme is driven.
Number of participants	ca. 250.

Main themes / topics

The panel reflected on the EURAD-2 experience from the perspective of young professionals, highlighting strengths and areas for further improvement.

What is working

- Working within a WP alongside senior researchers was described as one of the most valuable aspects of the experience, both for scientific content and especially for the mentoring that naturally comes with it.
- The creation of the Young Generation group was highlighted as an achievement in its own right, offering activities such as panels, mobility opportunities and dedicated support that give early-career participants a shared space and a collective voice.
- EURAD-2 offers an unusually rich range of environments and interactions with senior experts and RWM organisations.

Where the experience could be strengthened

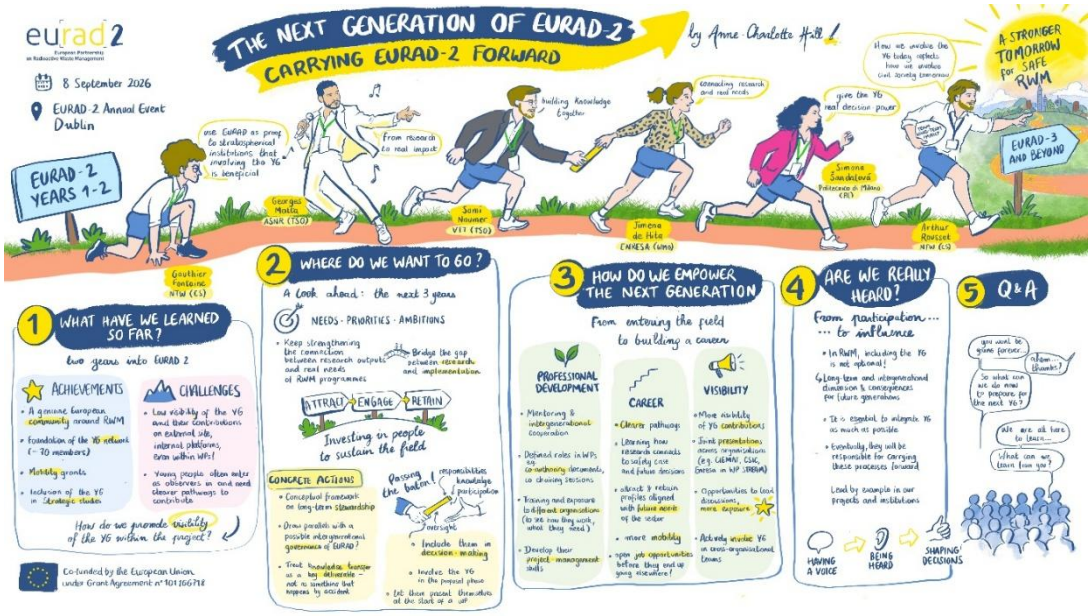
- Visibility of contributions: Young Researchers are contributing across many WPs and deliverables, but this contribution is not easy to see from the outside.
- Widening the range of roles: Involvement today is largely scientific, while exposure to WP roles, such as project management, would provide valuable complementary experience.
- Understanding and contributing to decisions: The perspectives of the next generation could be more systematically reflected in how decisions are taken. Greater transparency on decision-making processes would itself be valuable.
- Continuity towards industry: The link between research and industrial application remains an area with significant potential, particularly in ensuring that expertise and knowledge are carried forward rather than lost.

Possible ways forward

- Dedicated visibility slots: Short, regular slots for the Young Generation within WP annual meetings to present activities, contributions and ongoing work.
- Structured opportunities to contribute: Regular occasions for Young Researchers to present their work and participate in strategic studies.
- Broader WP roles: Progressive involvement of Young Researchers in project management and coordination tasks, alongside scientific contributions.
- Participation in decision-making: Involving Young Researchers in decision-making processes, initially as observers and progressively as contributors.
- Connections, mobility and exchange: Strengthening mentorship, mobility, exchanges with end users and collaboration across WPs and organisations to support knowledge transfer.

Outcomes and future actions

The key discussion points from this panel session, together with feedback from the EURAD-2 Young Generation Youth Day (7 September 2026), were used to prepare the Young Generation message presented during the WP2 session on Thursday. The message is a call to action to the EURAD-2 consortium, highlighting ongoing successful initiatives and proposing further actions to strengthen the involvement of the next generation of radioactive waste management experts in the EURAD-2 partnership, support their career and skills development, and encourage their long-term engagement in the field. A written version of the message is currently being prepared and will be shared on the EURADSchool platform.



1.6 From ideation to action: year-one outcomes and next steps

Rapporteurs	Louise Théodon (Andra)
Key speakers	Alexis Geisler-Roblin (NTW) Christophe Debayle (ASNR) Elke Jacops (SCK CEN) Sabrina Dollinger (AGES)
Objective	Report progress made on actions prioritised during annual event n°1
Number of participants	ca. 250.

Data Management

During Year 1, needs were identified across four main areas: the Knowledge Management platform, Data Management Plan, training, and community building.

Progress since last year:

- Platform specifications were established, resulting in Deliverable 2.1, issued in September 2026.
- A mentoring programme was launched.
- Measures were introduced to reduce data exchanges by email.
- The creation of additional standalone portals was discontinued to avoid further fragmentation.

Still to be addressed:

- Update the Data Management Plan.
- Further reduce reliance on local and personal data storage.

Civil society

Two key priorities were identified for further action:

- Reaching a broader civil society community.
- Enabling stronger mutual learning and transformation between EURAD-2's technical and societal perspectives.

Progress since last year:

- Interactions with Civil Society workshops were restructured to reduce technical jargon and the use of acronyms. Achieved
- Specific R&D WPs were invited to participate in the workshops and present their results and key challenges. Partially achieved
- More events were organised, particularly at regional level. Achieved

Small Inventory Member States

Several priorities were identified during Year 1:

- Better promotion of mobility and training opportunities.
- Greater SIMS representation in EURAD-2 governance.
- Maintaining a broad and inclusive scope addressing SIMS needs.
- Workshops focusing on practical challenges.
- A stronger SIMS voice in EURAD-2 and European Commission discussions.
- Increased opportunities for mentoring, networking and data sharing.

Progress since last year:

- SIMS are now represented in the Bureau and College Boards, with the PMO remaining the only governance body without SIMS representation.
- Discussions have started on establishing a single SIMS representative able to convey a broad range of challenges and needs.
- Several EURAD-2 activities directly address SIMS needs. ASTRA, ICARUS, SUDOKU and STREAM contribute, for example, through standardised characterisation protocols, optimisation of near-surface disposal facilities, and outputs made available to participants.

Still to be addressed:

- Strengthen SIMS-LIMS knowledge transfer.
- Further improve SIMS representation in governance and strategic decision-making.

EURAD-2 impact / outreach

Four main areas for strengthening EURAD-2's impact and outreach were identified:

- Gamification
- Social media
- Graphical approaches
- Events

Progress since last year:

- Collaboration with the EURAD-2 Young Generation has been strengthened, particularly around gamification activities.
- A social media policy has been implemented.

Prioritising actions with the greatest impact:

Following an assessment of the effort, feasibility and expected impact of the proposed ideas, some actions will not be pursued within EURAD-2, including escape rooms, temporary art exhibitions and VR-based activities. Resources will instead be focused on realistic, impactful and sustainable outreach actions.

2. Day 2 – Parallel sessions, breakout sessions

2.1 Plenary – Climate change on nuclear waste facilities

Rapporteur	Peter Ormai (PURAM)
Key speakers	Didier Paillard (LSCE) Álvaro Sáinz García (Amphos 21) Berta Picamal (Nucleareurope)
Objective	Provide a strong basis for integrating climate change into programme development, safety assessment, and regulatory review across different national contexts
Number of participants	ca. 250.

Didier Palliard: Long-term climate scenarios

The presentation examined how human activity changes long-term climate scenarios relevant to environmental assessments. Older “natural” scenarios extrapolated past glacial cycles and used Quaternary analogues, but the presentation argues that they are unrealistic on 100–10,000-year timescales.

Long-term projections must account for future greenhouse-gas emissions, atmospheric concentrations, global temperature and carbon-cycle persistence.

Under the illustrated emission scenarios, large northern glaciations would not return until the latter half of the next million years. Local assessments also require downscaling global climate-model results to finer regional resolution.

The presentation highlighted possible tipping points beyond northern ice sheets, including Antarctic ice loss, changes in the Atlantic overturning circulation and carbon release from soils or permafrost. These outcomes remain sensitive to assumptions and could substantially alter regional climate and extreme weather. Future carbon removal and geoengineering may also affect long-term climate, although their scale, feasibility and societal choices are uncertain. The central conclusion is that neither purely natural scenarios nor a single temporary emissions spike adequately captures the range of possible human influences over very long timescales.

Álvaro Sainz Garcia: Climate Change on Radioactive Waste Management: Key Findings from WP11 CLIMATE

EURAD-2 WP11 CLIMATE examined climate change impacts and research gaps in radioactive waste management. It covereed surface, near-surface and deep geological facilities during construction, operation and after closure.

During construction and operation, heavy rain, floods, heatwaves, erosion and coastal hazards can affect infrastructure, access and worker safety. Compound and cascading events also require assessment, since their combined effects may exceed those of individual hazards. After closure, infiltration, groundwater flow, landscape evolution and sea-level change can affect barriers and long-term safety assessments. Near-surface facilities are more exposed to infiltration and erosion; deep repositories depend on long-term hydrogeological and geological evolution.

Climate projections need to be translated into site-specific parameters and scenarios that can inform safety decisions.

Key gaps include local data on rare extremes, scenarios spanning centuries to millennia, and coupled climate–hydrogeological models. The project recommends a shared European assessment approach, explicit uncertainty treatment, targeted monitoring and periodic review.

Berta Picamal: Nucleareurope view

The speaker provided some remarks on what nuclear contributes to the EU's economy and how perception of its impact has evolved in recent years both at the European Commission's level but also in the EU Member States level.

It is clearly recognised that nuclear, alongside renewables, is the energy source that will help us curve CO2 emissions, which is one of the objectives that the European Union has fixed itself. In fact, when analysing in detail, it is clear that nuclear, in all of its lifecycle, including the fuel cycle, has roughly the same CO2 emissions as the renewable sources.

The speaker reminded the discussion about 5 years ago during the establishment of an EU framework that would facilitate sustainable investment, the famous Taxonomy regulation

"the analyses did not reveal any science-based evidence that nuclear energy does more harm to human health or to the environment than other electricity production technologies already included in the Taxonomy as activities supporting climate change mitigation".

Nucleareurope experts believe that for meeting the electricity needs the lifetime of the existing nuclear fleet needs to be ensured as much as possible and as far as it continues to comply with the safety regulations.

Alongside the long-term operation of the existing fleet, new installed capacity with large reactors as well as with the development and deployment of SMRs and further down the timeline the AMRs will be key.

The speaker mentioned that perception of nuclear energy has evolved to being a lot more positive. The regain in interest is obviously linked to global geopolitics. Security of supply and energy independence have become once again key, alongside competitiveness and combating the negative effects of climate change. At European Commission level we have seen a clear wind of change: at the highest political level. When it comes to the attitude of Member States, here again we see a clear shift toward inclusion of nuclear energy in their forthcoming plan at working level, we have to continue to insist on the need for this respect of the technology neutrality and any proposal coming from the European Commission services needs to ensure that nuclear is not excluded but all the contrary.

Key takeaways

Climate change must be considered throughout the full lifecycle of radioactive waste facilities.

Climate projections support safety decisions only when translated into site-specific scenarios and parameters.

Long-term climate scenarios must account for human influence; past natural cycles alone are no longer a sufficient guide.

Future scenarios should explore tipping points and possible human interventions, rather than assume a single climate pathway.

The new encouraging EU prospects will have an impact on the radioactive waste management community.



Session 1 – Climate change impacts on society

2.1.1 Rapporteur	Alexis Geisler-Roblin (NTW) and Zoe Emory (KTH)
Key speakers	Yves Lheureux (ANCCLI)
Objective	Explore how climate change may affect radioactive waste management policies, governance and societal engagement
Number of participants	ca. 30

Key speakers: Yves Lheureux and Kevin Deniset

- Interactive breakout session explored how climate change may affect radioactive waste management policies, governance and societal engagement.
- Through a PEP exercise covering 17 scenarios, participants examined climate, societal and geopolitical challenges facing RWM.
- Major concerns included extreme events, sea-level rise, flooding, geopolitical instability and impacts on operational safety.
- Key recommendations focused on proactive adaptation, resilient systems, institutional stability, continuous monitoring and stronger public involvement.
- The PEP methodology was positively received as a powerful tool for discussion, learning and consensus-building across diverse stakeholder groups

Session 2 – Climate change impacts on existing facilities

Rapporteur	Anne Kontula (TVO), Liz Harvey (Galson Sciences), Rêka Szöke (HUN-REN)
Key speakers	Anne Kontula (TVO)
Objective	Generate key ideas to answer the question: What should be conserved, ceased (stoped/modified), or created under future climate conditions to ensure that existing facilities remain resilient to climate change?
Number of participants	ca. 50

Key Speakers

Anne Kontula (TVO) was the keynote speaker for this session and the talk focussed on How climate change was taken account in the licensing of the new near surface repository in Finland.

The presentation describes how climate change has been addressed in the licensing and long-term safety assessment of TVO's near-surface repository for very low level waste (VLLW) at Olkiluoto, Finland. The repository received its operating licence from STUK in 2026 and is expected to start operation in 2028. Finnish legislation requires nuclear waste producers to manage and dispose of their waste responsibly.

The long-term safety assessment covers a 1,000-year period and evaluates the impacts of climate change using multiple IPCC climate scenarios. Key climate-related factors considered include increased precipitation, sea-level rise, coastal flooding, frost, and erosion. Repository design features, such as limiting water infiltration and ensuring long-term stability, have been developed to maintain safety under a range of future climate conditions. The assessment follows a conservative approach, recognizing climate change as a significant source of uncertainty in long-term repository performance.

Main Topics

What we should Conserve, Cease or Modify and Create (CCC) under future climate conditions to ensure that existing facilities remain resilient to climate change?

Outcomes

Using the three C approach, the task was for attendees divided into groups to identify two ideas (one conserve; one create) on an impact vs. effort matrix.

Overarching conclusions were:

1. For high-level waste management, consideration of climate change is, in many countries, considered to be in good shape. More attention should be given to LILW repositories
2. Improving existing concepts and solutions rather than focusing solely on creating new ones

Session 3 – Climate change impacts on operation

Rapporteurs	Rachael Clayton (UKNNL)
Key speakers	Frank Lemy (NIRAS)
Objective 2.1.3	Generate key ideas to answer the question: what technologies, monitoring and modelling innovations are needed to understand the potential impacts of climate change on a disposal facility?
Number of participants	ca. 32

Key Speakers

Frank Lemy (NIRAS-ONDRAF) was the keynote speaker for this session and the talk focused on how the Dessel surface disposal facility is designed and continually assessed to remain safe under evolving climate conditions throughout its lifecycle, from 50 years of operations through to the post-institutional control period beyond 1,000 years. Monitoring of meteorological and hydrogeological conditions is a key component of the safety case, providing data to validate models, support regulatory compliance, detect potential radionuclide releases, and enable adaptation of design assumptions and operational controls when observed conditions, such as extreme groundwater levels or unusual weather patterns, differ from those predicted. This keynote underpinned the importance of monitoring/modelling and set the scene for the following discussions.

Main Topics

- What are the potential impacts on disposal facilities due to climate change?
- What technologies, monitoring and modelling are required to understand these impacts?

Outcomes

Using the 1-2-4-all approach, attendees generated ideas for future technology, monitoring and modelling requirements (both existing and aspirational) that will be required at disposal facilities, which were then built on through group discussions. Ideas included:

- Digital twin — couple complex calculations with a model and AI
- Digital decision framework — automatic updates from sensors into dashboard (quick issue visibility)
- The use of advanced AI to analyse the data from monitoring/modelling and manage the site
- Global-scale and local-scale modelling integration to produce a bigger picture of climate change impact
2.1.4
- Data retention strategy — ensuring data is useful for future uses up to 350yrs

Session 4 – Climate change impacts on post-closure safety

Rapporteur	Elke Jacops (SCK CEN)
Key speakers	Johan Liakka (SKB)
Objective	“What should we do today, under evolving climate conditions, to cause a RWM facility to fail catastrophically over centuries to millennia?”
Number of participants	ca. 90

Key speaker

Johan Liakka (SKB) presented “Climate and post-closure safety - What are the potential long-term implications over centuries to millennia (and beyond…)?”

He provided examples of climate impact and potential consequences for post-closure safety during different phases: warm phase and cold phase. Some examples of “Effects of climate evolution on post-closure radiological risk” from the SKB safety case were shown.

In summary:

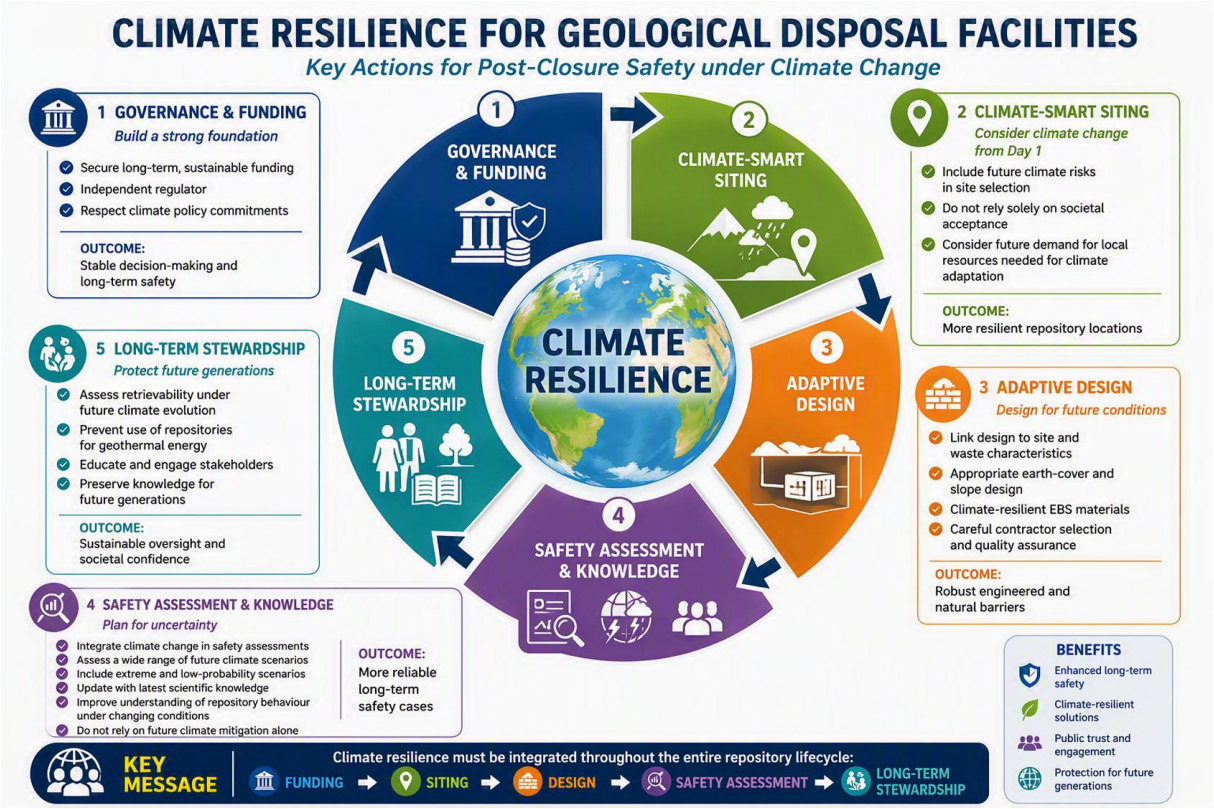
- Climate and climate-related processes can affect post-closure safety under both warm and cold climate conditions.
- These effects are evaluated in the post-closure safety assessment through a range of climate scenarios.
- Climate scenarios should be tailored to the long-term climate evolution, site characteristics, repository type, and repository concept.
- Warm climates are generally more important for radionuclide transport, whereas cold climates may have a greater impact on the performance and integrity of engineered barriers.

Main topics

The concept of this breakout session was to list actions which we should do today, under evolving climate conditions, to a cause an RWM facility to fail catastrophically over centuries to millennia. After a few minutes of individual reflection, all ideas were briefly explained and categorized into failure objectives. Afterwards, negative ideas were mirrored into positive actions and solutions. Finally, each group presented their main idea.

Outcome

The outcome was a list of ideas/actions which should be taken now or in the coming years to ensure a climate robust repository. The actions are listed in the figure below.



Date of issue of this report: **04/11/2026**

3. Day 2 – Parallel sessions, technical results / projects

3.1 Topical 1 – Optimising radioactive waste disposal facilities under a changing climate (CLIMATE, SUDOKU and OPTI)

Rapporteur	Maia Vercelli (Amphos 21)
Key speakers	Crina Bucur (RATEN) Álvaro Sáinz García (Amphos21) Philipp Herold (BGE)
Objective	Summarise main results from CLIMATE, SUDOKU and OPTI. Discuss in small groups a few possible future scenarios in which climate change affects near-surface and surface RWM facilities.
Number of participants	ca. 80

Main topics

- Results from CLIMATE show that atmospheric variations, namely temperature increase and changes in precipitation patterns, are expected to cause the main impacts on RWM facilities. Projections indicate that heavy rainfall, droughts, freeze-thaw cycles, and heatwaves may especially affect multilayer covers due to increased runoff, erosion, desiccation, and, eventually, water infiltration. Finally, climate change is expected to affect shallow hydrogeology, especially by modifying the water table, groundwater flow and saline intrusion. Finally, sea level rise is a major climate risk for facilities located by the coastline.
- For SUDOKU, areas potentially affected by climate change are multilayer cover performance and the modelling of EBD evolution and radionuclide migration. To evaluate potential consequences of changing climate conditions, several experiments are being conducted by the SUDOKU partners: this includes the analysing data from the multilayer cover of the Centre de Stockage de l'Aube, in France, to evaluate the clay layer integrity using 30 years of monitoring data. A laboratory-scale experiment is being conducted to study the erosion rate of a soil slope with no vegetation under extreme rainfall conditions. Another laboratory-scale experiment assesses the performance of various cover layers under concentrated rainfall conditions. Finally, a modelling experiment based on erosion test results will be conducted, aiming at evaluating the erosion rate of the superficial layer of the multilayer cover under extreme rainfall conditions.
- OPTI is working to develop a conceptual optimisation framework and identify its drivers. Results indicate that RWM optimisation must consider prevailing circumstances, including the regulatory framework, the state of knowledge, and the resources available.

Participants were divided into small groups and required to discuss one of the following scenarios:

- **Scenario 1 "Drought and heavy rain"** longer dry periods and heavy rain events are predicted by recent climate models. How should this be taken into consideration in the next Safety Case update for near-surface repositories before, during and after construction?
- **Scenario 2 "Heatwaves"** Heatwaves are expected to intensify, with +6°C summer peaks by the end of the century. Assess the implication for repository safety. Which parts of the repository are most likely to be affected? How should the monitoring and inspection strategy be designed to track and assess potential impacts?
- **Scenario 3 "Accelerated extreme events"** Recent climate models predict more frequent droughts, heavy rain events, storms, and freeze/thaw cycles starting mid-century (2050). Discuss if the cover design has to be adapted and, if yes, how
- **Scenario 4 "Long-term uncertainties"** Climate projections diverge significantly after 2100 (high uncertainties). Define an optimisation strategy that remains robust under high climate uncertainties, at the same time balancing safety, cost, reversibility, and stakeholder trust

Outcomes

As a result of the group discussion, some key aspects came out:

- Need for improved cover design to adapt to more extreme conditions, considering new climate knowledge
- Include potential increase in wildfire risk and evaluate potential future biosphere conditions given new climatic conditions
- Concern for hail events on facility drainage system and need to find a balance on cover design to adapt to increased erosion and increased heavy rain
- Use a conservative approach to include most pessimistic scenarios and ensure design flexibility to be able to include future scientific knowledge

As a general consideration, flexibility and iteration of the design process were identified as a priority, as they allow reassessing the safety cases periodically and include updated scientific knowledge

3.2 Topical 2 – Optimisation of engineered barrier systems and waste containers of a GDF

Rapporteur	Xavier Pintado (ClayTech)
Key speakers	Xavier Pintado (ClayTech) Jiri Svoboda (CVUT) Ursula Alonso (CIEMAT) Mirjam Kiczka (UBern)
Objective	Description of the two work packages considering that both work on engineered barrier systems: ANCHORS in clay barriers and InCoManD in canisters. Six round tables were organized for answering different questions.
Number of participants	ca. 40

Main topics

- Description of both work packages:
  - ANCHORS: Optimization potential of the clay barriers. Several types of bentonites analysed. Prediction capability carrying out simulations. Advanced THMC models to simulate bentonites and mixtures of bentonties with coarse aggregartes and sands. Materials' data base. Achievements of the last two years and next steps commented. Meeting in Barcelona next October
  - InCoManD: Identify new materials to manufacture the canisters. Processes investigation (like welding). 30 partners from 10 countries. Expert review group.
- Bentonite as complex material which changes of its behaviour depending on the groundwater composition.
- Experimental benchmark in ANCHORS to study the repeatability of tests carried out in different laboratories. This issue is pointed out in the SRA driver 3.3.1.
- Durability of the canister in InCoManD. Corrosion in copper-bentonite contact. Interactions with other WPs: Radionuclide migration (RAMPEC) and barrier properties (ANCHORS).
- IC-A experiment in InCoManD to study the effects of O_2 in compacted bentonites and reactive transport for the IC-A experiments. Working with g-irradiated samples. Tests with steel coupons inside bentonite ongoing during 1.5 years.
- Six rounded with discussions.

Outcomes

- Combined experiments testing canister components and bentonite.
- Due to the slow processes, tests in "unlimited" time span needed. Increasing resources to be able to perform such tests.

- Looking the whole system: how changing in a EBS component affects the entire EBS system.
- Importance of the modelling capabilities and the presence of the IA.

Follow-up actions

- ANCHORS meeting next October in Barcelona.
- Joint action between ANCHORS and InCoManD: Combine experiments and identification of parameters needed. Preparing a workshop.

3.3 Topical 3 – Deep geological disposal of spent nuclear fuel: radionuclide release and criticality safety considerations (SAREC and CSFD)

Rapporteur	Olivia Roth (SSM)
Key speakers	Lena Zetterström Evins (SKB) Madalina Wittel (NAGRA)
Objective	Summarize the results from both WPs and highlight joint issues and end user perspective
Number of participants	ca. 20

Main topics

- Results from both WPs
- Highlight on Joint Issues
- End user perspective
- Scientific discussion

Outcomes

- Joint view on SNF radionuclide source term is needed; SAREC is concerned with radionuclides escaping the fuel during dissolution and CSFD is concerned with radionuclides remaining in the fuel
- Both WPs work to reduce the uncertainty in the SNF radionuclide source term
- A suggestion for a strategy for an optimized scenario was presented where data from SAREC is fed into DSFC, assessed and updated to give input to SAREC
- End user perspectives were only received for SAREC- End users had a very positive wiev on the project
- Efforts have been made (and will continue) to involve more end users in CSFD and receive their input
- First draft of glossary comprising technical terms regarding post-closure criticality safety is currently being reviewed.

Follow-up actions

- Increase involvement of end users
- Joint meeting early 2027

3.4 Topical 4 – Perspectives on the management of small and emerging inventories (ASTRA and FORSAFF)

Rapporteur	Timothy Schatz (VTT)
Key speakers	Timothy Schatz (VTT) Marja Vuorio (COVRA) Gabriele Magugliani (POLIMI) David Garcia (Amphos21) James Begg (EGIS) Sami Naumer (VTT) Alexis Geisler-Roblin (NTW) Meritxell Martell (MERIENCE) Muhammad Maladoh Bah (SEAI)
Objective	The joint session aimed to identify common challenges, knowledge gaps and solutions for the safe, proportionate management of small and emerging radioactive waste inventories, from legacy waste in small programmes to new SMR/AMR waste streams.
Number of participants	ca. 65

Main topics

- Understanding Waste:
  - Reliable, transparent waste data is the foundation. Data gaps weaken safety cases, monitoring and disposal decisions.
  - For LW-SMRs existing codes and measurement protocols should mostly apply but need validation. Gaps include new fuels, SMR-specific validation data, material impurities, and data locked up as intellectual property. Modularity cuts both ways: serial production makes inventories more predictable, but reusing components across operators adds uncertainty.
  - For AMRs inventories are mostly model-based with almost no validation data. Many design specific issues will need to be accounted for, e.g., new coolants and alloys non-radiological properties such as the chemotoxicity and reactivity of Pb and Na, scaling factors that have to be built from scratch for some designs.
- Predisposal and Disposal Challenges:
  - Incomplete inventories: legacy waste records are missing or inconsistent, and NORM and DU lack standard definitions. Proposed fixes are harmonised inventory templates, digitised historical records, and grouping waste into families to reduce heterogeneity.
  - Limited characterisation capability: heterogeneous wastes and sealed or high-dose packages are hard to characterise, and lab capacity is limited. Proposed solutions are mobile non-destructive assay (NDA) units, robotics for hot-cell inspection, AI-assisted nuclide identification, and rapid screening tools for NORM and DU residues.
  - Treatment and conditioning gaps: some residues have no treatment route, and small programmes can't justify large facilities. Shared regional treatment centres and mobile conditioning units are proposed, along with harmonised conditioning standards and repackaging routes for legacy drums.
  - Ageing waste packages: packages suffer corrosion, swelling and gas generation, and their integrity is often unknown. Corrosion and gas-generation models, embedded sensors and non-intrusive inspection such as muon tomography are proposed.
  - Missing or non-aligned waste acceptance criteria (WAC): legacy waste often doesn't meet modern WAC, countries without disposal routes can't define WAC, and DU often has none at all. Proposed solutions are tools that map legacy waste properties to

modern WAC, predictive WAC modelling for future disposal concepts, and harmonised WAC for NORM and DU.
    - Options for storage and transport of SMR/AMR waste were reviewed. Needs include criticality safety assessments for SMR-specific fuels, which are currently limited by inventory data gaps, dedicated safety assessments for storing metal coolants, work on salt corrosion of containers and on tritium permeation for molten-salt reactor waste and long-term ageing and durability testing of TRISO fuel and graphite in both pools and dry casks.
    - PUREX reprocessing is commercially mature only for LWR and oxide LMFR fuels. Even for oxide LMFR fuel, the higher plutonium content calls for adaptation and added criticality safety and regulatory measures. Every other route is still at low technology readiness. Advanced solvent extraction is at proof-of-principle stage, and preprocessing of metallic, nitride and molten-salt fuels is still at laboratory or conceptual scale and needs major scale-up. For TRISO fuel, aqueous methods could be used once the kernels are exposed but getting through the SiC and PyC coatings is still experimental, and there are further problems with large volumes of C-14-bearing graphite and off-gas treatment.
- Scalable Disposal
    - Shared or multinational repositories give economies of scale through pooled expertise and can reduce the need for each country to build its own facilities. However, questions of regulation, governance, decision-making and long-term responsibility and liability remain open.
    - In deep borehole disposal, safety comes mainly from the host rock at depths of 3–5 km. The concept is modular and suits small volumes. It should also lower the cost per unit of waste. It still faces significant challenges. Its technology readiness is perceived as low, no field demonstrator has been built, and drilling at the required depths and diameters has yet to be demonstrated. The long-term performance of seals and plugs is unproven, emplacement and retrieval of HLW and spent fuel packages need development, and public and stakeholder acceptance has still to be won.
    - What is disposed, how much, how and where all depend on the size of the country and its energy needs, the type of operator, the reactor technology, and whether disposal infrastructure already exists or is planned. Operators range from established nuclear operators to newcomers in non-nuclear countries, and the technology may be light-water or advanced.
    - SMRs/AMRs may serve very different uses, such as large-scale power, remote energy supply, district heating and hydrogen production. Their modular and potentially decentralised nature raises a strategic question for national waste management. Should waste be managed on site or in national, regional or international repositories?
- Civil Society Views:
    - Civil society involvement in radioactive waste management research rests on the Aarhus Convention principles of access to information, participation and justice. Bringing civil society in at the start of the knowledge chain builds mutual understanding and trust and improves the quality of the research process.
    - For small inventories, legacy waste and alternative disposal options, it was expressed that all radioactive waste and materials, including uranium mine and mill tailings, be brought under Directive 2011/70/Euratom. Defined design life for old storage facilities and casks, with an Environmental Impact Assessment required for any extension are desired actions. Robust safety case for deep borehole disposal should be developed and further debate on how the retrievability of mined repositories compares with the possible security benefits of non-retrievable boreholes should take place. Because both disposal and long-term storage affect many generations, research on intergenerational stewardship models should start soon.
    - For SMRs/AMRs, the Aarhus principles are not yet fully met. Industrial confidentiality limits public access to information, and decisions risk being seen as made behind closed doors. Trust is fragile because of the history of nuclear power, first-time SMR vendors, cancelled or stalled projects, and projects imposed on communities. With new licence holders, owners and operators in back-end services, accountability for long-term liabilities and decommissioning is unclear, and newcomers may carry a disproportionate share of disposal costs. The recommended responses are to develop engagement frameworks tailored to SMRs/AMRs, to test methods for communicating

uncertainty and evidence, to co-produce waste management scenarios and decision points with stakeholders, and to develop and validate governance and fairness mechanisms covering intergenerational responsibility and long-term liabilities.

- Nuclear Power in Ireland:
  - Ireland aims to cut greenhouse gas emissions by 51% by 2030 and reach carbon neutrality by 2050. Current and planned measures are not expected to close the gap, so a broader set of clean technologies needs to be evaluated, and the talk asked whether nuclear power could be one of them.
  - Ireland nearly went nuclear in the 1970s. A Nuclear Energy Board was set up in 1973, and in 1974 the Electricity Supply Board sought planning permission for a 500–700 MW plant at Carnsore Point in County Wexford. The project was shelved after the Three Mile Island accident, environmental opposition and the recession that followed the oil crisis, and Ireland built the coal-fired Moneypoint station instead.
  - Nuclear electricity generation is currently banned by statute, under Section 18(6) of the Electricity Regulation Act 1999 and Section 182 of the Planning and Development Act 2024.
  - Beyond the Euratom Treaty and international IAEA and NEA standards, Ireland's regulatory framework covers only ionising radiation protection, overseen by the Environmental Protection Agency. The EPA would license any waste facility. The owner or operator would be fully responsible for financing and safety, and regulations favour managing waste domestically rather than exporting it. Open questions include whether Ireland has any site suitable for a geological repository, whether counties could object to siting, who would have the final say, and whether host communities would be compensated.
  - A GIS-based siting screening applied several exclusion criteria. These were buffers around buildings and settlements, access to cooling water, groundwater vulnerability and aquifers, and coastal and river flooding risk. Ireland's dispersed settlement pattern and strict rules on inland water abstraction make suitable sites hard to find and an inland plant unlikely.
  - Further constraints include grid limits, shown by rising wind curtailment, high capital costs, and generally low public acceptance driven mainly by concerns over safety and nuclear waste. Given these hurdles, deployment would come too late to contribute meaningfully to Ireland's 2050 targets. In the short to medium term, more electricity interconnection with Great Britain and France would let Ireland import nuclear-generated power without the risks of developing SMRs at home.

Outcomes

- ASTRA
  - International cooperation, knowledge management and targeted RD&D can move SIMS from long interim storage towards credible end-point solutions. The WP provided a list of concrete solutions list per problem area.
- FORSAFF
  - SMRs/AMRs look promising, but targeted R&D is needed to close gaps in waste characterisation and management. The SMR/AMR back end is not new in kind, but new materials and volumes need specific R&D. Graphite, Na/Pb-wetted components and salt-contaminated parts are some technology-specific problems.R&D is needed to prove existing predisposal and disposal options can take these new waste streams, including the long-term behaviour of new waste forms and matrices. Reprocessing is not yet a viable back end for most novel fuels.

3.5 Topical 5 – Predisposal (ICARUS, STREAM and L'OPERA)

Rapporteur	Fabio Fattori (POLIMI)
Key speakers	Eros Mossini (POLIMI) Federica Pancotti (SOGIN) Thierry Mennecart (SCK CEN) Elena Torres (CIEMAT) Yevheniia Kudriashova (SSTC NRS)
Objective	Overview of the 3 WPs focused on predisposal activities, highlighting the importance of collaborating between different WPs. The main achievements of the 3 WPs were presented, followed by an interactive role-play session. Each group (total of 6 groups) represented a different stakeholder perspective on RW characterisation and WAC.
Number of participants	ca. 95

Main topics

- WP5 ICARUS highlights: starting to populate the data management platform and selecting the most promising non-destructive techniques for real decommissioning scenarios; developing and validating through intercomparison exercises robust and innovative destructive protocols for difficult-to-measure radionuclides; implementing first-of-its-kind statistical and theoretical scaling factor models on real waste packages.
- WP6 STREAM highlights: demonstration of organic waste volume reduction via Fenton treatment; advances in reactive metal decontamination techniques; screening alternative binder matrices across flexible waste loading ranges; characterization of low-carbon binder systems for final matrix selection.
- WP7 L'OPERA highlights: definition of key, representative boundary conditions for waste form durability; production and characterization of an inventory of conditioned waste forms using harmonized protocols; ongoing long-term leaching and artificial ageing stability tests are ongoing.
- Introduction of the training portfolio 2027, comprising two on-site courses and reusable online resources
- Interactive role-play session, in which 6 distinct groups represented the perspective of WMO, regulators, TSO, RE, industry, and civil society, on two different topics (i.e. WAC and RW characterisation)

Outcomes

- All three predisposal WPs showed great involvement of young researchers and efforts in dissemination through research papers and conferences.
- The interactive session was highly participated, and each different group was able to discuss its topic, identifying itself on the assigned stakeholder group. The discussion was made easier thanks to the role of the facilitators, i.e. expert from the field.
- The discussion led to the identification of one main criticality, i.e. the lack of communication between involved actors in the predisposal community. Another criticality was identified as the need to assist the next generation of experts, encouraging knowledge transfer.

Follow-up actions

- The WPs had already identified the importance of knowledge transfer. Aside from the already programmed training and courses, more activities will be planned for the upcoming years.
- The WPs will continue to work in strict collaboration and contact, sharing common useful information and aligning experimental methodologies to ensure seamlessly integrated outcomes across all project activities.

3.6 Topical 6 – Sorption modelling: status and challenges (RAMPEC and DITUSC)

Rapporteur	Norbert Maes (SCK CEN)
Key speakers	Stéphane Brassinnes (NIRAS) Norbert Maes (SCK CEN) Pierre Henocq (Andra) Jean-Charles Robinet (Andra) David Garcia (Amphos21) Sarah Saslow (PNNL)
Objective	Sorption modelling - status and challenges: uncertainty treatment and sorption databases
Number of participants	ca. 50

Main topics

- Identification of treatment of uncertainties in Thermodynamic Databases (DITUSC--> THERMOGAP)
- Derivation of Sorption data on barrier materials and their further use related to feed into thermodynamic databases / sorption databases. Different goals, different approaches

Outcomes

- **Thermodynamic databases are key for the understanding of radionuclides behaviour in a repository environment - cornerstone of Safety Case.**
  - Excellent databases are available and are continuously evolving.
  - Focus of DITUSC: identification of datagaps and methods for uncertainty treatment.
  - THERMOGAP: deliver validated, SA oriented workflows for geochemical sensitivity and uncertainty analysis.

- **Understanding and parametrization of radionuclide sorption mechanisms are needed to underbuild Retention safety function**
  - Foucs of RAMPEC - providing sorption data for clay/crystalline/cement systems under “perturbing” conditions
    - feed into Thermodynamic and PA oriented databases.
    - Need for proper documentation of the experimental conditions to ensure that the data can be used in a proper way for feeding databases
    - Uniformisation
- **Kd approach remains a common methodology for carrying out SA calculations (simplicity, versatility for sensitivity analysis)**
  - Collection of Kd for specific material and specific condition – selection of data ranges
  - Often not digital
  - Sorption modelling used to underpin data selection
    - Benefit from establishing international initiatives in building digitized sorption basis (more generic)

- **Different types of "sorption" related databases exist but none is sufficiently extensive to answer all kinds of purposes….**
    - International initiatives are undertaken to discuss on the development of sorption databases starting from the needs of different types of end-users: availability of data (&data gaps), long term preservation, which data to capture, database structures, harmonization, tools,…
        - Rampec Task2 Retention/transport database
        - Workshops on sorption database development (A21-N/O-FZDR-LLNL)

Follow-up actions

- THERMOGAP has a task un uncertainty treatment related to the use of thermodynamic data
- RAMPEC task 2 has an objective to provide a proof of concept for a retention/transport parameter database linking main physical-chemical characteristics of solids, water chemistry with the sorption and diffusion parameters.

3.7 Topical 7 – Repository digital twin concepts and model developments (DITOCO2030 and HERMES)

Rapporteur	Attila Baksay (TS ENERCON)
Key speakers	Réka Szőke (HUN-REN EK) Sergey Churakov (PSI) Xavier Pintado (ClayTech) Pablo Cayon (INGECID) Gabriela Roman (Amphos21) Nikolaos Prasianakis (PSI)
Objective	Repository Digital Twin Concepts and Modell Developments
Number of participants	ca. 45

Main topics

- DITOCO2030/HERMES: Project aims and major achievements – by Réka Szőke and Sergey Churakov
- DITOCO2030 WhitePaper recommendations and outlook - Xavier Pintado and Pablo Cayon
- Good practices and takeaways from interaction with end-users and stakeholders - by Réka Szőke and Gabriella Roman
- Surrogate (AI/ML/ROM) models for acceleration of coupled codes - Nikolaos Prasianakis
- Interactive part organized by Arto Laikari

Outcomes

- DITOCO WP is concluded by the 24th month of the EURAD2 program. Its major achievements are summarized in three documents, Green paper, White paper and Impact report. The findings summarized:
    - The vision of DITOCO WP: Build a federated, governed Digital Twin ecosystem creating a continuous digital thread across the entire lifecycle of the radioactive waste repository (design, site selection, construction, operation, closure, post-closure period).
    - Challenges in DT development of the radioactive waste management:
        - There is no coherent and off-the shelf solution, because the data silos are fragmented and tools are not synchronized to build a consistent digital tool.

        - DT terminology and scope are inconsistent in this field.
        - Because of the decades long design, site selection and operation periods and the thousands years long post-closure periods the feedback loops are weak between models and field reality and it is difficult to find traceable evidence.
        - Need to build regulatory and societal trust progressively.
    - To deal with this situation it is necessary to develop an interoperable, modular and technology-agnostic ecosystem connecting BIM/GIS, monitoring data and multi-physics models through open interfaces and shared semantics.
- The R&D activities in HERMES WP are focusing on the development of high-fidelity numerical models for simulations of strongly coupled THMC processes in repository nearfield, repository design optimisation and interpretation of mock-up experiments using a combination of physics-based models and accelerated computing assisted with machine learning and artificial intelligence.
    - The development of Data Hub, which connects models, monitoring systems and data sources, providing a consistent and accessible data foundation for Digital Twin applications.
    - AI/ML-based surrogate models can make high-fidelity simulations fast enough for Digital Twin applications, provided that accuracy and reliability are demonstrated through validation and benchmarking.
    - Real field-scale experiments provide essential data for the development, calibration and validation of Digital Twins, bridging the gap between numerical models and real-world conditions.

Follow-up actions

- Short- to medium-term priorities
    - Identify and prioritise high-value, decision-relevant DT use cases based on end-user needs.
    - Establish common data governance principles, interoperability requirements and a modular reference architecture.
    - Develop and demonstrate an auditable Minimum Viable Product (MVP), integrating relevant models and datasets.
    - Engage Technical Support Organisations (TSOs), regulators and other key stakeholders from the early stages of development.
    - Strengthen collaboration between experimental, modelling and digital technology communities to support data integration, model validation and the practical implementation of DT solutions.
- Long-term vision
    - Progress towards a Living Safety Case Digital Twin, continuously integrating monitoring data, validated models and traceable evidence to support safety assessment, reporting, knowledge management and stakeholder communication throughout the repository lifecycle.
- Cross-cutting priority: End-user involvement
    - Ensure continuous end-user engagement throughout DT and AI/ML surrogate model development, from requirements definition and use-case selection to validation and demonstration, to deliver practical, trustworthy and decision-relevant solutions.

4. Day 3 – Plenary sessions

4.1 Spotlight on cutting-edge science

Rapporteur	Kateryna Fuzik (SSTC NRS) and Alexis de Aragao (EPFL/Nagra)
Key speakers	Marwa Rima (CEA) Alexis de Aragao (EPFL/NAGRA) Alba Mon (UDC)

Objective	Highlight studies and state-of-art research conducted within the EURAD-2 partnership.
Number of participants	ca. 250.

Corrosion of Magnesium alloy in geopolymer: in situ corrosion and mechanical alteration monitoring (WP STREAM)

- Research investigated magnesium alloy corrosion in geopolymer matrices used for waste conditioning, with a focus on understanding corrosion-induced degradation mechanisms and long-term containment performance.
- Experimental and numerical studies showed that sodium fluoride (NaF) can significantly reduce magnesium corrosion rates and limit damage to the encapsulating matrix.
- The work illustrates the value of coupling laboratory observations with hydro-chemo-mechanical modelling to better predict waste package evolution over time.

Post-Closure Criticality Safety: studying and modelling aspects of the DGR Long-Term Evolution (WP CSFD)

- Cutting-edge research is being conducted to assess criticality safety over timescales of thousands of years, considering the continuous evolution of disposal systems.
- WP CSFD is developing new methodologies to identify key post-closure processes, assess uncertainties and improve modelling approaches for criticality safety assessments.
- Advanced modelling developed through collaboration between EPFL and Nagra is improving understanding of how material degradation and geometrical changes may affect repository performance over the long term.

Reactive transport models and metamodels for the geochemical evolution in a HLW repository (WP HERMES)

- Presentation of high-fidelity reactive transport models to simulate long-term geochemical evolution within geological repositories.
- Machine-learning metamodels based on Random Forest and Gaussian Process techniques demonstrated strong potential to significantly reduce computational times while maintaining high prediction accuracy.
- Such developments could enable faster repository-scale simulations and support more comprehensive safety assessments in the future.

4.2 Knowledge Management and Young Generation network

Rapporteur	Alexandru Tatomir (BGE)
Key speakers	Alexandru Tatomir (BGE) Liz Harvey (Galson) Niels Belmans (SCK CEN) Christophe Debayle (ASNR) Kateryna Fuzik (SSTC NRS) Simona Sandalova (Polimi) Hanna Rostova (KIPT)
Objective	Present the main achievements, lessons learned and future priorities of the EURAD-2 Knowledge Management programme and Young generation network
Number of participants	ca. 250.

The session began with the Young Generation presentation, followed by updates on Tasks 1–5 of the EURAD-2 Knowledge Management WP. The central message was that EURAD-2 must now focus not only on producing knowledge, but also on making it accessible, preserving it, transferring it between generations and Member States, and ensuring its practical use.

Main topics

- The Young Generation network has grown to more than 70 members from over 30 partner organisations and 15 countries. Its priorities include career development, practical skills, mobility and site visits, access to project information, mentoring, visibility in the work packages, and greater contact with end users.
- Task 1 reported on KM programme coordination, the KM Board and the network of KM Ambassadors linking the KM programme with the R&D and Strategic Studies work packages, and the links to the international cooperations strengthening KM (e.g., with IAEA, OECD/NEA).
- Task 2 presented progress in knowledge capture. Around 40 of the 80 planned Domain Insights (DI) documents have been published, alongside ten State-of-the-Art reports and six White Papers from Wave 1. Furthermore, 2 KM-Workshops were organized.
- Task 3 covered guidance signposting, European infrastructure needs and the new operational-safety gap analysis. Three signposting documents were being finalised on public engagement, disused sealed radioactive sources, and waste from small modular reactors. The new infrastructure catalogue was updated with 36 new infrastructures.
- Task 4 reported three training courses, two DI webinars, seven completed Lunch and Learn sessions, two mentoring pairs, and 74 supported mobility applications during the first two years.
- Task 5 addressed data management, long-term preservation, the future KM platform and innovative methods. The EURAD-2 knowledge base already comprises almost 90,000 pages, strengthening the case for improved retrieval and possible AI-assisted access.

Outcomes

- EURAD-2 has established the main structures and activities of its KM programme. The next phase should concentrate on discoverability, practical uptake, long-term preservation and knowledge transfer between organisations, Member States and generations.
- Knowledge capture is most effective when it remains closely connected to technical work packages. Publication should be followed by webinars, training or discussion so that users can understand and apply the results.
- Raw data and supporting documentation must be preserved alongside final reports, particularly for Strategic Studies.
- Young professionals should be integrated into mainstream project activities while receiving visible and structured support.

Follow-up actions

- Onboard the new KM Ambassadors and maintain coordination between the KM Board, PMO and technical work packages.
- Complete the current DI and guidance-signposting documents, improve their discoverability and collect feedback on their use.
- Continue training, mobility and mentoring activities and implement the new Young Generation empowerment subtask.
- Update the Data Management Plan, preserve project data and supporting material, and continue development of a sustainable KM platform.
- Launch the operational-safety gap analysis and further stakeholder engagement on critical European infrastructure needs.