

Introductory course on EURAD and Radioactive Waste Management

Expectations and Challenges

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The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 847593.

The EURAD Vision on Joint Programme (a reminder)

provide added value to member states in their timely implementation of RWM activities

The vision of the European Joint Programme on Radioactive Waste Management (EURAD) is:

“A step change in European collaboration towards safe radioactive waste management (RWM), including disposal, through the development of a robust and sustained science, technology and knowledge management programme that supports timely implementation of RWM activities and serves to foster mutual understanding and trust between Joint Programme participants”.

By step-change we mean a new era of more effective and efficient use of public RD&D funding in Europe, and a deepening of research-cooperation between Member States. We aim to implement a strategic Joint Programme of research and knowledge management activities at the European level, bringing together and complementing national EU Member State programmes in order to ensure cutting edge knowledge creation and preservation in view of delivering safe, sustainable and publicly acceptable solutions for the management of radioactive waste across Europe now and in the future.

EURAD – Overview (a reminder)

- **EURAD – European Joint Programme on Radioactive Waste Management**
- **Joint programming**
 - participants mandated by responsible entities of member states & linked 3rd parties
 - ... representing three colleges
 - Waste Management Organisations (WMO)
 - Technical Support Organisations (TSO, supporting regulatory activities)
 - Research Entities (RE, supporting all interested bodies)
 - ... and: involvement of **civil society** organisations
- **Covering**
 - RD+D projects (currently: ACED, CORI, DONUT, FUTURE, GAS, HITEC, SFC)
 - strategic studies (currently: ROUTES, UMAN)
 - knowledge management (State-of-Knowledge & transfer, guidance, training & mobility)
- ... **with a *roadmap* and a *strategic research agenda* as essential frameworks**

Expectations – added value for member states

- **Advance scientific excellence & technology in specific areas in line with EURAD vision**
(selection of topics based on joint programming by WMO, TSO and RE → strategic research agenda)
- **Advanced programmes – make progress with 'optimization'; maintain knowledge & capability needed for the long period of safe operation of disposal facilities**
- **Less advanced programmes – take advantage of existing knowledge & experience**
(information, indication of capabilities needed (competencies, infrastructure, ...))
 - to do the right things in the right order, being aware of and able to use existing information
 - to do the things in a correct and efficient manner, using training & advice when needed
 - having the possibility to learn from science (RD+D) and from advanced programmes (management)
- **Provide guidance & training** (where needed)
- ***... and: be able to inform on the status of scientific-technical knowledge for implementing RWM activities based on documented evidence***

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- **Less advanced programmes – maintain knowledge & experience** (information, indicators, structure, ...))
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- **Provide training & guidance** (where needed)
- ***... and: be able to inform on the status of scientific-technical knowledge for implementing RWM activities based on documented evidence***

Importance of Knowledge Management

Expectations – added value for member states

- **Advance scientific excellence & technology in specific areas in line with EURAD vision** (selection of topics based on joint programming by WMO, TSO and RE → strategic research agenda)
- **Advanced programmes – make progress with 'optimization'; maintain knowledge & capability needed for operational facilities**
- **Less advanced programmes – provide knowledge & experience** (information, indicators, structure, ...))
 - to do the right things
 - to do the things in the right way
 - having the possibility to learn from science (RD+D) and from advanced programmes (management)
- **Provide training & guidance** (where needed)
- **... and: be able to inform on the status of scientific-technical knowledge for implementing RWM activities based on documented evidence**

Using a roadmap to provide an adequate framework for Knowledge Management

The EURAD Roadmap – For Implementing Radioactive waste management

A generic representation of goals, activities, and knowledge needed, from waste generation to disposal



Diagram: Based on RWM Programme Phases (IAEA DGR Roadmap, In-Press 2020)

eurad

SCOPE of the EURAD Roadmap

Thematic goals breakdown structure (GBS) covering all RWM activities needed for implementation

1. Programme Management
2. Pre-Disposal
3. Engineered Barrier Systems
4. Geoscience
5. Design & Optimisation
6. Siting & Licensing
7. Safety Case

Hierarchical breakdown: 7 Themes > 20 Sub-themes > ~ 60 Domains

This provides a framework within which to look inside and see whether sufficient information and knowledge exists (knowledge management), or whether additional RD&D is needed (strategic research agenda of EURAD or of national programmes).

Goals-orientated breakdown provides clarity on scope definition

... complemented with more detailed documents from KM (State-of-Knowledge) and RDD WPs (State-of-the-Art)

Generalities or typical activities common across RWM programmes are the basis of the EURAD Roadmap. Originally developed during the establishment of EURAD for mapping RD&D needs, the roadmap has been re-developed through a broader lens of all activities needed to successfully implement a RWM programme.

Roadmap content: not cataloguing, rather structured 'codification' (→ **context**)

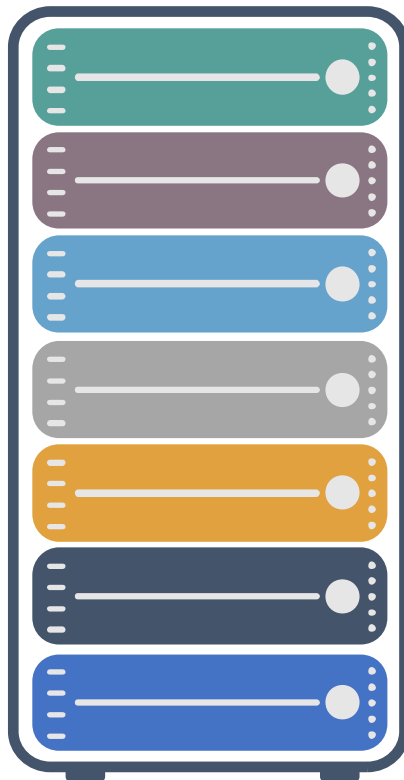
- **Signposting & orienting on what is needed & what is available** (with periodic updates)
 - 'state-of-knowledge'** for all themes (& domains) - indicates role of theme/domains & captures what is known & what uncertainties exist → provides overview and gives context
 1. what the different elements of theme can contribute to safe disposal (safety functions, feasibility, ...)
 2. what needs to be done to 'mobilize' elements to become effective (system, materials, procedures, ...)
 3. what knowledge is available (key documents, etc.) to support statements under 1. and 2.
 4. ... and evaluate where additional work would/could be useful → Strategic Research Agenda → new WPs?
 - competencies** (skills, critical infrastructure) & training/mobility and transfer of experience
 1. capture all competencies needed for implementation, what does market offer, what is needed in each program
 2. what is available to complement missing competencies in program (training, mobility, transfer of experience)
 3. identify critical competencies (areas with no/limited market and no/limited education) to act if needed
 - guidance** – guidance needed, guidance available → guidance to be developed?

Framework: Phases (X-axis) vs. thematic Goals Breakdown (Y-axis)



Common structure allowing users to 'click in', and to access existing knowledge

Defined terminology, glossary & schema.



**EURAD Roadmap
Goals Breakdown
Structure**



Goals oriented to knowledge and competencies most critical for implementation

This is aligned to the EURAD Vision.

Roadmap End Users

Supporting knowledge capture and transfer between generations and programmes.

Next Generations

- New entrants to the field / entering a specific RWM domain (including early or middle career professionals working in advanced programmes or in programmes that experienced a long pause/delay and/or high percentage of retiring staff)

Advanced Programmes

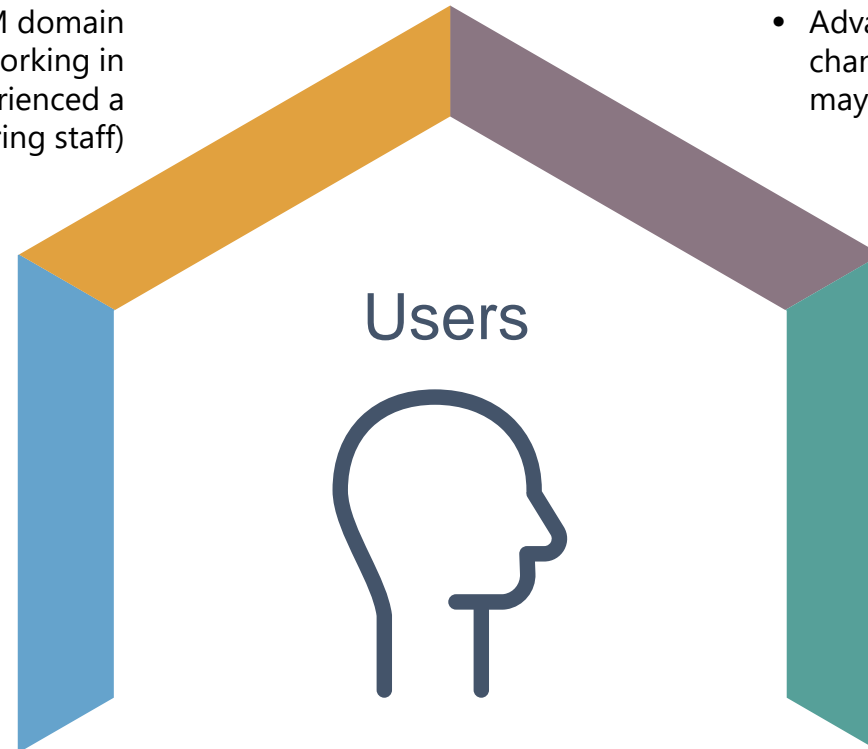
- Advanced programmes where generation changes might imply that tacit knowledge may be lost

EURAD & International Scientific Community

- EURAD to prioritise its work.
- Scientific community, wanting to identify future research needs.
- Anyone working in RWM (including non-specialists and generalists) to provide a window into the state of progress in EUROPE for implementing RWM

Later-Stage Programmes

- Later-stage programmes wishing to roadmap their own programme based on insight from advanced programmes



EURAD – the expected impact

- **Support compliance with European regulations**
- **Support (passive) safety of radioactive waste management procedures & facilities**
- **Help to gain & maintain public awareness of & confidence in radioactive waste management**
- **Support radioactive waste management innovation & optimization**
- **Contribute to addressing scientific/technical challenges & evolving regulatory concerns**
- **Enhance knowledge transfer to early stage programs**
- **Foster efficient use of the RD&D resources at the EU level**
- **Foster a better transfer of knowledge across generations of experts**

EURAD – the expected impact

- **Support compliance with European regulations:** support Member States in developing solutions for their radioactive waste (RDD results, procedures, skills, ...)
- Support passive safety of radioactive waste procedures & facilities
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- Support radioactive waste management innovation & optimization
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
- Enhance knowledge transfer to early stage programs
- Foster efficient use of the RD&D resources at the EU level
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EURAD – the expected impact

- **Support compliance with European regulations**
- **Support passive safety of radioactive waste procedures & facilities:** contribute to responsible & safe management of radioactive waste in Europe (e.g. safe start of operation of first GDFs for HLW, improve science & technology for management/disposal of other radioactive waste)
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- Support radioactive waste management innovation & optimization
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
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- Foster efficient use of the RD&D resources at the EU level
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EURAD – the expected impact

- Support compliance with European regulations
- Support passive safety of radioactive waste procedures & facilities
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- **Support radioactive waste management innovation & optimization:** continuously improve & optimize waste management & disposal solutions, incl. needs of small programs
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
- Enhance knowledge transfer to early stage programs
- Foster efficient use of the RD&D resources at the EU level
- Foster a better transfer of knowledge across generations of experts

EURAD – the expected impact

- Support compliance with European regulations
- Support passive safety of radioactive waste procedures & facilities
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- Support radioactive waste management innovation & optimization
- **Contribute to addressing scientific/technical challenges & evolving regulatory concerns**
... and prioritize activities of relevance & high common interest → future work?
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
- Enhance knowledge transfer to early stage programs
- Foster efficient use of the RD&D resources at the EU level
- Foster a better transfer of knowledge across generations of experts

EURAD – the expected impact

- Support compliance with European regulations
- Support passive safety of radioactive waste procedures & facilities
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- Support radioactive waste management innovation & optimization
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
- **Enhance knowledge transfer to early stage programs:** provide opportunity for less advanced programs to benefit from cross-European integration in radioactive waste management
- Foster efficient use of the RD&D resources at the EU level
- Foster a better transfer of knowledge across generations of experts

EURAD – the expected impact

- Support compliance with European regulations
- Support passive safety of radioactive waste procedures & facilities
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- Support radioactive waste management innovation & optimization
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
- Enhance knowledge transfer to early stage programs
- **Foster efficient use of the RD&D resources at the EU level:** share & advance existing knowledge, facilities and infrastructure (no repeating and duplicating efforts)
- Foster a better transfer of knowledge across generations of experts

EURAD – the expected impact

- Support compliance with European regulations
- Support passive safety of radioactive waste procedures & facilities
- Help to gain & maintain public confidence in & awareness of radioactive waste management
- Support radioactive waste management innovation & optimization
- Contribute to addressing scientific/technical challenges & evolving regulatory concerns
- Enhance knowledge transfer to early stage programs
- Foster efficient use of the RD&D resources at the EU level
- **Foster a better transfer of knowledge across generations of experts:** help bridging the risk of shortage of the skilled, multidisciplinary human resources & critical infrastructure

Summary & Conclusions

- **EURAD offers many opportunities**
 - with the 3 colleges - to have all the views and many possibilities for interaction & networking
 - with the resources available to make a 'big step forward'
 - with highly motivated people
- **... and we have demonstrated that we can work together as envisaged, thank you!**
- **The different WPs have been successfully launched – they are all now up to speed**
- **The interactions between the different WPs are being implemented & come to 'live'**
- **The WPs on RD+D (& strategic studies) profit from experience; knowledge management has many new aspects** (quite some 'learning by doing' for all of us)
- **The challenges**
 - Covid-19 pandemic had a big impact on nearly everything – but we learned to live with it ...
 - EURAD with its opportunities leads to significant complexity to manage large diversity

Thank you for your attention!



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