eurad

**European Joint Programme
on Radioactive Waste Management**

KNOWLEDGE MANAGEMENT
& NETWORKING PROGRAMME

2020-2024

*Supporting the
capturing of knowledge
and its transfer
between organisations,
Member States and
generations*

EURAD KNOWLEDGE MANAGEMENT & NETWORKING PROGRAMME 2020-2024
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EXECUTIVE SUMMARY

From the outset, knowledge generation, management and transfer between organisations, Members States and generations has been at the heart of European Joint Programme on Radioactive Waste Management (EURAD). The EURAD Vision:

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

"Robust and sustained" means actions that are trustful, useful and effective (save time and money) and enhance business activity for Radioactive Waste Management (RWM) programmes, and that would be supported and continue in the long-term. "Knowledge management (KM)" means actions to identify, acquire, transform, develop, disseminate, share, and preserve knowledge in an integrated and systematic approach.

EURAD as a joint programming has an outmost advantage, compared to individual projects, as it provides:

1. a platform for interaction to find out what is most useful to investigate on what should be done in KM

2. resources to develop the identified KM issues

3. access to experts that identify and make knowledge available

4. means to create networks for (face-to-face) interaction as part of KM

5. presence of representatives of MS of different stages of national program development and concomitant different needs and offers in KM

6. presence of different categories of actors representing national responsibilities in waste management, safety oversight and research

Within EURAD there are a variety of tools and methods that could support knowledge management and networking. Currently we have 4 dedicated work package (WP) teams and budget to coordinate:

- WP1 EURAD Roadmap – activities to orientate people to existing knowledge and needs for research and technology development via a generic roadmap for implementing radioactive waste management, from generation to disposal. The Roadmap provides an integrated and systemic framework for organising, structuring and sharing available RWM knowledge.

- WP11 State of Knowledge - Experts' view of the most relevant knowledge and associated uncertainties in a specific domain of the roadmap applied in the context of a radioactive waste management programme.

- WP12 Guidance - Activities consisting of developing a comprehensive suite of instructional guidance documents that can be used by Member-States with RWM programmes.

- WP13 Training and Mobility - Activities consisting of developing a diverse portfolio of tailored basic and specialised training courses taking stock of and building upon already existing initiatives and creating new initiatives to bridge the identified gaps.

This strategy document, entitled 'Knowledge Management and Networking Programme' communicates the overarching vision for how the four KM WPs above work together to deliver

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value for the organisations participating in EURAD and for other organisations worldwide. It describes the link between the EURAD Roadmap and the EURAD knowledge management, the mechanisms for how various types of end-users can interact with the KM WPs and the long-term vision for KM in radioactive waste management in the European Union.

The programme will remain reactive and responsive to the knowledge management and networking needs of the EURAD community, the pre-disposal community within the PREDIS project (associated to EURAD), and other interested organisations (including IAEA, OECD-NEA …). Needs are identified from a combination of identification of gaps using the Roadmap and Experts (top-down), and specific needs raised directly by end-users (bottom-up). For WP13 (Training and Mobility activities), end-users have already been surveyed in Year 1 (2019) identifying a number of training needs of common interest across EURAD members. A mobility scheme is also established that EURAD members can apply to.

Finally, this strategy document communicates a common view of what we consider to be success for the EURAD KM and Networking Programme 2020-2024. It is not the intention of EURAD to address and solve all processes, tools and methods that a KM system may need, rather it is a short-duration project within the very long-duration RWM activity. What it can expect to do is agree and put in place the mechanisms and strategies for a long-term, rolling project of KM and networking [EURAD Roadmap].

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1. INTRODUCTION

The European Joint Programme on Radioactive Waste Management (EURAD) includes scope on knowledge management to deliver strategic objectives in its Founding Documents (Vision, Strategic Research Agenda, Roadmap and Deployment Plan), dedicated to the enhancement and transfer of knowledge between generations, member states and organisations:

- Make sure that the publicly available knowledge generated over the past, ongoing and future RD&D activities is preserved and made accessible, with a particular focus on knowledge generated in previous EU projects.

  Preservation / capitalisation of generated knowledge

- Make sure that Member States with national programmes at an early-stage of implementation can take advantage of freely available existing knowledge and know-how from the Member-States with advanced national programmes, primarily to access state-of-the-art, second to ease access to knowledge developed during previous EC supported RD&D projects and third also if there is joint interest at a fair price for to proprietary knowledge.

  Transfer of knowledge towards Member-States with early-stage RWM programmes

- Ensure that the necessary expertise and skills are maintained through generations of experts in view of the long lead-times and operational timespans (several decades) for RWM, including disposal, by providing training and mobility for young staff of WMO, TSO and RE.

  Transfer of knowledge between generations

- Disseminate and demonstrate progress, results and added value of the European Joint Programme to a wider audience.

  Dissemination of knowledge

To fulfil these objectives the Joint Programme is going to develop the EURAD Roadmap as a central tool for organising and coordinating its Knowledge Management and Networking Programme 2020-2024. The Roadmap is essentially a representation of a generic Radioactive Waste Management (RWM) Programme enabling users and national programmes to 'click-in', and to access existing knowledge and the status of future and ongoing work (incl. RD&D), within both the EU and other advanced programmes. The Roadmap is providing access to relevant information and translates the information into knowledge, allowing to apply this knowledge to the questions at hand (i.e. competence based on education, experience, skills, and attitudes) orienting towards infrastructure considered most critical for implementation of RWM, aligned to the EURAD Vision.

The Roadmap includes a common set of rules for contextualising knowledge, a common structure or schema for categorising knowledge, and common language and glossary – aligning where possible with glossaries and schema from IAEA, NEA and advanced (RWM) programmes. Experts have also evaluated a high level view on the current status of knowledge across each of the 7 Themes of the EURAD Roadmap, identifying in a rough sense where resources exist and where efforts should be focussed as a programme evolves through successive phases of a waste management programme – see Roadmap 'Theme Overviews'.

The EURAD Knowledge Management and Networking Programme (2020-2024) goal is therefore centred around the use of the EURAD Roadmap as the main structure (schema, goals breakdown structure, glossary, safety functions and implementation goals) to guide EURAD mandated actors

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during their development of new knowledge (in RD&D and Strategic Studies WPs) and transfer and codification and contextualisation of existing knowledge (in KM WPs).

This goal will be met by three distinct KM WPs each with priorities identified for the next 4 years. The State-of-Knowledge work package (WP11) aims at populating the EURAD Roadmap with a comprehensive overview of the current state-of-knowledge for all roadmap domains. Short guiding domain insights are provided for each domain together with corresponding State of knowledge documents (SoK). The SoK documents are, supported more exhaustive State-of-the-Art (SotA) documents potentially available for certain sub-themes of a domain and produced within the EURAD RD&D and Strategic Studies WPs. The State-of-Knowledge WP strongly contributes to EURAD KM "Preservation and capitalisation".

The Guidance work package (WP12) objective is to develop instructional guidance, in collaboration with experts with experience from 'having done it before'. The guidance documents aim to support MSs on how more practically structure the workflow for implementation of a specific area in radioactive waste management and can stretch over several themes in the EURAD Roadmap structure. The guidance WP responds to the EURAD goals "Transfer of knowledge towards Member States with early-stage RWM programmes", as well as "Transfer of knowledge between generations".

The objectives for the Training and Mobility work package (WP13) is to identify end-users needs for training modules and match them with existing or past training course materials or develop new training sessions. The EURAD Roadmap structure is used to systematically organise available trainings and promote gap analysis. Successful implementation of tacit knowledge depends on capabilities - a combination of access to competences and infrastructures – to be supplied with a high-level training and mobility programme. Therefore, this work package identifies the needs (through surveys) for hands-on-experience for scientists and engineers, thus expanding the theoretical knowledge with tacit knowledge given over by experts. The training and mobility activities are presented at the School of Radioactive Waste Management homepage (https://euradschool.eu/). Both activities support the EURAD KM ambitions of "Dissemination of knowledge" and "transfer between generations".

Role of KM in EURAD

European Joint Programming in Radioactive Waste Management is founded on the step-change (as described in the EURAD vision) moving on from individual projects to an integrated programme promoting collaboration and networking between different actors (WMO, TSO, RE and Waste Producers). The Joint Programme provides an opportunity for programmes to collect, share knowledge and experiences and organise (in a common way) a preservation and transfer between organisations/programmes and for future generations.

This requires acknowledgement of existing knowledge structures and networks, as over 30 years of developed RWM knowledge is codified and accessible in the various documents, procedures and processes, organisations, and people of the broad RWM community.

The role of KM in EURAD is therefore to better harvest this existing knowledge and integrate with it newly created knowledge, giving weight to:

- **Importance**: Improved orientation of knowledge - how knowledge contributes to specific implementation goals and activities in radioactive waste management;

- **Proficiency**: Improved definition of needed competences – what level of proficiency is needed and available to support programmes;

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- **Codification**: Improving accessibility to knowledge by signposting to people and documents, use of a common structure, digitisation, or other codification activities – how knowledge is documented, stored and easily re-used;

- **Diffusion**: Improving socialisation, training, and networking – how knowledge is transferred and spread.

Where there are risks of knowledge loss or opportunities for improved knowledge preservation and transfer, the Joint Programme can support addressing such issues (partly through a small internal budget, future SRA, channelling information to EC or by other means) and by using access to the broad RWM network. It cannot be enough stressed that the Joint Programming for the first time collects a large part of European expertise, covering WMO, TSO and RE aspects, in one collective RD&D, Strategic Studies and KM and Networking programme, thus creating a platform for networking and communication. Currently EURAD has 4 dedicated WPs to deliver the specific actions:

- **WP1 EURAD Roadmap** – activities to orientate people to existing knowledge via a generic roadmap for implementing radioactive waste management, leading to disposal. This provides an integrated and systemic framework for organising, structuring and sharing available RWM knowledge.

- **WP11 State of Knowledge** - Experts' view of the most relevant knowledge and associated uncertainties in a specific domain applied in the context of a radioactive waste management programme.

- **WP12 Guidance** - Activities consisting of developing a comprehensive suite of instructional guidance documents that can be used by Member States with RWM programmes.

- **WP13 Training and Mobility** - Activities consisting of developing a diverse portfolio of tailored basic and specialised training courses taking stock of and building upon already existing initiatives and creating new initiatives to bridge the identified gaps.

Survey of current needs

In year one (2019/20) of EURAD we have engaged across various networks, including the EURAD Colleges, to understand expectations for Knowledge Management within the Joint Programme. Several high-level and common themes have emerged from this:

- Huge RWM knowledge bases are already developed from over 30 years of RD&D - focus on content and signposting to this existing knowledge, thus building an effective baseline of what knowledge and resources already exist (i.e. to not focus on IT systems).

- Make people and networking central - reinforce that people and networks are at the heart of the knowledge management programme (i.e. to not focus only on documents).

- Learn from people that have 'done it before' – capturing the experience and tacit knowledge that is not always documented.

- Do not duplicate what others are doing – coordinate with other international knowledge management activities (i.e. provide added value by building on international good practice) and use platforms e.g. the EURAD Strategic Research Agenda (SRA) and Roadmap to help identify what has already been done.

- Learn from doing – pilot ideas and remain reactive and responsive to feedback and the knowledge management and networking needs of the EURAD community.

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Needs are identified from a combination of top-down and bottom-up approaches. Top-down requires a broad and strategic overview across the entirety of the RWM knowledge base. This is being developed by the EURAD Roadmap. Bottom-up requires identification of specific needs raised directly by end-users – this is being developed by each of the EURAD KM Work Packages. Using this combination of approaches, we will be able to establish a RWM knowledge baseline and evolve the EURAD programme. As priorities change, existing gaps will be closed, and new gaps identified. A correctly setup Roadmap, regularly revised and consistently populated with updated knowledge will support the long timespans of disposal implementation in Europe.

2. KM STRATEGY

Our strategy for knowledge management in EURAD (2020-2024) is to agree and put in place the mechanisms and foundation for a long-term, rolling project of KM and networking that will stay in place and be active also after the end of EURAD.

Our vision is that the EURAD Roadmap in combination with KM activities and through harmonisation with other (international) organisations, tailored to needs, behaviours, priorities and perspectives of the RWM community, will enhance knowledge collection, generation, transfer and preservation, so that we safeguard existing competencies and create lacking competences for future generations.

In simple terms our strategy is:

1. Establish the EURAD Roadmap as an effective and common framework for RWM knowledge management – it will link, where beneficial, with existing knowledge structures in Europe and worldwide

2. Realize the Roadmaps added value – end-users must be able to see the knowledge and information provided in a broader context with the possibility to directly apply the knowledge and information provided by also using the expert network behind it

3. Integrate EURAD WPs – even though the knowledge field covered by the various WP is highly specific and never covers any of the knowledge domains of the Roadmap, the expertise available within EURAD is an unexplored asset that is planned to be coupled into the KM and Networking processes, including the Roadmap development through meetings, information exchange and incorporations of their RD&D WPs output (SotA, publications, trainings/training materials, webinars, mobility experiences, …)

4. End-users and stakeholders involvement - develop and apply strategies to include these actors in the KM and Networking programme, e.g. through contribution to the population of the Roadmap, evaluate its usefulness and advice further development

5. Promote accessibility and actualization – the Roadmap and associated the KM structure must be easily and freely accessible and with a straightforward procedure for structure and content updating

6. Develop strategic links to PREDIS heading for a joint KM strategy at the end of EURAD.

7. Long-term sustainability – find a "home" for the Roadmap within an organisation that will preserve existing collective knowledge and inclusively promote, develop and include future knowledge, for decades to come.

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Knowledge is (in general) 30% explicit, 70% tacit. This is linked to two important functions of the EURAD Roadmap: codification and personalization:

Codification:

- Safeguarding the collective memory by systematically storing existing explicit knowledge, enriching it, keeping it up to date and reusing it throughout the European RWM community (College-level involvement).
- Preservation of the collective memory by codifying existing tacit knowledge in explicit tangible knowledge (documents, videos, testimonials, …), structured in the Roadmap to make it reusable for current and future generations, thus to put in place:
    • Documentary rules and guidelines (common schema)
    • Procedures, instructions, manuals and good practices (built on best practice from Colleges who have their own KM experience and expert networks such as the NEA Information, Data and Knowledge Management (IDKM) WP)
    • Technical tools to structure and store knowledge (linking knowledge to generic safety functions and implementation goals common to all RWM programmes, leading to disposal)

Personalization of information to transfer information into knowledge:

- Facilitate interpersonal networks and conversations that encourage the exchange of ideas and dialogue in order to boost the transfer and acquisition tacit knowledge

    • Structural tools and collaborative tools and social networks (Roadmap signposts to networks and identifies emerging risks for critical knowledge domains);
    • Exchange of ideas, advice, expertise, concerns that cannot be easily articulated (co-creation using EURAD hive-mind, not for one organisation or few people, but developed for a multitude);
    • Face-to-face trainings facilitated through mobility programme;
    • Webinars to reach a large audience with different viewpoints (Waste Management Organisations, Technical Support Organisations, Research Entities, Waste producers, academia in general, regulators and civil society);
    • Add interactivity into the information platforms to engage experts with newcomers and makes it a living platform;
    • Recurrently looping the different information platforms to keep them up-to-date and attractive.
- Supporting continuous improvement and innovation through cross-fertilization of ideas, play of question & answer, etc.

We consider the EURAD Roadmap and the KM WPs as the start of a step-change in long-term (European) collaboration. To achieve this, the most important success factor is the ability to raise interested actors interest and to ensure a broad support to develop and to keep alive the overall KM process to collect, develop, store, personalize and transfer knowledge, but also to disseminate and interact, using the Roadmap as a vehicle to run these processes. In that sense we aim to determine the priority themes for which KM needs to be applied, agree upon a KM strategy and establish processes that serves the defined KM needs and that are broadly acknowledged to be highly valuable and that gets the full support to keep KM info/network going in the long-term.

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3. KM COMMUNITY

One major asset of EURAD KM are the people that constitute the EURAD community. This community can bring together top experts and professionals from all areas of RWM with end-users and mandating actors looking for useful knowledge. Importantly, the roles of expert/professional and end-user are not fixed but dynamic. Depending on the topic, different persons will be in the role of the Expert or End-user, making EURAD KM a living and flexible system. In order to be successful, a living system needs to evolve with time. This means that also EURAD KM needs to be a learning system that has now to come alive and adapt to new developments and needs, when for example realized through feedback mechanism (as discussed later).

In summary, EURAD KM aims to be a multidirectional network of knowledge providers/end-users, rather than a one-way "knowledge dispenser", just functioning in a "top-down" manner. It is these interactions between people that is at the heart of EURAD KM and its core strength, and not merely the creation and storage of reports and documents. The broad knowledge base in the community is a huge potential for EURAD KM, and also a great responsibility/challenge. For KM can only be considered a success if it can bring to live this "hive-mind" and create a true KM culture within all of EURAD and – once established – ensure its longevity also over the end of EURAD. This will bring added value for the KM end-users, now and for future generations. Ultimately, it is the needs of these end-users that dictate the KM strategy and that constitute the benchmark for success.

End-users

The end-users of EURAD KM are intended to integrate a variety of different backgrounds, with the major categories being:

- Anyone working in RWM (including non-specialists and generalists) to provide a window into the state of progress in Europe for implementing RWM.

- Scientific community, wanting to identify future research needs.

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

- Early-stage programmes wishing to Roadmap their own programme based on insight from advanced programmes.

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

- Anybody that wants to have an overview about the state-of-knowledge at a very high level.

Of course, EURAD KM is not restricted to these categories or only to EURAD members. It is and will be open for other end-users, and will continuously work to identify new groups of potential end-users and adapt its programme accordingly. The role of Civil Society as stakeholders in RWM shall also be recognized. Strategies to involve Civil Society Organizations shall be developed and implemented.

One important aspect for the KM and Networking Programme will be the collection and utilization of end-user feedback. This is crucial to ensure that the needs of end-users are taken into account at all times and the KM programme is subject to continuous improvement. Since this feedback is

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so important for the long lasting success of EURAD KM, approaches will be developed to allow easy feedback by end-users, for example through interactive forums or messaging systems (passive feedback route). Another important approach will be the active collection of feedback by EURAD KM from the end-users, for example through online surveys or questionnaires (active feedback route). For this, methods will be developed that allow active engagement of end-users and stimulate the willingness to provide feedback. Ideally, this will also encourage users to develop and submit input on general ideas about EURAD KM. This will strengthen the "KM culture" in EURAD, providing more than a one-way street from experts to end-users, but a real and vivid KM community. To increase participation and acceptance amongst users, it is important to show that the collected feedback is actually taken seriously and leads to real changes. Therefore, efforts shall be taken to transparently report on received feedback and the subsequent actions.

The interaction with RWM end-users is the driving force for the whole EURAD, ´the input to do the right thing at the right moment and do it right´. Even before the start of EURAD end-users interaction were intensive, mainly through adoption of the WMO/TSO/RE common Strategic Research Agenda, creation of the EURAD Bureau (Colleges), agreeing on the KM WPs and through different types of surveys and consultations in JOPRAD. End-users interactions within EURAD are deepened through; events, workshops, webinars, expert input, end-user groups, engaging end-users as reviewers, surveying colleges, common publications, consultations and networking. Past EURAD, on a time scale of 5-15 years, a complementary solution will need to be developed as the end-users will need to have a fix point – a hub – to interact with EURAD(-2). Such a point could be the School of RWM as this is expected to exist longer than EURAD.

All of this can and should foster the overall acceptance and participation of all EURAD members in EURAD KM, which is essential for the success of the programme.

Experts

EURAD KM core strength is the access to people, acting as knowledge providers, i.e. experts. These experts will have a prominent role in various areas, such as; populating the Roadmap with contextual information or steer guidance WP, contribute to unique trainings, transfer of tacit knowledge and contributing to authoring or reviewing different types of documents (state-of-knowledge, state-of-the-art, guidance and training materials).

Experts are defined by the IAEA as someone widely recognized as a reliable source of technique or skill whose faculty for judging or deciding rightly, justly, or wisely is accorded authority and status by their peers or the public in a specific well-distinguished domain. As such, experts selected to produce a EURAD State-of-Knowledge (SoK) document fulfil these criteria, but they also:

- have shown high intellectual achievement, either academically or in applied work within industry.

- understand well the relevance and significance of their knowledge domain in the context of different safety cases for a range of RWM solutions (i.e. different concepts and waste groups) and are adept at communicating uncertainties in a balanced, generic way.

The identification and selection of experts for individual tasks shall be done according to a comprehensible process on the basis of their expertise. Usually, a number of different EURAD actors will be involved in this process, such as the WP involved in the specific task, the PMO, and the Bureau/Colleges. This will ensure a broad view on the expected qualities needed for the task

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at hand, allowing for the selection of the most suitable experts. Here, the expert networks of the EURAD members provide a great benefit for this important processes.

Importantly, this will allow to also engage "external" experts that have no affiliation with EURAD, but still hold invaluable expertise in their respective fields. Thus, access to these experts is crucial for the success of EURAD KM and can be provided through the EURAD community. Nevertheless, involvement of experts is a challenging task that depends on factors such as availability, willingness, timing, available budget and legal aspects when issuing contracts and agreements.

Networking

The EURAD community can not only provide access to top experts, but also connect end-users and from different backgrounds and different stages of their career. For example, "young professionals" that many times face the same challenges and questions can build up knowledge networks that they can rely on for the rest of their career, and beyond. With these KM networks, end-users looking for the same knowledge can support each other and create a mutual benefit. Sometimes talking to someone with the same questions can be more enlightening and easier than finding and exchanging with an expert. Efforts will be undertaken to foster these end-user networks, for example through the "WP13 Training & Mobility" programme and through targeted activities in the context of webinars, chat rooms connected as *ad hoc* to webinars, meetings, workshops and conferences.

Another important aspect of networking in EURAD KM concerns the collaboration between the dedicated KM WPs as well as between the KM WPs and the RD&D/Strategic Studies WPs. Successful KM can only work as a common effort by the whole EURAD community. Means and methods to achieve this exchange are to a certain degree already developed and implemented, for example through dedicated KM WP meetings and the installation of dedicated KM tasks in RD&D/Strategic Studies WPs that focus on the KM aspects of their WPs and the connection with the broader EURAD KM community.

For all this, it is important to keep in mind that EURAD KM is not the first and only KM Programme in the field of RWM. In order for us to be successful, the KM activities of other organisations need to be recognized and synergies utilized whenever possible. This is particularly true for EURAD KM programme. Competing KM programmes will result in less acceptance by the end-users, more need for resources and ultimately a disadvantage for everyone.

Hence, links to other KM initiatives will be established and maintained. Interactions and decisions should be coordinated in accordance to the EURAD KM Strategy and reported transparently within the EURAD community and governing bodies. This should help to create and maintain the desired KM culture in which everyone in the EURAD community feels as an active part of EURAD KM.

Preserving and capitalising new knowledge, transfer it between MSs organisations and new generations requires networks over time-spans of decades. It will demand a robust "hub" where newcomers, young scientists and senior experts from different disciplines can meet and interact. Equally important would be the interface - at this hub - between the supplier of research activities within RWM and end-users or stakeholders including Civil Society (CS). As a far reaching possibility one could imagine that the School of Radioactive Waste Management could act as such a hub, run by a research entity under Implementing Geological Disposal of Radioactive Waste – Technology Platform (IGD-TP) and with a shared budget from the MSs and the European Commission.

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Links with other KM initiatives

EURADs linking and collaborating with RWM organisations/projects (advanced programmes, PREDIS ...) and international organisation (IAEA, OECD-NEA ...) in the field of RWM is requested by the EC. It fulfils the goal to access expertise, avoiding overlaps and being complementary, initiate and enlarge networking activities, as well as collaborate where possible and desirable on existing activities as well as on planned future activities.

IAEA

IAEA is a natural partner for EURAD advising and giving training courses to its 172 member states in all nuclear aspects. Related to KM in waste management, IAEA is offering 12 online learning courses on spent fuel and radioactive waste management, and decommissioning and environmental remediation, containing 50 modules and almost 100 lectures. With mutual interest a dialogue between EURAD and IAEA has been initiated on how to best align EURAD KM activities with IAEA. In a first step our goal is to identify overlapping training activities, guidance and State-of-Knowledge documentations identified through EURADs end-users needs. In the following steps it is EURADs ambition, based on the overall Roadmap to complement identified knowledge gaps with training courses, possibly in collaboration with IAEA. A natural link would be to have a concerted meetings where the organisations planned activities are coordinated to avoid overlaps.

OECD-NEA

The present collaboration with OECD-NEA is right now two-fold, on one hand with the NEA Integration group for the safety case (IGSC) and on the second hand with NEA Information, data and knowledge management (IDKM). NEA IGSC activities relates to evaluate effective assessment strategies, tools and methodologies to integrate and process what we know in a way that allows well-founded conclusions regarding both long-term and operational safety of repositories, while acknowledging any remaining uncertainty. NEA IDKM focuses on the effective capture, transmission and use of data, information and knowledge. For both groups contacts are established and the common goal is to align the activities, especially in the area of safety case. The link between EURAD and NEA is to efficiently coordinate the future training activities and signposting and reviewing of SoK documents assuring that all training activities relative to the Roadmap are available.

Advanced Programmes

The involvement of advanced programmes, e.g. Sweden, Finland and France, to the KM and Networking Programme is mainly through their participation in EURAD as experts in RWM. The goals for EURAD is to obtain guidance and learn from those that have made the experience of RWM implementation. The links are through experts in advisory groups such as the PMO, Bureau, Roadmap Advisory Board, EURAD External Advisory Board or part of the EURAD College as WMOs represented by IGD-TP.

PREDIS

The Pre-disposal Management of Radioactive Waste" (PREDIS) is an EC H2020 RIA project with 48 partners from 17 countries. The project started September 2020 and will run for 4 years. The total budget is 23.7 M€ of which EC contribution is 14 M€. The project targets to develop solutions (methods, processes, technologies and demonstrators) for future treatment and conditioning of waste across a number of MSs for which no industrially mature or inadequate solutions are currently

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available, improving safety during next waste management steps. Further, it aims to improve existing solutions with safer, cheaper or more effective alternative processes where they bring measurable benefits to several MSs (Member States). Additionally, the goals is to analyse criteria, parameters and specifications for materials and packages with associated Waste Acceptance Criteria (WAC) for pre-disposal and disposal activities, supporting homogenisation of waste management processes across Europe. The PREDIS project is strategically important for EURAD as it addresses pre-disposal activities that are exempted from the EURAD scope and could in future be joined with EURAD to form a possible follow-up programme as EURAD2. The two projects complementarity call for alignment of common and overlapping activities; mainly in the KM area but also in other areas, e.g. the Waste Acceptance Criteria (WAC), through intensive cooperation.

4. KM PROGRAMME COORDINATION 2020-2024

The KM and networking programme for the period 2020-2024 is enveloped by the budget, resources and access to competence. In that sense, it needs an efficient coordination to make best use of the EURAD KM WP's resources as well as efficient use of external actors such as targeted surveyed organisation, experts, reviewers and consulted organisations. At a first glance, the three KM WPs tasks are similar and are all connected to the EURAD Roadmap as the backbone to which the three KM WPs are feeding in targeted knowledge documents (SoK and guidance) and actions (competences connected to training and mobility with access to special infrastructures). This implies that the three WPs can use the similar methodology and high-quality standards, which requires a common KM WPs integration and levelling. Their coupling to the Roadmap will create continuous information flow between the Roadmap development/update and the three KM WPs (populating activities), thus gluing them all together into one KM and Networking programme. The success of the KM and Networking programme depends on the individual achievements in each KM WP as well as on the integration/population of the individual KM components (SoK, competences, training, mobility, guidance) in the EURAD Roadmap. Further on, the integration of the R&D and Strategic Studies WPs into the KM and Networking programme as; contributors/authors to SotA or SoK, as internal reviewers or supplying feedback from WP leaders and teams, as well as beneficiaries feedback from their organisations and - if possible – to get a feedback from the mandating organisation within each MS, is the KM and Networking programmes internal networking part. Within each KM WPs production processes, the internal networking will be complemented with external networking, consultations and cooperation with ongoing projects e.g. PREDIS and organisations such as IAEA, OECD/NEA and other relevant organisations.

Anyhow, in all parts of these coupled KM processes involving all EURADs WPs it must be ensured that the prioritised document (SoK, SotA, guidance or training material) or action (mobility, webinar), the content and the quality corresponds to end-users needs and expectations. In this aspect, involvement and recurrent end-user feedback (through the EURAD Colleges and in some cases mandating actors) is of crucial importance and the following sections outlines a possible process taking this in consideration.

Gaps identification

This task consists of using EURAD internal (Bureau, PMO and WP leader) or external (e.g. EURAD Roadmap Advisory Board) expert judgement to identify important knowledge gaps in; State-of-Knowledge documents, guidance documents and non-existing trainings. In this process, experts from advanced programmes (that possesses experiences of the disposal implementation processes) will consult the EURAD Roadmap for gaps in knowledge, competences, training, mobility's (researcher's access to unique infrastructures) and guidance documents. In some cases the advanced programmes already give technical support to early stage programmes, such as transfer of know-how, trainings and guidance, thus having knowledge on missing competences,

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trainings, mobility´s measures and guidance. Parallel to expert gap analysis, KM WPs will perform mapping of existing SoK document, guidance and trainings that can be signposted or identified for production and will contribute to population of the Roadmap.

To support the gap identification other sources can be used, such as gap analysis using Roadmaps and SRA from EURAD, PREDIS, IGD-TP, SITEX II, IAEA, OECD/NEA and SNE-TP or MSs national organisations. In some cases, e.g. Training and Mobility, a survey might help to identify knowledge gaps. The identified gaps will be collected in a long-list of gap items; knowledge documents or actions.

Avoid duplication

In a second step the WP teams compare the long-list items with IAEA, OECD/NEA, EC, and other relevant international organisations for on-going or planned production. In case of risk of duplication a comparison will be made of the overlapping scope and content and foreseen publication dates. A cut-off with <50% overlapping issues or >3 years delay in publication compared to EURAD the item can remain in the long-list (with remark).

Prioritisation

In a third step a prioritisation of the long-list of gap documents or actions needs to be made by a steering committee (could be the same as the committee selected for evaluation and prioritisation of mobility's) with the input from the three colleges (WMO/IGD-TP, TSO/SITEX, RE/EUROSCIENCE) and PMO. The outcome is a commonly agreed upon prioritised short-list of gap documents or actions. The prioritisation methodology could be based on (i) importance for implementation of SNF or HLW disposal (ii) urgency, (iii) existing expertise and (iv) duration of production (scope size).

Production

The priorities short-list selection of documents or actions is the base for starting the production process. The engagement of EURAD internal or external experts for the production will depend on the topic, availability of EURAD experts and budget constraints, thus decided by WP leaders and PMO/Bureau on a case-by-case base. The production process can be slightly different in each KM WP, but in general, it follows a quality management procedure (QMP) developed within each WP, which in its turn follows existing common standards. The QMP describes the sequence of production, the selection of experts, internal reviewing, external consultations and socialisation. The WP teams accompanies and supports the production process.

EURAD review process

Once approved by the WP leader, the produced document as a deliverable will enter the normal EURAD review process.

Coordination of KM WPs

The above outlined processes show how integration of individual KM components into the common Roadmap can be made even more efficient when the KM WPs closely collaborate and together setup common goals. The coordination of the KM + Roadmap collaboration will need to come from WP1, being responsible for the development of the EURAD Roadmap, which is also coupled to future update of EURADs Strategic Research Agenda.

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How could such collaboration and coordination be organised? It could start with this document that outlines how we could achieve all our WPs goals in an efficient way using similar processes, use experts and reviewers covering more topics, coupling the outputs to a structured Roadmap, thus better know what we want to achieve and what should not be done or postponed. The Roadmap success doesn't have to be that it is fully populated, but that it is populated with those components which end-users are asking for.

Thus, the prioritisation and coordination of all KM WPs work should follow a transparent, reasonable and defendable logic. Different approaches can be suggested:

- width before depth, meaning better to cover the upper SoK domains rather than following one domain to the sub-domain or sub-sub domain, focussing on context rather than detail;

- the highest prioritised SoK could be investigated if it needs to be complemented with competence, training, mobility and guidance;

- outcome of published surveys can be used to identify guidance and training needs (e.g. IAEA, OECD/NEA and others);

- expert judgments;

- ask trainers from advanced programmes that give trainings to early-stage programmes;

- targeted surveys to end-users;

- KM WPs insights:

- others

The new working methodology outlined in this KM and Networking programme will help to prioritise and structure our ways of working with emphasis on open up for ways of work together with common structured goals.

The programme will help us to streamline our processes, being more efficient, better use our resources in the form of experts and reviewers and prioritise our efforts in a transparent and coordinated way using the Roadmap structure. Nevertheless, each KM WP has its specific task that need to be executed.

Only through a common strategy, the KM and Networking programme will be able to convince the participants in the R&D and Strategic Studies work packages to their involvement and attachment to the common knowledge management within EURAD.

State of Knowledge

State of knowledge is an Experts' view of the most relevant knowledge and associated uncertainties in a specific domain/sub-domain applied in the context of a radioactive waste management programme. Activities consist of developing a systematic approach of establishing the state-of-knowledge in the field of RWM research. Initially this will involve development of two demonstration cases, to understand what output is needed that meets the needs of end-users. A key challenge is the production of State of Knowledge that enhances access to and complements the already existing extensive knowledge base documented in state-of-the-art technical reports. Initial ideas for State of Knowledge documents include:

- key items of knowledge that are central to GDF safety strategy and design that have caused difficulties with interpretation or application, but which have now been fully (or largely) resolved (to show historic success in solving problems: e.g. climate change impacts);

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- key items that are central to GDF safety strategy and design that are in the process of resolution by major RD&D: there are not likely too many of these;
- items that could be of central importance but are not well understood and are the subject of current RD&D: these are the challenges that can arise;
- topics where RD&D using present knowledge offers significant engineering and operational optimisation today:
- topics where present knowledge suggests the prospects of engineering and operational optimisation in the indeterminate future ('blue skies').

Guidance

On the basis of the updated scope of guidance WP (decision at EURAD General Assembly N°2), the procedure of selecting the topic of a demonstration guide is the first priority. The process could follow the 'top-down' or the 'bottom-up' approach, or a combination of those, taking into account, that a guidance often covers an overarching Roadmap theme. As a starting point, considering the precondition, that the guidance WP has to serve both the 'Transfer of knowledge towards Member-States with early-stage RWM programmes' and the 'Transfer of knowledge between generations' goals, the target audience of the demonstration guide has to be defined. When selecting the topic, it will be ensured that the new guidance

- effectively assists the targeted end-users in their programme implementation (it is need-driven);

- has real added value (verified through consultation of Colleges);

- does not duplicate materials produced earlier (e.g. under the auspices of IAEA, OECD/NEA).

In order to achieve acceptance within the EURAD community, the selected theme or the ranking of the selected topics for the demonstration guidance will be proposed by the Guidance WP to the PMO and validated by Bureau/General Assembly. After having the topic for the demonstration guide, experts with relevant experience in the given area will be selected to assist the Guidance WP team in the elaboration of the guidance.

Considering the experiences gained from the production of the demonstration guide and also the progress made at EURAD level (e.g. how the Roadmap can be effectively used to frame EURAD knowledge management), the selection process for topics of further guides will be updated.

The demonstration guide and further guides will be elaborated in collaboration with experts with experience on the given topic (who 'have done it before'). Experts from countries with different status of geological disposal implementation are going to work together, which will create the network of experts. Networking is not only a by-product of elaborating the deliverables within Guidance WP, or in broader sense within EURAD, but an important mean of knowledge transfer.

Training & Mobility

WP 13 "Training and Mobility" aims to compose a portfolio of tailored, needs-driven basic and advanced training courses. These courses will be organized under the umbrella of the 'School of Radioactive Waste Management'. The School of RWM will list existing training initiatives in the field of RWM, while also creating new training courses based on the training needs of the RWM community and the identified gaps in the EURAD Roadmap. Training material will document the existing knowledge, interaction between lecturers and learners will enhance transfer of implicit knowledge.

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Furthermore, a Mobility Programme is organized which allows end-users to access dedicated infrastructures associated with EURAD partners. These mobility actions can be seen as complementary to the training courses and provide hands-on training by RWM experts or it can be part of the continuous personal development of more experienced personnel. They facilitates exchange of tacit knowledge.

Through these training courses and the Mobility Programme, WP "Training and Mobility" contributes to the 'dissemination of knowledge' and the 'transfer of knowledge between generations' (e.g. junior staff receiving hands-on training by industry experts).

In order to make the information gathered in this WP available to the end-users, a dedicated webpage will be developed for the School of RWM. This webpage will include, among other issues:

- An overview of existing training courses in the field of RWM.

- The newly organized training courses within EURAD.

- Overview of past mobility actions and their mission reports.

- A library of online webinars organized by EURAD and external organizations (IAEA, OECD/NEA).

- A forum to foster discussions between end-users.

5. CHALLENGES AND RISKS

This section outlines the broad steps for the coming 1-2 years addressing also challenges and possible risks that might occur on the way towards a successful KM and Networking programme. Possible solutions on how to get across the challenges and be successful show clearly that we will need support from all parts of the EURAD organisation.

Applying a combination of top-down and bottom-up approach, taking into account the end-users needs (including survey), ten to fifteen State-of-Knowledge documents, two Guides and 5-10 training courses could after end-users prioritisation be produced. Signposting and populating the Roadmap with existing SoK references, training modules and guides would be an ongoing activity, parallel with the document and training production. The produced SoK and guidance document should be coupled to training on the subject.

Even though this KM programme better outlines the KM WPs work, avoiding uncoordinated and overlapping activities, there are still risks that could hamper the progress. Built on our present experience and possible future risks the following key challenges have been identified:

- Slow/none response from end-users to prioritise SoK, Guides or Trainings.

- EURAD budget restrictions (high costs of experts, trainings,...).

- Difficulties to find available/suitable experts.

- Delay in experts contracting.

- Expert is delayed with his/her document production.

- No or few scientists interested in trainings or mobility's.

- None or limited access to historical RWM project documents (e.g. CORDIS) for signpost in SoK and guidance documents, as well as training materials

- Legal hindrance to share results between RWM programmes, projects and organisations.

- Limitation in collaborations between EURAD and international organisations (IAEA, OECD/NEA, ...).

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- No interest from end-users and stakeholders to use the KM and Networking programme.

- Other

The challenges outlined for SoK, Guide or Training productions are mainly related to delay of the processes and in some cases with access to the competences required to obtain the high-level quality of the documents. A possible solution for delayed production is to work with several parallel tasks or documents. Search for suitable and available experts could be made through sharing of lists and involvement by the PMO/Bureau/Colleges/WPL. Budget restrictions can be competences by move of resources within WPs or between WPs. Having too few participants following a training can be compensated by inviting people from external EURAD RWM organisations. Participation to expensive trainings will need to involve participant's prioritisation (applying essential need and most urgent need). The access to EC framework programme results stored in CORDIS is a prerequisite not to duplicate work and a EURAD community (EC, WMOs, TSOs, REs and Waste Producers) solution needs to be found. References to results published in public sources might be enough to avoid none-access due to legal hindrance. Intensive information exchange and broad communications, thus fostering mutual understanding and respect, should be an efficient ways to avoid friction between organisations. Nevertheless, all the above mentioned hurdles can certainly be overcome, but if there is no interest from end-users and stakeholders in this KM and Networking programme it has minimal chance to be a success.

6. SUCCESS CRITERIA

Acknowledgement of knowledge management as a core 'raison d'etre' for EURAD also requires that we set realistic expectations of what can and should be achieved in a short-duration project, compared with the very long-duration RWM activity. We can state confidently that EURAD will not 'solve' the Knowledge Management issue. What it can expect to do is agree and put in place the mechanisms and strategies for a long-term, rolling project of KM and networking.

We therefore consider success as:

- Establishing a EURAD-wide knowledge structure – this means a fully populated (breadth not depth) Roadmap that can stimulate programmes to focus on what is important. End-users must be able to benefit from the Roadmap and its population (with fully populated State of Knowledge, Guidance and Training) by the end of EURAD, with the possibility to transpose it into EURAD-2.

- Establishing a common set of KM procedures and mechanisms to better transfer and preserve knowledge – this translates to producing state of knowledge, guidance and training outputs that are high quality, credible, and used by programmes by the end of EURAD, with the possibility to transpose it into EURAD-2.

- Establishing a broad commitment to a joint activity on KM (SoK, guidance and training) based on and taking into account continuous end-user feedback – this means mobilising the Colleges of EURAD to support and continuously engage with the knowledge management and networking programme so that it can justify future investments in RD&D, Strategic Studies and Knowledge Management by the end of EURAD, with the possibility to transpose it into EURAD-2.

Ultimately, and if achieved, the successful achievement of these objectives should lead to a successful EURAD Knowledge Management and Networking Programme. The definitive key success of the programme is that people are enthusiastic and keen to use the Knowledge Management and Networking programme, as well as contribute to its further development.

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Even though, the present KM and Networking programme goals are set for EURAD, the implementation of the proposed goals will need to be evaluated during the last year of EURAD (2024) and the outcome serve as a starting point to develop a long-term sustainable European Knowledge Management and Networking Programme.

7. REFERENCES

[EURAD Roadmap]	EURAD Roadmap document, https://www.ejp-eurad.eu/publications/eurad-roadmap
[EURAD Vision]	EURAD Vision document, https://www.ejp-eurad.eu/publications/eurad-vision

8. ABBREVIATIONS

CS	Civil Society
CSOff	Chief Scientific Officer
GDF	Geological Disposal Facility
EURAD	European Joint Programme on Radioactive Waste Management
HZDR	Helmholtz-Zentrum Dresden-Rossendorf
IDKM	Information, Data and Knowledge Management
IGD-TP	Implementing Geological Disposal of radioactive waste - Technology Platform
IGSC	Integration Group for the Safety Case
KM	Knowledge Management
MS	Member State
PMO	Project Management Office
PREDIS	PRE-DISposal Management of Radioactive Waste
RD&D	Research, Development & Demonstration
RE	Research Entities
RWM	Radioactive Waste Management
QMP	Quality Management Procedure
SNE-TP	Sustainable Nuclear Energy – Technology Platform
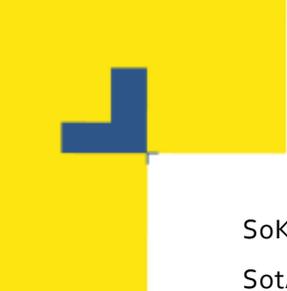
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SoK	State-of-Knowledge
SotA	State-of-the-Art
SRA	Strategic Research Agenda
TSO	Technical Support Organisation
WAC	Waste Acceptance Criteria
WMO	Waste Management Organisation
WP	Work Package
WPL	Work Package Leader