

IGD-TP position paper on the update process for the EURAD Strategic Research and Knowledge Management Agenda (referred to hereafter as, SRA)

1 Purpose

This position paper has been produced and agreed by the European waste management organisations comprising the Implementing Geological Disposal of Radioactive Waste – Technology Platform (IGD-TP). These organisations are responsible at the national level with implementing European Union policy (Waste Directive 2011/70/Euratom). The paper sets out the IGD-TP's view on the current and anticipated future need for co-ordinated collaborative research, development and demonstration (RD&D) in the area of radioactive waste management and disposal including predisposal as WMO input for EURAD-2.

2 Context and background

To develop the EURAD SRA Update Process (D1.8), the EURAD Bureau first established a (temporary) SRA update coordination team with a representative from each College. EURAD Bureau developed a letter containing key questions concerning the SRA update which was issued to EURAD Colleges in April 2021. Each College (for WMOs, TSO's and RE's) subsequently responded with answers to the key questions via position papers in June 2021, which were used as the basis for discussion at a workshop on 11th June 2021 where an overall consensus view on the SRA update process was established. College position papers were created and published. The WMO position paper is from May 2021 and is available at <https://service.projectplace.com/pp/pp.cgi/r235609914>.

The EURAD SRA update started in early 2022 and is led by the EURAD Bureau, with support and allocated resource from the PMO. Appropriate communications and engagement meetings with the three Colleges of EURAD and PREDIS will take place regularly and progress will be shared at each of the steps outlined above. All EURAD Colleges agree that PREDIS will bring in the views of the Waste Generators and the TSO College will bring in the views of the Civil Society Organisations. The IGD-TP have appointed the following persons to represent the WMO college in the Bureau:

- Anne Kontula (TVO, WMO Bureau representative);
- Astrid Göbel (BGE, WMO Bureau representative); and
- Lukas Vondrovic (SURAO, WMO Bureau representative).

The WMO Bureau representatives are in a key role to create the Position paper with support from the IGD-TP Secretariat. The position paper is reviewed and taking into consideration the input by European WMO's.

This position paper presents the coordinated response from the WMO College to the questions raised in the EURAD Bureau note for colleges paper (4.7.2022).

2.1 Feedback on the new SRA structure

The current proposed EURAD SRA is very extensive and follows the Roadmap, which is appropriate. The link with the 7 Themes should be kept as this provides the link to the Roadmap and consistency of the different EURAD documents is very important. It is still a concern that there are overlapping topics. Licensing for example in the roadmap is in two different locations (In Theme 1 and Theme 7)

The WMO SRA published in 2019 highlights the needs from the implementors side and this should be taken into account in the current EURAD SRA (the prioritisation is presented in Appendix 1). Also the content of the proposed tasks should be crosschecked with IAEA and NEA working groups to see the possible overlaps and gaps.

The role of the drivers and their use seems now to guide the SRA development and this might take effort on description of the content. For the purpose of the completeness, avoiding duplication and benefiting from synergies, it is recommended to include also past and ongoing IGD-TP activities. Although both SRAs are set up differently regarding the structuring of the overarching themes, the key topics from the IGD-TP SRA are fairly represented in the EURAD SRA. Further, the IGD-TP SRA defines specific categories for implementation of topics needs („networking“, „Research and development“, „Development and demonstration“), which implicitly indicate the maturity of the knowledge of these topics.

2.2 Feedback on how the new ‘driver’ classification scheme has been used –

The role of the drivers is basically to justify why the work is needed, but still the drivers from waste management organisations point of view are targeted to reach the Vision of 2040¹ (see footnote). The rest of the drivers of Knowledge Management (KM), Scientific Excellence etc are tools to ensure that the vision will be fulfilled and are not seen as drivers. In that sense scientific excellence as such is not a proper driver, it is a measure to assess the quality of the work proposed and it rather reflects a required framing condition.

The planned tasks require the description of the current level of knowledge (based on earlier or ongoing R&D work, possible new challenges and the nature of the work). An extra attribute could be assigned to the items to describe the nature of the work or expected outcomes: supporting policy making, networking, RD&D, etc.

The assignment of the drivers to each of the SRA activities is not straight forward even within one college as the application of broad drivers on broad description of activities is unfocussed and will lead only in rare cases to identifying the critical issues. Going to this level of detail at the start of the planning for EURAD2 needs to be considered carefully. The current SRA is already very

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1. ¹ safe operation of the first geological disposal facilities in Europe;
 2. optimisation and industrialisation of the planning, construction and disposal operations needed to achieve this; and
 3. development of tailored disposal solutions in order to meet the requirements of the diverse range of waste inventories in the various countries and programmes in Europe.

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descriptive and adding further very detailed analysis to it, hoping that this will lead to a consensus between colleges, might hinder developing a clear vision and strategic direction for EURAD2.

Also, the applicability of the drivers was not fully confirmed by the test case and we are not sure how the drivers contribute to development of EURAD2 topics.

2.3 Perspectives on needs which perhaps could be respecified more accurately

After consolidation, the SRA represents several areas like predisposal, LILW waste management, high-level waste management and spent fuel waste management. It is essential to distinguish in the proposed structure in which area the work is planned to be done and the possible boundaries and interfaces with other areas more clearly. Also, if there would be joint studies it would be good to see where is the weight of the planned study.

The items have a very heterogeneous scope: in the new SRA they could be rewritten such that certain topics become more specific or at least their importance could be assessed.

Certain topics are clearly overlapping and should be merged (e.g., related to gas generation and migration).

The Networking work packages should be concentrated on the selected topics (EURAD2 Work Programme) and not for all possible initiatives related to spent fuel disposal. The fact is that dissemination, Knowledge Management (KM), Training, uncertainties etc. should be more targeted on the content of future Work Packages and their specific scope and needs rather than waste management general.

2.4 Consolidated College suggestion for new SRA needs

The SRA is very extensive, and the new RD&D needs can be divided into three categories.

The world is going to be more **digital** in the future. The capacity of **different tools and automatization** proceeds. The new developed tools can be used in many ways for planning, design, implementation, evaluation and visualisation and documentation in different steps in disposal chain. That also raise lot of questions related to the Quality management, risk management and safety management point of view. The common European view is important. The different tools are developed within PREDIS, EURAD (Modats) and in other industries around the world. It requires effort at the European level to have the backend of nuclear industry as a forerunner in this field.

The waste management concepts, and designs (for different type of waste categories) require huge amounts of manmade and natural materials and related logistics and installation aspects. The performance of the materials is the most important aspect and handled generally in the safety case. The **sustainability and awareness of energy sources, climate aspects and availability of raw materials** is more critical in the current world situation, thus also **these topics needs to be included in the SRA**. Especially **new environmentally friendly materials** require similar types of performance studies and inclusion into the safety case. Since disposal projects typically have very long timescales, the needs for updates in materials are required in several steps. The

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optimisation of the concept usually supports the sustainability fact by decreasing volumes of manmade materials.

The plans in Europe are that the first SMR facilities would be in operation in next decade (2030-2040) and 4th Generation reactors a decade later. This sets a need to solve the **aspects for SMR and new type of reactors waste management**. This would be a joint challenge and common concern for many European countries and especially if there will be new actors not having strong link between waste management organisation as current waste implementors have. Though it is recognised that there are some countries that do presently not consider SMR and new type of reactors, it is agreed that this topic should be handled in co-operation at the European level.

In the proposed SRA tables (Appendix 2) the different waste management organisations have also proposed other topics, which are mainly targeted to continue the RD&D work related to the site characterisation and barrier behaviour (Theme 3 and Theme 4 and Theme 5 mostly).

3 Concluding remarks

As an overall comment, the SRA relies on the fact that now 3 different colleges and one Programme (PREDIS) will have similar possibility to propose different topics to the SRA. Still, it is not clear who has the mandate to decide or is there an equal power between these bodies. This is strongly identified as governance factor for EURAD2 and will be proposed in more detail in a separate position paper planned to be published in the end of November 2022. The IGD-TP SRA from 2019 is still valid and represent the views of Waste Management Organisations widely with needs from the implementors point of view. Usually, the implementors also have a strong insight on regulatory needs for implementation, which is reflected in the IGD-TP SRA as well.

It should be understood that R&D work can be done in different type of networks and groups. The European level R&D including crosscutting themes should be concentrated to the joint R&D topics, which are in their nature novel or joint challenges for many organisations (like SMR predisposal and disposal or further development of models to evaluate the performance of disposal system or test and development of AI applications for disposal facilities). This supports all participating organisations equally. There are also other instruments to proceed with joint challenges than just Joint Programming. Within IGD-TP platform some specific topics can be solved with joint resourcing of work. Some of the issues common for many organisations like application of novel concrete materials or AI are broadly discussed in other industries as well. Could there be a possibility to better use the other programmes also toward the EURAD2 topics. The benchmarking would be very important since the scientific knowledge related to these topics are not waste management specific and the applications needed might be developed elsewhere.

Scientific committee of the IGD-TP optimisation symposium creates a position paper (to be published by the end of 2022) on the role of optimisation in nuclear waste management and this paper also highlights the needs from WMO's toward the future joint programming.

The SRA needs to summarise the identified research needs but should not explicitly define how these research needs will be actioned and implemented. The detailed plan of how the research needs will be addressed should be set out in a deployment plan. The situation for budgeting (public/versus private funds) varies significantly across member countries. The deployment plan

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should consider how to ensure that possible national public money can be utilised in coordination with EURAD objectives.

The SRA update should respect also the new challenges in implementation such as EU conditions for sustainable financing or rapid development of SMR or 4th Generation reactors waste management technologies.

Appendix 1. WMO prioritisation in IGD-TP Strategic Research Agenda published in 2020.

- Topics with the highest priority, which had been voted the most important and the most urgent:

Topic	Description	“Action” category	Comment September 2022
Topic 1.3	Increase confidence in and further refinement of methods to undertake sensitivity and uncertainty analyses, and address flexibility and adaptability of the repository and evolution of safety requirements and regulations.	20% R&D 80% networking	Partly taken care in EURAD UMAN. The R&D work within this topic should be concentrated more on Design basis and reduction of conservatism. This is also linked to the optimisation topics.
Topic 2.6	Methods for determining the inventory of long-lived radionuclides and chemotoxic materials with high impact on the safety of final repositories for low and intermediate-level waste from nuclear power plants.	40% R&D 60% networking	An IGD-TP project established for chemotoxic /non-radioactive materials (iCHANCE). Long-lived radionuclides taken care by ?
Topic 3.3	Repository layout design including operational safety studies.	100% networking	
Topic 3.6	Performance of seals and plugs.	80% R&D 20% networking	No ongoing work within EURAD. CeBaMa gave information, but use of sustainable materials in concrete industry

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			might raise the importance of this Topic.
Topic 3.11	Repository-induced gas generation impacts and their mitigation.	60% R&D 40% networking	Partly taken care in EURAD GAS, and also further plans proposed within EURAD2. Important to synchronise the work with gas topics.
Topic 6.4	Data management.	20% R&D 80% networking	Partly taken care by MODATS in EURAD. Also further plans for EURAD2 (broaden with AI) since the technology development is really fast.
Topic 8.4	Retrievability and reversibility.	10% D&D 90% networking	An IGD-TP Workshop and status report completed.

- Topics outside the “highest priority” category, but which were still considered of high importance by most WMOs:

Topic	Description	“Action” category	Comment September 2022
Topic 1.7	Verification and validation of models for the simulation of the transport of radionuclides in the near-field of deep geological repositories.	50% R&D 50% networking	Taken care in EURAD FUTURE WP.
Topic 3.2	Industrial-scale operations for buffer and backfill.	80% D&D 20% networking	
Topic 3.10	Container materials and their long-term performance.	50% R&D 50% networking	Partly taken care in EURAD CONCORD WP.
Topic 3.12	Remaining issues on bentonite performance and properties	60% R&D 40% networking	Partly taken care in EURAD HITEC WP.