Template #2

Short Acronym and full Title	**ECOFRAME - *European COmmon FRAMEwork for Operational Scientific Data in RWM***		
Type of activity	☐R&D	☒ Strategic Study	
Budget estimation (total budget in M€, i.e ~ 1.5 M€)	0.75 mio €	Duration of the WP (in months)	24 months
Links with EURAD SRA / Roadmap Themes (if multiple choices, indicate the primary link in bold – maximum 3)	☒Programme Management (Theme 1) ☐Pre-disposal (Theme 2 ☐Engineered Barrier Systems (Theme 3) ☒**Geoscience** (Theme 4) ☐Disposal facility design and optimisation (Theme 5) ☐Siting and Licensing (Theme 6) ☒Safety Case (Theme 7)		
Links with EURAD SRA topics	Topic 1.1.1.: National RWM Policy **Topic 4.4.: Geosynthesis** Topic 7.2.2.: Information, Data and KM		
SRA drivers (maximum 3)	☐ Implementation Safety ☐Tailored Solutions ☐Scientific Insight ☒Innovation for Optimisation ☒Societal Engagement ☒ Knowledge Management		
Objective (What) – 1 sentence	The Strategic Study ECOFRAME proposes to transform currently fragmented, project-specific data management practices into a coherent, FAIR-compliant and societally anchored framework that strengthens safety case robustness, accelerates implementation, and ensures sustained knowledge preservation over the long timescales of conception, operation and post-closure phases of radioactive waste management.		
Justification: impact / innovation / added-value (Why) – bullet points or short paragraph **(maximum quarter of a page)**	ECOFRAME will: ➢ Inventory and gather the fundamental elements required to manage operational scientific data[1], in compliance with the FAIR principles and establish DMP (Data Management Plan) and QMP (Quality Management Plans) recommendations to facilitate the processing of data for actors in Radioactive Waste Management (RWM). ➢ Establish a strategic and community-oriented application based on existing scientific data, ideally acquired or shared within the framework of EURAD, to propose a robust database structure designed to benefit the community and its future work. ➢ Bring a shared understanding across EURAD actors of current operational scientific data practices. ➢ Examine existing standards and lessons learned to recommend shared principles for the data lifecycle, incorporating traceability at all stages from acquisition, use, storage and potentially destruction of data at all different phases		

[1] Operational scientific data refer to all scientific data, along with associated metadata on context (origin, acquisition conditions and methods, models, software, uncertainties, etc.) and evolution of the corresponding datasets (consolidation, discarding, merging), from its acquisition to its use to support site selection, facility design and optimization, and performance and safety assessments.

	of RWM, to anticipate the future management of this data in operational conditions. ➢ Increase alignment between implementers, TSOs, REs and civil-society partners on FAIR-oriented practices and expectations for future data management. This implies to fully involve civil society and experts in the humanities and social sciences at all stages of the WP to transfer knowledge and enable research activities on cognitive biases and values that may impact these data-related activities.
List of planned tasks / subtasks with % of effort per task (5% increments) **(Maximum 10 bullets)**	**Task 01: Management/Coordination of the WP 10 %** **Task 02: Knowledge Management 10 %** - KM activities (Green / White papers, etc.) and potential training activities - Collaboration with KM WP, Task 5 **Task 03: Strategic Guidance for Data Lifecycle 20 %** Effective management of the entire data lifecycle is essential for ensuring quality, transparency, and long-term usability of operational scientific data in RW disposal projects. Once acquired, data should follow a structured and traceable path, from validation and use in analyses to interpretation, curation, and ultimately archiving or deletion. Robust procedures help limit human biases, support reproducibility, and maintain confidence in the scientific basis of safety assessments. Clear guidelines will support both existing and future projects in managing complex datasets over long timescales. Objectives of Task 03: – Maps existing data lifecycle principles across programs, identifying gaps, inconsistencies and long-term risks based on lessons learned. – Establish comprehensive data-lifecycle management principles applicable to all datasets, including recommendations on validation, decision-making for data use, processing traceability, storage of interpreted data, and archiving or deletion. – Complement these principles with reviews and consolidated guidance on best practices for data curation and long-term preservation across diverse organizational settings. – Ensure that the guidance is designed to be readily integrated into future DMPs and QMPs, supporting long-term coherence across EURAD members and European countries. – Address key strategic questions, including: How to ensure full traceability throughout the system? How to identify and mitigate biases, errors or lack of transparency across the data lifecycle? – Fully involve civil society and social science actors in the identification of best practices to ensure the legitimacy, acceptability and credibility of data-related decisions, particularly regarding interpreted data, data deletion, and other sensitive lifecycle steps. – Identify key human, organizational, and cognitive factors shaping data handling and decision processes, acknowledging that not all factors can be exhaustively captured, to support more robust governance and operational strategies. *Expected outputs:* - *Framework and guidance for data catalogues and lineage, including conceptual models, best-practice guidelines, and examples for creating, documenting, and maintaining catalogue and lineage information.*

- *Recommendations for dataset curation and validation: relevant standards, quality criteria, and existing practical tools to support dataset curation, validation, harmonisation, and lifecycle traceability.*
- *Blueprints and comparative assessment of data-lifecycle tools: providing reference workflows and an overview of available tools, frameworks, and software supporting data management, validation, and archiving.*
- *Domain-specific recommendations and structured feedback to enhance DMP/QMP, including guidance on lifecycle governance, traceability, bias mitigation, and long-term data preservation.*
- *Data governance, including ownership, metadata/provenance, QA/QC, traceability, transparency, archiving, long-term preservation, and a reference architecture and DMP framework.*

Task 04: Framework for operational scientific data management 40 %

Efficient management of operational scientific data requires robust, structured, and interoperable databases, especially in the context of long-term RWM projects such as geological disposals. Today, datasets generated across Europe rely on heterogeneous formats, standards, and practices, which complicates their integration, long-term preservation, and use in design and safety assessments. Existing and future projects will benefit from experiences in building and maintaining management frameworks for an extensive amount of gained scientific data.

Objectives of Task 04:

- Maps existing operational data practices across programs, identifying gaps, inconsistencies, and long-term risks based on lessons learned.
- Establish a common European database framework including a shared data dictionary, harmonised structures, and traceability rules to support consistent data storage, processing, and exchange of operational scientific data:
    - Build on existing EURAD and international standards (IEEE, ISO, etc.) to ensure standardization, safety, interoperability, and long-term usability across diverse datasets and EU partners.
    - Integrate heterogeneous datasets into a unified information system to consider specific concerns about specific data management including monitoring data (large volume movies, pictures, 3D, x-ray pictures, fibre optics, etc.), modelling data, literature data research data, etc.
    - Establish flexible, European-scale solution, accommodating both the most and the least advanced countries: unique dataset IDs, FAIR-compliant traceability, interoperability, and standardisation.
- Engage Civil Society and social sciences participants from the beginning, allowing them to interact with the process, learn from activities, and help ensure early involvement, mutual understanding, and greater relevance and acceptance of the framework

Expected outputs:

- *European Common Framework, policy set (appraisal/retention, preservation/legibility), process maps, DMP framework & templates, reference architecture (incl. interfaces & security), KPI set (FAIR maturity, provenance completeness, retrieval time), interoperability profile (schemas, APIs, vocabularies), FAIR conformance checklist, assessment method for DMPs, adoption playbook.*

Task 05: From data interpretation to decision processes 20%

	Task 05 bridges the interpretation-to-decision gap by translating research monitoring into robust operational strategies. This is achieved through selected and targeted datasets, simulations with depreciated data and scenario stress-tests, while simultaneously mapping key stakeholders and societal concerns. The task also aims to establish decision-support views for safety cases and integrates resulting lessons into the DMP and broader governance processes, ensuring traceable, robust and evidence-based decision-making. Key activities listed below include the use of selected datasets from previous projects and/or potential R&D WPs on sensors or related modelling activities. Objectives of Task 05: - Improve dataset integration and scenario robustness: Assess differences between research and operational monitoring systems, considering scale, economics, and practical constraints. Use realistic scenarios, including degraded or incomplete datasets, to stress-test monitoring and decision-making processes. Develop approaches to harmonise diverse datasets through shared standards, metadata, and decision-support tools for variety of situations and needs (SIMS, LIMS, advanced and early stage). - Map stakeholders and analyse their relationships: Identify regulators, implementers, civil society actors, and other relevant participants. Examine their roles, responsibilities, and interactions in data collection, interpretation, decision-making, and public communication, with a focus on societal expectations and concerns. - Test the framework through case studies: Use real or simulated case studies (scenarios) to evaluate how technical artefacts (datasets, models, monitoring systems) interact with human factors such as bias, misinterpretation, and communication gaps. Example decision-support tools that can effectively inform safety cases while reflecting stakeholder perspectives. - Establish learning and feedback loops: Apply insights from scenario exercises to refine databases, monitoring strategies, and the integration of societal and technical views. Feed these lessons into the DMP to continuously improve data practices, transparency, and long-term governance. *Expected outputs:* - *Stakeholder/actor and engagement map; Influence–interest matrix with roles and responsibilities, engagement approach, and concerns linked to safety-case claims,* - *Scenario playbook with reports, case-study report,* - *Decision-support prototype as the smallest usable version of a tool or portal,* - *Governance model for ongoing operations. — Policies for data stewardship, change control, cybersecurity/privacy, compliance, escalation paths,* - *Feedback to the Data Management Plan (DMP) updates of rules for systems to exchange data.*
List of expected outcomes linked to the identified SRA drivers **(Maximum 6 bullets)**	• Integrated framework for data-lifecycle management that incorporates best practices and innovations, strengthens knowledge management, and fosters efficient collaboration within EURAD (*Innovation for Optimisation & Knowledge Management*). • Strategic recommendations for societal engagement and data governance that clarify roles, responsibilities, and participation of civil society and social-science actors in data-related decisions (*Societal Engagement & Knowledge Management*). • Proposition of standardized European data management framework for RWM, including a common data architecture, interoperability profile and traceability rules,

	supporting long-term safety and efficient reuse of data (*Innovation for Optimisation & Knowledge Management*). • Integrated data and decision-support concept for safety cases and operations, demonstrating how harmonised data, monitoring and models can optimise implementation strategies under realistic and degraded data conditions (*Innovation for Optimisation & Knowledge Management*). • Stakeholder engagement and feedback framework for ongoing, structured interaction with civil society and social-science actors, ensuring transparency, legitimacy and responsiveness of data governance (*Societal Engagement*). • Strengthened EURAD community of practice for operational scientific data, supported by KM outputs (green/white papers, training, guidance) to sustain long-term knowledge preservation and cross-programme learning (*Knowledge Management & Societal Engagement*).
Deliverables **(Maximum 6 – including the prescribed deliverables)**	Green paper (M12) White paper (M18) Recommendations for dataset curation and validation Guidelines towards European Common Framework for Data management in RWM Strategic insights from scenario exercises on interpretation-to-decision processes Outcome/impacts report to Member States and End Users
Critical input requirements & identified risks	Include all lessons learnt and existing experience to produce a useful framework suitable for different programmes
List of preliminary interested organisations as partners in the WP contributing effort; **% of effort**	WMO (40 %): ANDRA, SKB, BGE, SOGIN, ARAO, COVRA, NAGRA, ONDRAF, PURAM, NWS, NES TSO (40 %): AGES, ASNR, EIMV, FTMC, GRS, MERIENCE, NTW, NRG, SSTC, VTT RE (20 %): CEPN, EGIS, GALSON SCIENCES, INGECID, SCK CEN, UNIPI, LEI
If applicable - links with previous projects / work packages	• Several ongoing EURAD-2 WPs are developing collaborative unified platforms and/or databases, that could be considered as inputs for ECOFRAME: RAMPEC, HERMES, DITOCO2030. • Several proposals for EURAD-2 2nd wave WPs plans to develop collaborative unified platforms and/or databases and/or tools, that could be considered as inputs for ECOFRAME.
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