EURAD-2 SECOND WAVE

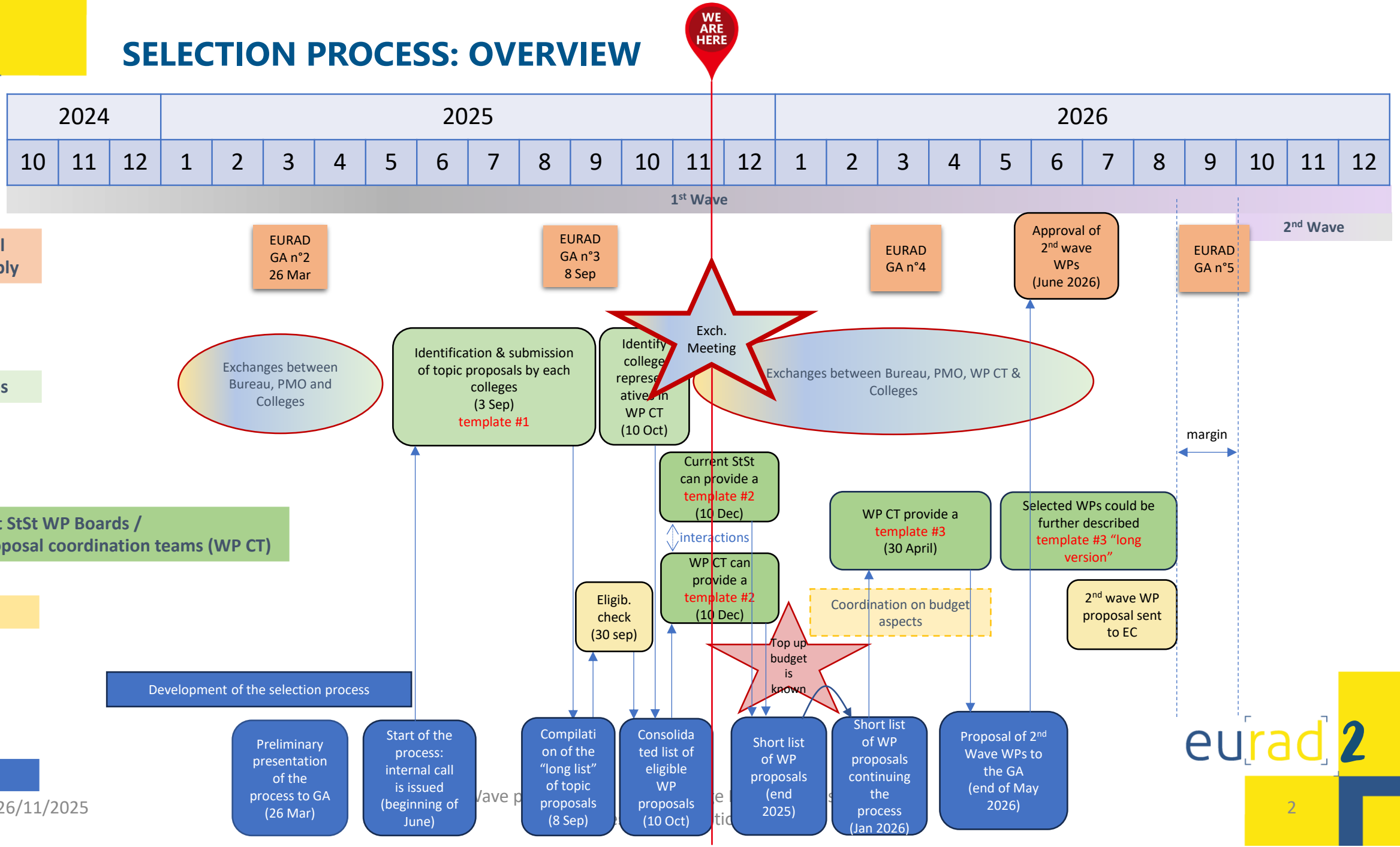
RD&D and StSt WP selection process

F2F Exchange Meeting to assist templates #2 preparation

EURAD-2 Bureau

Co-funded by the European Union under Grant Agreement n° 101166718

SELECTION PROCESS: OVERVIEW



		WP #	Acronym	Titles of the related proposals	Template #1 from College			WP Coordination Teams (WP CTs)		
					WMO	TSO	RE	WMO	TSO	RE
StSt	From templates #1	StStWP1	ECOFRAME	Operational scientific data management	X			marie-anne.bruneaux@andra.fr	nadja.zeleznik@eimv.si deputy: nataline.simon@asnr.fr	camelia.ichim@nuclear.ro
				Towards robust decision-making processes in RWM through participatory data analysis and co-creative development of scenarios		X				
		StStWP2	TOSCA	Toxic substances/ chemicals	X			benjamin.frasca@andra.fr	frederic.coppin@asnr.fr	anke.neumann-jenal@psi.ch
		StStWP3	GENESIS	Guidance for European (TE)NORM & DU enabled strategies for integrated stewardship		X		enga@enresa.es	yv_kydriashova@sstc.ua deputy: konrad.lotter@ages.at	fidel.grandia@amphos21.com
		StStWP4	NASTRAT	Investigating analogues for trusted understanding of repository assessment		X		erika.neeft@covra.nl	anamaria.fernandez@ciemat.es	heini.reijonen@gtk.fi
				Natural Analogues: Strategic review of holistic utilisation of NAs in radioactive waste disposal			X			
		StStWP5		THMC Host Rocks: Assessing the end user gaps and needs on THMC(B) properties of HR – defining a common strategy			X	No WP CT member identified.	baksay.attila@gmail.com	arnaud.dizier@euridice.be
R&D		R&DWP1		Intelligence (AI) / machine learning for analysis of site characterisation data and other large datasets	X			david.eastwell@nuclearwasteservices.uk	wpfingsten@pop.agri.ch	nikolaos.prasianakis@psi.ch
		R&DWP2	MOGARE	MOdelling of GAs behaviour and migration at the REpository scale storage/disposal	X			jacques.wendling@andra.fr	zakaria.saadi@asnr.fr	luca.urpi@psi.ch
		R&DWP3	DEEPCHEM	Detection and Evaluation of Electrochemical and pH Conditions for Corrosion and HEterogeneous Monitoring	X			johan.bertrand@andra.fr	charles.wittebroodt@asnr.fr	c.boxall@lancaster.ac.uk
		R&DWP4	CSFD ext	Experimental investigation of nuclide composition in SF for post-closure criticality safety	X			anna.alvestav@skb.se	eva.leser@base.bund.de	mathieu.hursin@epfl.ch
		R&DWP5	SAFEBIT	Assessment of the long-term evolution and safety of bituminous radioactive waste		X		jan.rosdahl@skb.se	georges.matta@asnr.fr	petr.vecernik@ujv.cz
		R&DWP6	GEOSCALE	Repository site flow and transport models		X		michael.schnellmann@nagra.ch	pirjo.hella@vtt.fi deputy: susan.britz@grs.de jeroen.mertens@belv.be	jon.engstrom@gtk.fi mirjam.kiczka@unibe.ch
		R&DWP10		Developing site screening strategies and procedures for integrated site descriptive models			X			
		R&DWP7		Backfilling materials for disposal: ensuring long-term stability and performance		X		jean.talandier@andra.fr	oliver.czaikowski@grs.de deputy: alexandre.dauzeres@asnr.fr	janez.perko@sckcen.be
				Materials for enhancing passive safety and robustness of Engineered Barrier Systems			X			
		R&DWP8		Development of robust and versatile conditioning matrices for challenging waste streams			X	jlen@enresa.es	radouane.sghir@belv.be	Quoc.tri.phung@sckcen.be
		R&DWP9		Self-Powered Monitoring Systems for Radioactive Waste Repositories			X	renaud.fallourd@andra.fr	rita.plukiene@ftmc.lt	jl.garciasineriz@amphos21.com deputy: susana.tunon@amphos21.com
	From 1st wave StSt			WP Proposal from ASTRA						
				WP Proposal from CLIMATE						
				WP Proposal from DITOCO						
				WP Proposal from DITUSC						
				WP Proposal from OPTI				assist		
				WP Proposal from FORSAFF						

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				Towards robust decision-making processes in RWM through participatory data analysis and co-creative development of scenarios		X				
		StStWP2	TOSCA	Toxic substances/ chemicals	X			benjamin.frasca@andra.fr	frederic.coppin@asnr.fr	anke.neumann-jenal@psi.ch
		StStWP3	GENESIS	Guidance for European (TE)NORM & DU enabled strategies for integrated stewardship		X		enga@enresa.es	yv_kydriashova@sstc.ua deputy: konrad.lotter@ages.at	fidel.grandia@amphos21.com
		StStWP4	NASTRAT	Investigating analogues for trusted understanding of repository assessment		X		erika.neeft@covra.nl	anamaria.fernandez@ciemat.es	heini.reijonen@gtk.fi
				Natural Analogues: Strategic review of holistic utilisation of NAs in radioactive waste disposal			X			
		StStWP5		THMC Host Rocks: Assessing th common strategy					attila@gmail.com	arnaud.dizier@euridice.be
R&D		R&DWP1		Intelligence (AI) / machine lear					ten@pop.agri.ch	nikolaos.prasianakis@psi.ch
		R&DWP2	MOGARE	MOdelling of GAs behaviour ar					saadi@asnr.fr	luca.urpi@psi.ch
		R&DWP3	DEEPCHEM	Detection and Evaluation of El Monitoring					wittebroodt@asnr.fr	c.boxall@lancaster.ac.uk
		R&DWP4	CSFD ext	Experimental investigation of r					r@base.bund.de	mathieu.hursin@epfl.ch
		R&DWP5	SAFEBIT	Assessment of the long-term e					.matta@asnr.fr	petr.vecernik@ujv.cz
		R&DWP6	GEOSCALE	Repository site flow and transp					lla@vtt.fi susan.britz@grs.de	jon.engstrom@gtk.fi mirjam.kiczka@unibe.ch
		R&DWP10		Developing site screening strat					mertens@belv.be	
		R&DWP7		Backfilling materials for dispos					zaikowski@grs.de deputy: alexandre.dauzeres@asnr.fr	janez.perko@sckcen.be
				Materials for enhancing passive safety and robustness of Engineered Barrier Systems			X			
		R&DWP8		Development of robust and versatile conditioning matrices for challenging waste streams			X	jlen@enresa.es	radouane.sghir@belv.be	Quoc.tri.phung@sckcen.be
		R&DWP9		Self-Powered Monitoring Systems for Radioactive Waste Repositories			X	renaud.fallourd@andra.fr	rita.plukiene@ftmc.lt	jl.garciasineriz@amphos21.com deputy: susana.tunon@amphos21.com
	From 1st wave StSt			WP Proposal from ASTRA						
				WP Proposal from CLIMATE						
				WP Proposal from DITOCO						
				WP Proposal from DITUSC						
				WP Proposal from OPTI				assist		
				WP Proposal from FORSAFF						

From the templates #1 (after the merge of some proposals):

- 5 StSt WP Proposals
- 9 R&D WP Proposals

From the 1st wave StSt WP:

- Maximum 6 R&D WP proposals

→ Maximum templates #2 expected on 10/12:

- 5 StSt WP Proposals
- 15 R&D WP Proposals

OBJECTIVES OF THE MEETING

- **Provide all stakeholders with an UpToDate overview of the templates #2 preparation.**
- **Exchange on possible issues relates to some templates #2 preparation.**
- **Start exchanging about the next steps of the selection process:**
  - What are the views of the Colleges ?
  - Which directions should we take for selecting the second wave WPs?

PARTICIPANTS

Indicative, late registrations not taken into account

Colleges	Number of Persons registered	Number of organisations registered	Number of organisations in total in EURAD-2	Registered org. / Total org EURAD-2	Registered Pers / Total Registered Pers
RE	31	15	23	65%	41%
WMO	27	15	31	48%	36%
TSO	18	9	26	35%	24%
Total	76	39	80		

- Not a very equilibrated representation of the colleges in the audience.
- WP CTs and 1st wave StSt are only partially represented.
- Today the focus is on discussions, and not on decisions.

FINAL AGENDA

Time	What	Who
13:30	Introduction	Bureau
13:40	Current status of templates #2 preparation ≈ 13:40 – 14:00 Part 1 1)EBS Materials, 2) & 3) GEOSCALE (Geosphere models as a tool for improving confidence in site characterization and assessment of long term evolution and safety), merged of Integrated site descriptive models & site flow and transport models, 4) THMC Host Rocks ≈ 14:00 – 14:20 Part 2 5) MOGARE, 6) Intelligence (AI)/Machine learning for analysis of site characterisation data and other large datasets, 7) DITUSC proposal, 8) Natural Analogues ≈ 14:20 – 14:40 Part 3 9) CLIMATE proposal, 10) OPTI proposal, 11) Self-powered monitoring systems, 12) Heterogeneous Monitoring (electrochemical and pH conditions) *For each part, the Bureau will present 4 templates #2 and then moderate ≈10min of Q/A (addressing notably possible open issues).*	Bureau Elke J. Anne K. Xavier P.
14:45	Break	
15:00	≈ 15:00 – 15:20 Part 4 13) ECOFRAME, 14) DITOCO proposal, 15) Conditioning matrices for challenging waste streams, 16) SAFEBIT, 17) GENESIS ≈ 15:20 – 15:40 Part 5 18) TOSCA Toxic substances & chemicals, 19) FORSAFF proposal, 20) ASTRA proposal, 21) CSfD extension *For each part (in one case 5), the Bureau will present 4 templates #2 and then moderate ≈10min of Q/A (addressing notably possible open issues).*	Bureau Astrid G. Sabrina D.
15:45	Break	
16:00	Focus on the directions we are taking for the second wave - College perspectives on how the current WP proposals would answer the College needs and what are the possible issues they see for the next steps of the selection process *Initial talks by RE and TSO college representatives (WMO views will already be shared during the IGD-TP Exchange Forum), followed by Q&A.* - Panel discussion with the 3 Colleges on "How our WP proposals complement each other to form a "programme" for the second wave of EURAD-2, and what criteria do we see as important for the upcoming selection steps" and Q&A.	College representatives Bureau SITEX: Valéry D. EURADSciences: Didier L. IGD-TP Bureau: Valéry D. Moderators: Elke J., Christophe D.
17:30	Break	
17:40	Wrap-up and conclusions	Bureau
18:00	End of the meeting	Astrid G.

EBS Materials		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users

To develop **innovative sustainable materials**, processes and manufacturing techniques that enhance the robustness and passive safety of radioactive waste disposal systems through the use of alternative container materials, innovative backfill materials and the sustainable use of closure materials.
End users will profit from the development of EBS material alternatives for future safe and sustainable development of disposal facilities.

WP main tasks

Task 1: Indicators and assessment of sustainable EBS
Task 2: Materials for HLW and SF disposal containers
Task 3: Backfill material design to prevent mechanical damage
Task 4: Reuse and repurposing of closure/backfill material

Issues faced currently (if any?)

- The main challenge is to align all interested partners with the objectives of the project and to define what is out of the scope
- To assure no overlaps with other on-going or proposed projects

Current potentially interested partners

WMOs: ANDRA	TSOs: ASNR, Energorisk, GRS, PSI	REs: SCK CEN, KIPT, BGR, CVUT, GSL, CEA, CEPN, Univ-Lorraine, Merience, HUN-REN, GSF, SIIEG NASU, Uni-Hannover

Main SRA topics addressed by the WP (max 3, primary in bold)	3.2.1 HLW and SF Containers 3.3.1 Buffers 3.3.2 Backfills
Main SRA themes related to the WP (max 3, primary in bold)	Theme 3: Engineered Barrier Systems Theme 5: Disposal facility design and optimization Theme 7: Safety Case
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: Tailored Solutions Driver 2: Innovation for Optimisation

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
WP6 STREAM – sustainable treatment of challenging waste WP9 InCoManD – Innovative container materials WP10 ANCHORS – Evolution of bentonite barriers WP13 OPTI – HLW repository optimisation

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
R&DWP8 – conditioning also belongs to EBS system

Proposal of a new merged WP 10/6:
GEOSPHERE MODELS AS A TOOL FOR IMPROVING CONFIDENCE IN SITE CHARACTERIZATION AND ASSESSMENT OF LONG-TERM EVOLUTION AND SAFETY (GEOSCALE)

Original Proposal WP10: Developing site screening strategies and procedures for integrated site descriptive models

Task 1: Development of policies and best practices for site sceening strategies and siting criteria

Task 2: Development of progressing site descriptive models in connection to siting stages and conditions

Task 3: Comprehensive set of methods for fast and efficient evaluation of borehole

Task 4: Tools and workflows towards integrated models for assessment of long-term evolution of disposal facility and surrounding geosphere

Partly
See extra slide

Task 2.3

Task 2.1 & 2.2

New-merged Proposal WP10/6: Geosphere models as a tool for improving confidence in site characterization and assessment of long-term evolution and Safety

Task 1: Geosphere requirements and parameters with respect to long-term safety
1.1 Review & State of the art report
1.2 Definition of requirements for site descriptive flow and transport models

Task 2: Development and benchmarking of modeling strategies for geosphere evolution in crystalline and sedimentary host rock
2.1: Definition of benchmark scenarios
2.2 Implementation and evaluation of benchmarking approaches
2.3 The evolution of site descriptive models during progressive data generation

Task 3: Approaches for efficient generation of model parameters from field investigation

Original Proposal WP6: Repository site flow and transport models

Task 1: Review of existing modelling approaches

Task 2: Planning of benchmark study

Task 3: Benchmark study in crystalline and clay host rock

Task 4: Analysis and recommendations

WP6/WP10: GEOSPHERE MODELS AS A TOOL FOR IMPROVING CONFIDENCE IN SITE CHARACTERIZATION AND ASSESSMENT OF LONG-TERM EVOLUTION AND SAFETY (GEOSCALE)

	StSt WP
X	RD&D WP

WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).

Green, orange or red

WP Objectives & added value for end users

The WP defines modelling approaches, exploration strategies and framework for data required at different stages of the siting process serving the needs for siting, site characterization and assessment of the long-term evolution for geosphere models, in particular flow and transport models. The WP will provide procedures and data needed to build trust in geosphere models and to improve credibility and robustness of site-specific data management and mitigate uncertainties. The WP will also increase the awareness and the social acceptance of siting procedures for the society.

WP main tasks

Task 1: Geosphere requirements and parameters with respect to long term safety

Task 2: Development and benchmarking of modeling strategies for geosphere evolution in crystalline and sedimentary host rock

- Task 2.1: Definition of benchmark scenarios for flow and transport modelling
- Task 2.2: Implementation and evaluation of benchmarking approaches
- Task 2.3: The evolution of site descriptive flow and transport models during progressive data generation

Task 3: Approaches for efficient generation of model parameters from field investigation

Issues faced currently (if any?)

We might be short in time to involve all interested organisations to allow a bottom up approach

Current potentially interested partners

WMOs ca. 5	TSOs ca. 10	REs ca. 30

Main SRA topics addressed by the WP (max 3, primary in bold)	**Topic 4.1.1: Site descriptive model** Topic 4.1.2: Aqueous transport and retention Topic 6.2.2: Detailed site characterisation and site confirmation
Main SRA themes related to the WP (max 3, primary in bold)	**Theme 4: Geoscience** Theme 6: Siting and licensing Theme 7: Safety Case
Main SRA drivers characterising the WP (max 3, primary in bold)	Implementation Safety **Scientific Insight** Knowledge Management

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
Which WPs and which interactions ? • KM >> Geosphere models are tools for knowledge management • HERMES >> Tools and platforms for model coupling • CLIMATE >> Coupling to long term evolution and scenarios • DÌTUSC >> Relevant for implementing chemistry in geosphere models • RAMPEC >> Coupling to long term evolution and scenarios

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
Which WPs and which interactions ? • Artificial Intelligence (AI) / machine learning for analysis of site characterisation data and other large datasets >> Collaboration and exchange of experience (Task 3) • Assessing the end user gaps and needs on THMC(B) properties of HR – defining a common strategy >> Collaboration regarding requirements and parameters

Main change for the merged WP:
Task 1 has been focused on the geosphere to closer align with the other tasks of the new proposal

Original WP 10 Proposal Task 1 (Siting strategies and criteria)	What is still in the new WP?	What has not yet been considered in the new WP?
Task 1: Development of policies and best practices for site screening strategies, criteria and their communication strategy based on literature review/collection of expert knowledge and end user entities. • Geoscientific, environmental and socio-economic siting criteria, • GIS-based analysis processes including data quality management. • Development of policies and best practices for site screening processes. • Communication • Assessment of alternative sites, e.g. develop screening criteria applied for candidate sites of SMR including procedures for waste management.	Literature review /expert assessment of best practices and criteria with respect to geosphere models and site descriptive modelling workflows Geoscientific siting criteria Geosphere models as a tool for communication and trust building Knowledge and Data quality management	Assessment of alternative sites, e.g. develop screening criteria applied for candidate sites of SMR including procedures for waste management. (SMR are investigated in WP FORSAFF) Environmental and socio-economic siting criteria are not included No development of nation specific siting strategies, GIS bases analysis processes

Assessing the end user gaps and needs on THMC(B) properties of HR – defining a common strategy	05	StSt WP
		RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	orange	

WP Objectives & added value for end users
The objective is to systematically identify knowledge gaps and prioritize research needs related to the upscaling of THMC(B) processes and gas transport, and to understand how properties can be derived in clayey host formations and clay-based engineered barrier systems (EBS). Engagement with end-users of national programmes will take place at all stages to incorporate the needs of both early-stage and advanced countries

WP main tasks	Issues faced currently (if any?)
Task 1 : Management Task 2 : Knowledge management Task 3 : Identification of Knowledge Gaps in THMC(B) Behavior Task 4: Proposal of a Common Perspective	No involvement of WMO

Current potentially interested partners		
0- WMO	6 - TSO	24 - RE

Main SRA topics addressed by the WP (max 3, primary in bold)	**Topic 4.2 perturbation** Topic 4.4 Geosynthesis Topic 7.1 Safety strategy
Main SRA themes related to the WP (max 3, primary in bold)	Engineered Barrier Systems (Theme 3) **Geoscience (Theme 4)** Disposal facility design and optimisation (Theme 5)
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: Scientific insight

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
WP2 KM WP10 ANCHORS WP13 OPTI WP15 DITOCO2030 WP16 HERMES

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
R&DWP02 - MOdelling of GAs behaviour and migration at the REpository scale storage/disposal

MOGARE (MOdelling of Gas behavior and migration at the Repository scale)		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users
The main objective of this WP is to provide new advances (compared to the one provided in EURAD-GAS) for better consideration of gases in the long-term safety and in the optimization of the EBS, which could be used by WMOs to optimize repository concepts and could increase the confidence of the various stakeholders (TSO and public) regarding gas considerations.

WP main tasks	Issues faced currently (if any?)
Task 1 : Coordination task ~~Task 2 : Numerical modelling on behaviour in,~~ and performance of, a deep repository	Reduction of the contour of the WP (no more task on "sub-surface ~~repository") to be able to manage a fruitful work in the 3 years on the~~ WP as the number of teams able to work on a two-phase flow model at repository scale is limited and benchmarking of approaches / results of simulations from the different teams is important ; all the teams should work on the same task, for deep repository.

Current potentially interested partners		
Andra, ARAO, BGE, COVRA, NAGRA, ONDRAF, PURAM, SKB	ASNR	PSI, EDF

Main SRA topics addressed by the WP (max 3, primary in bold)	**3.4.1 EBS System** **5.1 Design** **7.3.1 Performance assessment and process models**
Main SRA themes related to the WP (max 3, primary in bold)	**Engineered Barrier Systems (Theme 3)** Disposal facility design and optimisation (Theme 5) Safety Case (Theme 7)
Main SRA drivers characterising the WP (max 3, primary in bold)	**Implementation Safety** Scientific Insight Knowledge Management

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
Some links with ANCHORS, in terms of seal two-phase flow characteristics

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?

AIMLBIGD		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Orange	

WP Objectives & added value for end users

To develop and evaluate AI and machine learning methodologies for integrating borehole derived subsurface datasets to enhance geological understanding and predictive modelling in support of Geological Disposal Facility (GDF) siting.:

- Use large data sets from WMOs for AI and machine learning methods, particularly convolutional models, offer powerful tools for integrating diverse and complex subsurface datasets.
- Apply convolutional techniques that have been shown to link digitised core photographs with descriptive metadata
- Forward and reverse predictions allow for the synthesis or interpretation of missing or incomplete data based on learned patterns, together with an efficient check of the consistency of the different data response.
- The databases aggregated in the siting process for a GDF lends these datasets ideally towards AI convolutional models
- The results of successfully integrating all subsurface data into a complex convolutional model is an enhanced understanding of the behaviour of, and ultimately the characterisation of GDF host rock units.

WP main tasks

Task 1: Management/coordination of WP
Task 2: KM
Task 3: Develop a comprehensive set of best practice, processes, standards and structure for borehole data including:
- Develop a database structure for the storage of borehole data within a database referencing all data collected from an archetypal site characterisation borehole.
- Identify how all data (including ascii, image files, records, engineering parameters etc.) may be structured according to a standard reference frame e.g. depth and identify how data of variable sample interval, sample frequency may be stored

Task 4: Develop a standardised reference database for future research applications
- Utilise example data provided by a WMO, generate a reference database. Validate structure of all identified data types.
- Incorporate mechanisms for data import/export in machine-readable formats (e.g., JSON, XML).

Task 5: Demonstrate proof-of-concept
- Demonstrate potential applications through the generation of statistical analysis of stored data, perform statistical analyses (supervised and unsupervised clustering) to identify lithological or geotechnical patterns.
- Demonstrate integration of qualitative and quantitative data in machine learning workflows. Illustrate how the database can feed visualization tools, predictive models, or decision-support systems. Provide examples of automated data extraction and transformation for downstream applications.

Issues faced currently (if any?)

- Overlap R&DWP10 Developing site screening strategies and procedures for integrated site descriptive models

Current potentially interested partners

NWS ANDRA ARAO BGE COVRA NAGRA SKB RHK PURAM SOGIN

ASNR CIEMAT EIMV FTMC GRS Merience NRG PALLAS NTW SSTC NRS SURO TS Enercon VTT BS

Amphos 21 AtkinsRealis BGR CEA CEPN Česk vysoké

Main SRA topics addressed by the WP (max 3, primary in bold)	- 4.1.1 Develop a model of the host rock and surrounding geological environment, including distributions of rock types, geometry and - 4.1.2 Describe bedrock transport properties - 4.2.1 Characterize or confirm the chemical, hydrogeological, geomechanical, thermal, geomicrobiological, gaseous and radiation-induced perturbations, … 4.3.1 & 4.3.2
Main SRA themes related to the WP (max 3, primary in bold)	Theme n3: Engineered Barrier Systems (Theme 3) Theme n4: Geoscience Theme n6: Siting and Licensing Theme n7: Safety Case
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: Tailored Solutions Driver 2: Scientific insight Driver 3: Innovation for Optimisation

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
WP11 HERMES

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
R&DWP10 Developing site screening strategies and procedures for integrated site descriptive models

THermodynamic Experimental Research and Methods for Overcoming Gaps in Analysing Performance (ThermoGAP)

	StSt WP
X	RD&D WP

DITUSC board evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).

See issues faced

WP Objectives & added value for end users

For a defined set of safety-relevant topics - such as poorly retarded radionuclides (e.g., I, Se) and detrimental effects of (ternary-quaternary) complexes (organics, carbonates, silicates) on speciation and solubility, potentially overlooked beneficial processes in PA/SA, and optimization choices - the objective is to move beyond the current state of thermodynamic knowledge by integrating experimental evidence with advanced thermodynamic models. The aim is to establish scientifically defensible methodologies and formulate practical recommendations that can be reliably applied within the Safety Case, thereby reducing uncertainties and strengthening the overall robustness of safety assessments by increasing safety margins and informing optimization in EBS.

WP main tasks

1. Management / Coordination of the WP
2. Knowledge Management
3. Improvement of scientific basis to feed TDBs (experimental work & estimation methods)
4. Thermodynamic model development and refinement
5. Development of methodologies/recommendations for applications in the SC
6. (Communication and interactions with Civil Society to build mutual trust around reference cases)

Issues faced currently

DITUSC shared vision is in preparation based on 2nd DITUSC workshop transversal prioritization (held on 19&20/Nov). Further engagement with representatives of the 3 colleges and DITUSC End-User Group is needed to confirm interested parties. Shared short-term high priority topics have been identified at the operational level, but confirmation from leading management is required.

Current potentially interested partners

Andra*, BGE*, SKB, ONDRAF	**CIEMAT, GRS, NRG, NTW**	**Amphos 21, Česk vysoké učení v Praze, CNRS, Forschungszentrum Jülich, GalsonSC, HZDR, KIT-INE, Lancaster University, SCK CEN, UFZÚJV Řež, a. s.**
*end user WMO	TSO	RE

Main SRA topics addressed by the WP (max 3, primary in bold)	**7.3.1 Performance assessment and system models** 3.4.1 EBS system 4.4.1 Geo-datasets and conceptual models
Main SRA themes related to the WP (max 3, primary in bold)	• **Safety Case** • Engineered Barrier Systems • Geoscience
Main SRA drivers characterising the WP (max 3, primary in bold)	• **Implementation Safety** • Scientific Insight • Innovation for Optimisation

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?

- **WP12 RAMPEC**
- **WP8 SAREC**
- **WP9 INCOMAND**
- **WP16 HERMES**
- **WP6 STREAM**
- **WP14 SUDOKU**

WP CT proposal

- **WMO:** S. Brassinnes (ONDRAF - Belgium)
- **TSO:** T. Misana (CIEMAT- Spain)
- **RE:** X. Gaona (KIT-INE - Germany)

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?

- **StStWP2:** TOSCA: Toxic substances/ chemicals
- **R&DWP8:** Development of robust and versatile conditioning matrices for challenging waste streams
- **R&DWP7:** Backfilling materials for disposal: ensuring long-term stability and performance /Materials for enhancing passive safety and robustness of Engineered Barrier Systems
- **R&DWP5:** Assessment of the long-term evolution and safety of bituminous radioactive waste (SAFEBIT)
- **R&DWP3:** Detection and Evaluation of Electrochemical and pH Conditions for Corrosion and HEterogeneous Monitoring

Natural Analogues – Strategic review of holistic use of NAs in radioactive waste disposal (NATSTRAT)	X	StSt WP
		RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users

Objectives: 1. defining state of the art and critical gap analysis on NAs (including archaeological and anthropogenic analogues) for HLW and L/ILW concepts, 2. providing guidance for holistic use of NAs in disposal programmes (including safety cases and stakeholder communication)
Added value: identify unexplored areas for focussed future R&D, further reduce uncertainties in SC and improve communication and make the most of an underused asset

WP main tasks

Task 1: Management and coordination of WP
Task 2: Knowledge management and training
Task 3: FEP based gap analysis and state-of-the-art review on the analogues used in safety cases (utilizing existing literature)
Task 4: Feasibility assessment for future NA studies
Task 5: Final structured and versatile assessment report for selecting future study topics

Issues faced currently (if any?)

None

Current potentially interested partners

WMOs: ANDRA (FR), ENRESA (ES), COVRA (NL), NUMO (JP)

TSOs: CIEMAT (ES), Merience (ES), UGR (ES), UDC (ES), VTT (FI), EIMV (SI), EIMV (SI), NTW (FR), CEPN (FR), GRS (DE), BGR (DE), LBL (USA), SSTC NRS (UA), SÚRO (CZ)

REs: GTK (FI), VTT (FI), CEA (FR), BRGM (FR), EGIS (FR), FZ-JUELICH (DE), GFZ Helmholtz (DE), KIT (DE), HZDR (DE), UFZ (DE), ENEA (IT), UniBern (CH), EPFL (CH), Remondis (CH), TUDelft (NL), TNO (NL), SCK CEN (BE), BGS (GB), Uni Manchester (GB), UKNLL (GB), Amphos21 (ES), ÚJV Řež (CZ), INRP (RO), SIIEG NAS of Ukraine (UA), KAERI (KR)

Main SRA topics addressed by the WP (max 3, primary in bold)	**Topic 7.1.2: Performance indicators: Shared experience in the use of NA) To verify and build confidence in long-term, large-scale processes** Topic 1.1.3: Public information and participation: Ensure that public information on radioactive waste and spent fuel and a process for public participation are available Topic 4.4.1: Geo-datasets and conceptual models
Main SRA themes related to the WP (max 3, primary in bold)	**Theme n°7: Safety Case** Theme n°1: Programme Management Theme n°4: Geosphere
Main SRA drivers characterising the WP (max 3, primary in bold)	**Driver 1: Scientific Insight** Driver 2: Societal Engagement Driver 3: Knowledge Management

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
WP2 KM (integration of Nas in KM) WP4 FORSAFF (NA for new waste streams/disposal concepts?) WP9 InCoManD (corrosion analogues) WP10 ANCHORS (clay analogues for more holistic understanding of performance) WP11 CLIMATE (climate related analogue development) WP12 RAMPEC/WP18 DITUSC (need to seek nuclide specific NAs and analogues for perturbed conditions) WP13 OPTI (closure material optimization would benefit from filling the NA gap – understanding of the uncertainties in long-term behaviour of materials) WP14 SUDOKU (surface disposal has not utilized NA yet) Potential interactions also with L'OPERA, SAREC.

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
Same processes considered from experimental and modelling point of view in other proposed WPs would benefit from collaboration with NATSTRAT to assure holistic understanding. These include at least R&D WP proposals 2,5,6,7 and StSt WP proposals 2 and 5.

CLIMATE: Safety-relevant impacts of climate change on multi-layer cover performance at (near-)surface disposal systems		
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Orange	

WP Objectives & added value for end users

The objective of this WP is to develop a validated, interoperable EU framework that quantifies climate-driven change (including extremes) in multi-layer cover performance at (near-)surface disposal sites and to build regulator-ready decision tools to incorporate climate change and extreme (rare but credible) events into safety cases. As such, it provides a holistic and safety-relevant approach to assess climate change effects on (near-)surface disposal systems.

WP main tasks

- Intensity-frequency mapping of climate extremes
- Modelling of climate-related processes
- Cross-climate zone benchmarking using experiments and natural analogues
- Develop decision/prioritization framework

Issues faced currently (if any?)

The proposal as such does not fully represent the 1st wave StSt CLIMATE recommendations (timing issue w.r.t. White Paper production). Feedback from the webinar makes it clear *that the scope needs to be expanded, and that the WP should take on a more generic character* with regard to climate-related processes and waste disposal facility types. More partners may become interested.

Current potentially interested partners

ANDRA, NES, SKB, Sogin	ASNR, EIMV, FTMC, NTW, SURO, VTT	Amphos21, AtkinsRealis, ENEA, GTK, Lancaster Univ., SCK CEN, UFZ, Remondis, Mines-Paris

Main SRA topics addressed by the WP (max 3, primary in bold)	**Topic 4.3.2: Climate change** Topic 7.3.2: Treatment of uncertainty Topic 3.4.1: EBS system
Main SRA themes related to the WP (max 3, primary in bold)	**Theme n°4: Geosphere** Theme n°7: Safety case Theme n°3: EBS
Main SRA drivers characterising the WP (max 3, primary in bold)	**Driver 1: Scientific Insight** Driver 2: Knowledge Management Driver 3: Societal Engagement

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
SUDOKU: Processes affecting long-term performance of engineered barriers in near-surface disposal facilities include climate change impacts (partially overlapping) **DITOCO**: Digital representation of physical systems can be applied to climate change impact on near-surface disposal facilities **ASTRA**: Impact of climate change on alternative RWM solutions

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
StStWP04: Natural analogues Analogues provide crucial benchmarking material for long-term evolution models **R&DWP06: Repository site flow and transport models** Understanding of (ground)water evolution, including composition and flow, relating to past and future events, such as climate change **R&DWP10: Site screening and site descriptive models** Uncertainties related to site characteristics, including possible geodynamics (and thus climate change)

Integral Multi-Criteria Optimisation for Repository Evaluation IMCORE		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Orange (identification of CT)	

WP Objectives & added value for end users

Develop and demonstrate a multi criteria optimisation (MCO) framework and digital tool that integrates safety case evidence, cost functions and environmental/social indicators, with uncertainty and robustness analysis.

How can MCO be structured so that safety case lines of argument, cost and environmental/societal factors are commensurable yet traceable under prevailing circumstances?

WP main tasks

T1 (PM) and T2 (KM)
T3 Conceptual framework & indicators -> develop indicators and establish traceability & change management links
T4 Development of the MCO digital tool -> MCO digital tool including robustness and uncertainties
T5 Demonstration by pilot applications/test cases -> demonstrator and document model interfaces to safety case tools
T6 Stakeholder engagement and prioritisation -> reflections, lessons and experiences, develop holistic guidance

Issues faced currently (if any?)

WP OPTI discussed internally which topic will be developed to a proposal. Feedback from outside is limited. It is difficult to form a coordination team, especially feedback form the WMO is limited.

Current potentially interested partners

WMO 4	TSO (incl. SC) 15	RE 5

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 5.2.2:…**Optimisation** Topic 7.2.2:…Information, data, and knowledge management Topic 1.5.2:…Options and concept selection
Main SRA themes related to the WP (max 3, primary in bold)	Theme n°X:…Disposal facility design and optimisation Theme n°X:…Safety Case Theme n°X:…National Programme Management
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: **Innovation for Optimisation** Driver 2: Tailored Solutions

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
WP OPTI, because the proposal is the consequence of the StSt WP ANCHORS and InCoManD, optimizations/modifications of existing SSC can be evaluated with the new framework WP XX, input/support for the development of a digital tool will be helpful

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
EBS proposal, the optimization of backfilling materials can be used as test case for the new framework

Self-Powered Monitoring Systems for Radioactive Waste Repositories		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users
Objective: to develop sustainable, cyber-resilient, self-powered monitoring systems that provide long-term surveillance of RWs, predisposal and repositories. Added value: reduce technological constraints on the implementation of monitoring programmes for disposal systems by providing new technology based on wireless transmission and alternative power supplies to replace conventional chemical batteries with self-power technologies (e.g. nuclear batteries and energy harvesting).

WP main tasks	Issues faced currently (if any?)
Task-1: AI, Data and Knowledge Management. Task-2: Sensor and Energy-Harvesting Task-3: Wireless and Power Delivery Task-4: System Integration and Demonstration Task-5: Dissemination	Attempts to merge with R&DWP3 have not been successful so far. The meeting with WMO and TSO representatives was very positive. Two TSOs will participate, and ANDRA is evaluating how they could contribute.

Current potentially interested partners		
WMO: ANDRA	TSO: FTMC, NGR Pallas	RE: Amphos21, UniPi, SCK CEN, TNO, BAM, SIIEG NASU

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 3.4.1: EBS system Topic 5.5.1: Baseline monitoring **Topic 5.5.2: Monitoring with regard to onsite investigation, construction and operations**
Main SRA themes related to the WP (max 3, primary in bold)	Theme n°2: Pre-disposal **Theme n°3: Engineered Barrier Systems** Theme n°5: Disposal facility design and optimisation
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: Innovation for Optimisation Driver 2: **Implementation Safety** Driver 3: Tailored Solutions

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
WP5 ICARUS: safe and reliable monitoring of radioactive wastes, since predisposal WP7 PREDIS: develop solutions (technologies) for future conditioning of waste

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
R&DWP3 (DEEPCHEM): monitor specific parameters, data monitoring of electrochemical variables and pH for corrosion monitoring

DEEP CHEM: **Detection and Evaluation of Electrochemical and pH Conditions for Corrosion and HEterogeneous Monitoring**		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users

The project aims to deliver a new generation of high-performance chemical sensors engineered specifically for the extreme conditions found in geological repositories for radioactive waste. Its first objective is to map the monitoring needs of both advanced and emerging waste-management programs and to conduct a critical, gap-focused review of current chemical sensing technologies. Built on this, the project will design and prototype rugged **in situ** sensors capable of tracking pH, redox potential, corrosion processes, and pivotal dissolved or reactive species

WP main tasks

Task 1: Review and Gap Analysis of Chemical Sensing Technologies
Task 2: Chemical sensors development
Task 3: Integrated Laboratory-Scale Sensor Testing
Task 4: Pilot Scenario Co-Creation and Sensor–Model Integration

Issues faced currently (if any?)

We have very limited time to conduct a discussion with all the organizations that wish to participate

Current potentially interested partners

~~WMOs: Andra, BGE,~~	~~TSOs: ASNR, VTT, NRG~~, EIMV	Res: in progress

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 2.3.2 : Evaluate potential for improving and optimising implementation phases with new technologies… Topic 5.2.1:Develop, adapt and/or buy the technology and systems required to be able to construct and then commission the facility … Topic 5.2.2:Perform a continuous balancing exercise with requirements and technical solutions to balance the risks among the different barriers
Main SRA themes related to the WP (max 3, primary in bold)	Theme n°5 : facility design and optimization Theme n°3: engineer barrier system Theme n°2: predisposal
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1:Tailored Solutions Driver 2: innovation & optimisation Driver 3:Scientific Insight

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?	Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
RAMPEC **InCoMand,** **DITUSC**	To be analysed

ECOFRAME EUROPEAN COMMON FRAMEWORK FOR OPERATIONAL SCIENTIFIC DATA IN RWM	X	StSt WP
		RD&D WP
WP CT evaluation of the progress of the template #2 preparation	Green	

WP Objectives & added value for end users

- ***Turns fragmented, project-specific data practices into a coherent, FAIR-compliant, societally anchored framework that improves safety-case robustness, speeds implementation, and sustains knowledge over the very long horizons of radioactive waste management.***
  - Data processing & FAIR model.
  - A database model for the community.
  - Civil society, humanities and social sciences, cognitive biases.
  - Data lifecycle & Traceability models.

WP main tasks	Issues faced currently (if any?)
Task 01: Project management Task 02: Knowledge Management Ambassador and social sciences engagement success Task 03: Development of a common framework for processing operational scientific data from its acquisition to its use in design and safety assessments Task 04: Data lifecycle and data validation, curation and preservation (including archiving) Task 05: From interpretation process to decision process: bridging the gap between research monitoring and operational monitoring	NA

Current potentially interested partners

ANDRA, SKB, BGE, SOGIN, ARAO, COVRA, NAGRA, ONDRAF, PURAM, NWS, NES	AGES, ASNR, EIMV, FTMC, GRS, MERIENCE, NTG, SSTC, VTT	CEPN, EGIS, GALSON SCIENCES, INGECID, SCK CEN, UNIPI

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 1.1.1.: National RWM Policy Topic 5.5.2.: Monitoring Programmes during different phases **Topic 7.2.2.: Information, Data and KM…**
Main SRA themes related to the WP (max 3, primary in bold)	Theme n°1: Programme Management **Theme n°4: Geoscience** Theme n°7: Safety Case
Main SRA drivers characterising the WP (max 3, primary in bold)	**Driver 1: Implementation Safety** Driver 2: Innovation for Optimisation Driver 3: Societal Engagement

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?

Several ongoing EURAD-2 WPs are developing collaborative unified platforms and/or databases, that could be considered as inputs for tasks 3 and 4 of ECOFRAME:

- RAMPEC
- HERMES
- DITOCO2030

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?

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 tasks 3 and 4 of ECOFRAME:

- DITOCO StSt WP (Next generation Digital Twins to support Optimisation, Construction and Operation of surface and subsurface radioactive waste management facilities) (RD&D)
- R&D WP1 - Intelligence (AI) / machine learning for analysis of site characterisation data and other large datasets (RD&D)

Some data produced by the following proposed EURAD-2 2nd wave WPs could be used for task 5 of ECOFRAME:

- R&D WP3 – Detection and Evaluation of Electrochemical and pH Conditions for Corrosion and HEterogeneous Monitoring
- R&D WP9 - Self-Powered Monitoring Systems for Radioactive Waste Repositories

JUSTIFICATION OF THE CONTINUATION OF DITOCO

- Technology Transfer: Apply proven Digital Twin capabilities from nuclear and high-tech industries to DGR development, enabling shared innovation across WMOs.
- Data-Centric Integration: Create a unified environment that consolidates all information, simulation outputs, and operational data.
- AI & Generative Design: Implement AI-assisted and generative techniques for optioneering, performance optimization, and predictive safety assessments.
- Automation & Interoperability: Advance process automation and ensure compatibility with existing tools, standards, and third-party data sources.
- Knowledge Sharing & Alignment: Promote shared methodologies and interoperable frameworks to support convergence and standardization among European WMOs.
- Societal & Regulatory Value: Enhance transparency and communication through AR/VR visualization to strengthen public understanding and safety assurance.

TASKS OF THE R&D DITOCO

- Definition of Digital Twin Requirements
- Development of Parametric Models and Data Integration Framework
- Benchmarking and Selection of Digital Twin Platform
- Implement AI-driven / Generative Design Case Study
- Development of interface for Visualization and Stakeholder Engagement
- Reporting and Roadmap and Business Case
- Assessing the distortion caused by modeling a complex system

WP Conditioning		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users

- Advancing radioactive waste conditioning by developing and demonstrating AAM/geopolymer-based matrices that are robust, versatile, and sustainable, offering a pathway to safer, more efficient waste management.
- Solutions for wide range problematic waste streams, that remain incompatible with conventional cement-based.
- Handling uncertainty and a wide range of radioactive wastes, and facilitating application and implementation at industrial scale (increase TLR).

WP main tasks	Issues faced currently (if any?)
1. Waste inventory, identification of waste streams compatible with AAMs 2. Development of robust conditioning matrices for defined waste streams 3. Robustness testing for variability in waste and precursor prosperities 4. Establishment of standardized protocols 5. Modeling long-term performance under relevant disposal conditions. 6. Sustainability – LCA/LCC.	No

Current potentially interested partners

WMOs (2): ENRESA, ANDRA (to be confirmed)	TSOs (4): VTT, EIMV, Isotopech, CIEMAT	REs (15): UAM, INCT, RATEN, PSI, KhPI, Tractebel, KIPT, HUN-REN, UJV, Polimi, HZDR, SCK CEN, UAM, CSIC, EDF R&D, UniPi

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 2.1.1: Inventory Topic 2.1.2: WAC **Topic 2.2.3: Conditioning**
Main SRA themes related to the WP (max 3, primary in bold)	**Theme n°2: Pre-disposal**
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: **Innovation for Optimisation** Driver 2: Tailored Solutions Driver 3: Scientific Insight

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
ICARUS – waste and wasteform characterization STREAM – wasteform formulation development (AAM) LOPERA – durability testing protocols

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
No

Assessment of the Evolution and Safety of Bituminous Radioactive Waste (SAFEBIT)		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Orange	

WP Objectives & added value for end users

Evaluate BWPs behavior and safety under transport/storage/disposal conditions by studying thermal reactivity, gas generation, swelling, and leaching mechanisms by combining existing knowledge, conducting R&D, modeling key mechanisms, and providing safety analysis basis.

WP main tasks

- Compile and harmonise data from Member States on the characteristics, conditioning, storage practices, and management strategies of bituminized waste.
- Carry out experimental R&D to clarify the mechanisms governing thermal reactivity, gas generation, and the swelling and leaching behaviour of bituminized waste.
- Develop mechanistic and scenario-based models, from fundamental physic-chemical processes to disposal-cell scale, to evaluate the behaviour of bituminized waste packages under both normal and accidental conditions.

Issues faced currently (if any?)

It is encouraging to see that all partners agree on the importance of the SAFEBIT WP.
Previous EURATOM projects (EURAD-1, PREDIS, CHANCE) identified key challenges related to BWPs management. However, key challenges remain unsolved, and several safety questions are still open.

Current potentially interested partners

SKB	ASNR, FTMC, SSTC NRS	UJV Rez, Amphos 21, LEI, KIT-INE, SCK CEN, POLIMI

Main SRA topics addressed by the WP (max 3, primary in bold)	• R&D: thermal reactivity, gas generation, swelling, leaching. • Modeling the behavior of BWPs, from fundamental physicochemical processes to the disposal-cell scale, to assess their performance under both normal and accidental conditions.
Main SRA themes related to the WP (max 3, primary in bold)	• Pre-disposal (Theme 2)•2.2.3Conditioning • Engineered Barrier Systems (Theme 3)•3.1.4 Other wasteforms • Design•5.4.2 Normal operations safety
Main SRA drivers characterising the WP (max 3, primary in bold)	• Driver 1: Implementation safety • Driver 2: Tailored solutions • Driver 3: Knowledge management

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
L'OPERA ASTRA ? WP 02 - KM

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
Analogs ? MOGARE ?

GENESIS: Guidance for European (TE)NORM & DU enabled strategies for integrated stewardship	X	StSt WP
		RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users

Objective: To establish a consolidated European strategy for the sustainable management of (TE)NORM and DU waste by defining clear pathways for reuse and disposal and specifying the requirements for the necessary future R&D and knowledge bases. **Added Value for End Users**: Our primary added value is the creation of a top-down, multi-criteria decision-making framework. This will provide a clear, harmonised basis to reduce uncertainty, strengthen regulatory compliance, and enable a strategic shift from a waste-as-a-liability model to a proactive resource recovery perspective.

WP main tasks

This study is structured into frameworks that follow the logical waste management lifecycle. Societal engagement is integrated into each task.

- Task 3: (TE) NORM Characterisation and Regulatory Landscape Assessment (15%)
- Task 4: (TE) NORM resource recovery and implementation of circular economy approach (35%).
- Task 5: (TE) NORM long-term storage and final disposal strategy (25%)
- Task 6 Depleted Uranium (DU) Strategic Framework (15%)

Issues faced currently (if any?)

There are no issues currently.

Current potentially interested partners

WMOs: NES, SOGIN, ANDRA, ENRESA	TSOs: AGES, EIMV, NRG PALLAS, NTW (EU CS), SSTC NRS, SURO, VTT, ASNR, CIEMAT, FTMC	REs: Amphos 21, CEPN, Egis, Galson Sciences Ltd, HZDR, IST-ID, Remondis, SIIEG NASU, UFZ, University of Tartu, CNRS, Lancaster University, LEI, SCK CEN, ÚJV Řež, a. s, POLIMI

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 1.5.1: **Integrated waste management routes and strategic options** Topic 2.2.1: Characterisation Topic 5.2.2: Optimisation
Main SRA themes related to the WP (max 3, primary in bold)	Theme 2: **Pre-disposal activities** Theme 7: Safety Analysis, Performance assessment, and Safety Case development
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: **Tailored Solutions** Driver 2: Knowledge Management Driver 3: Societal Engagement

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
This StSt is designed as the direct, strategic successor to the essential information-gathering work conducted in previous and ongoing European projects. ASTRA WP is a key input; where ASTRA diagnosed the challenges and fragmentation of NORM management, the GENESIS study is designed to be the next logical step – creating the strategic framework required to address those needs. Our framework is explicitly informed by the findings of ASTRA's sub-task 5.3 (summarised in Milestone 61), which successfully documented the fragmented landscape of (TE)NORM & DU management across 18 countries.

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?
There is a strong potential for synergy with the proposed topic on "Toxic substances /chemicals." The 'Toxic Wastes' WP is a horizontal review of a specific problem across all waste types. The GENESIS WP is a vertical strategic framework for all management challenges for a specific waste type (TE)NORM/DU). We are a key potential "customer" for their work, and (TE)NORM is good "case study" for them. Coordination will be essential.

TOxic Substances & Chemicals	X	StSt WP
		RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Green	

WP Objectives & added value for end users
Analyse the current knowledge, and identify relevant gaps, on toxic substances and chemicals in the areas of their inventories, sources terms, their behaviour in engineered barriers and the geosphere, and their interactions with the biosphere, to propose an evidence-based approach for integrating non-radiological toxicity into the safety assessment of the repositories

WP main tasks
Task 3: Review of knowledge about the determination of the source term of toxic chemicals from different wastes Task 4: Review of knowledge about the toxicity of substances in the biosphere (impact on human and non-human biota) Task 5: Review of knowledge about the behaviour of toxic substances in the geosphere and engineered materials

Current potentially interested partners		
WMO: Andra, ARAO, BGE, ENRESA, NWS, Nagra, NES, Ondraf/Niras, PURAM, SOGIN, SURAO	TSOs: AGES, ASNR, CIEMAT, SSTC, NRS	Res: AMPHOS21, AtkinsRealis, CEPN, GTK, HZDR, KIT, LEI, POLIMI, PSI, SCK-CEN, UFZ

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 2.1.1: Evaluate waste inventory from generators and existing storage, accounting for future waste generation and evolution Topic 2.1.2 Identify parameters and metrics for waste acceptance criteria through whole life cycle (Waste Acceptance Criteria) Topice1.2.4 Implement a system of appropriate oversight, a management system, regulatory inspections, documentation and reporting obligations for radioactive waste and spent fuel management activities (Waste management System)
Main SRA themes related to the WP (max 3, primary in bold)	Theme n°2: Pre-disposal Theme n°4: Geoscience Theme n°7: **Safety Case**
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: **Implementation Safety** Driver 2: Scientific Insight Driver 3: Societal Engagement

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?
DISTUC – In Task 4 of this proposal, some interactions could occur, especially concerning the behavior of toxic chemicals and the review of geochemical data related to these substances. **ICARUS** – Interaction with WP3 regarding the chemical characterization of LLW/ILW waste.

Waste Management for SMRs and Future Fuels (FORSAFF)		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	orange	

WP Objectives & added value for end users

Objective: Perform R&D activities to meet SMR/AMR waste management needs aiding SMR/AMR deployment.

Anticipated Added Value:

- Develop (more) comprehensive understanding of SMR/AMR waste streams.
- Bridge gaps between SMR/AMR designs and waste management.
- Provide evidence-based guidance to support waste management decisions and licensing.
- Create collaborations with EURAD-2 activities and other initiatives, e.g., EURATOM, SMR Industrial Alliance, IAEA, NEA, as limited coordination risks duplication of efforts.
- Strengthen interactions between technology developers and end-users.

WP main tasks (work in progress)

- Determine RN inventories in SMR/AMR SF under various burnups, enrichments and power densities to include impurity and structural material effects (expand numerical tools to SMR/AMR designs).
- Assess disposability of SMR/AMR waste in existing or proposed facility concepts (to include DBD).
- Predisposal R&D: treatment of AMR waste streams (sodium-based), decontamination of structural AMR components, recycling of AMR waste streams
- Transversal aspects: research on public trust and transparency, engagement framework and development of methodologies for scenarios assessments.

Issues faced currently (if any?)

The main issue faced in developing this R&D WP is organizing and prioritizing the wide range of proposed topics.

Current potentially interested partners

2 WMOs	9 TSOs	14 REs

Main SRA topics addressed by the WP (max 3, primary in bold)	Topic 1.5.1 - Integrated waste management routes and strategic options Topic 2.1.1 - Inventory Topic 3.1.1 - SNF
Main SRA themes related to the WP (max 3, primary in bold)	Theme 1: National Programme ManagementDesign Theme 2: Predisposal Theme 3:EBS
Main SRA drivers characterising the WP (max 3, primary in bold)	Tailored Solutions Scientific Insight Implementation Safety

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?

- WP6 Sustainable treatment and immobilisation of challenging wastes – if expected AMR wastes could be included.
- WP7 Waste matrices: long term performance – if expected AMR wastes could be included.
- WP9 Innovative containers/canisters materials – if expected AMR wastes could be included.

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?

- ASTRA R&DWP – disposability of SMR/AMR wastes using DBD
- R&DWP8 Development of robust and versatile conditioning matrices for challenging waste streams – if expected AMR wastes could be included (and no overlap with WP6)
- R&DWP10 Developing site screening strategies and procedures for integrated site descriptive models – if any connection to DBD siting could be included.

ASTRA RD		StSt WP
	X	RD&D WP
WP CT evaluation of the progress of the template #2 preparation (green: on track, orange: issues to be solved but still feasible, red: template #2 will not be ready).	Orange	

WP Objectives & added value for end users

The objective: Initiate research on alternative RWM topics identified from ASTRA Strategic Study with specific emphasis on topics urgent for SIMS
The expected added-value:

- Bridges knowledge gaps between SIMS and LIMS
- Advances safety assessment for deep borehole disposal
- Helps further the circular economy objective by exploring alternative waste management strategies for TENORM and DU
- Demonstrates integrated knowledge management systems
- Supports end-of-life decision-making for storage facilities and waste packages
- First realisation of a SIMS-LIMS cooperation demonstrator that includes all colleges and CS

WP main tasks

Task 1: Management/coordination of WP
Task 2: KM
- Live Discussion Forum
- Setup of a demonstrator partnership of SIMS and LIMS partners

Task 3: Long-Term storage
- Setup of a decision support system for end-of-life management of storage facilities and waste packages
- Predictive modelling for long-term package and barrier evolution
- Setup of a knowledge exchange for considerations of legacy waste management

Task 4: Deep Borehole Disposal
- Develop a generic Safety Assessment for operational safety (focus on waste emplacement)
- Improving technologies for characterizing deep geological environments (including deep measurement of pore fluids and monitoring) and application of this data in safety assessments for DBD
- Guidance Framework to establish mutual trust with CS

Task 5: (TE)NORM and DU R&D
- Safety case Development and Post closure assessment
- Reuse and Recycling – Valorization and DU reuse in disposal
- Waste Management options (To be covered under future LDFs)

Issues faced currently (if any?)

- Overlap with GENESIS.
- Ensure ongoing work in other areas is not repeated.
- Large mixture of topics is far from ideal

Current potentially interested partners

ANDRA, NES, Sogin S.p.A, COVRA	EIMV, FTMC, NRG PALLAS, NTW, SSTC NRS, SURO	AtkinsRealis, Egis, Česk vysoké učení v Praze, Geological Survey of Finland, Galson Sci Ltd, IST-ID, SCK CEN

Main SRA topics addressed by the WP (max 3, primary in bold)	- 1.1.1 (National RWM policy) - 1.5.1 (Integrated waste management routes and strategic options) - 2.2.1 (Characterisation) - 2.2.4 (Storage) - 5.2.2 (Optimisation)
Main SRA themes related to the WP (max 3, primary in bold)	Theme n1: Programme Management Theme n2: Pre-disposal Theme n5: Disposal facility design and optimization Theme n7: Safety case
Main SRA drivers characterising the WP (max 3, primary in bold)	Driver 1: Tailored Solutions Driver 2: Societal Engagement Driver 3: Knowledge Management

Links and possible interactions between your WP and ongoing EURAD-2 WPs (if any)?

WP7 L'OPERA - long-term performance of waste matrices
WP6 STREAM - optimisation of predisposal management of problematic waste
WP9 InCoManD - Innovative and new container/canister materials under disposal fields conditions: manufacturing feasibility and improved durability
WP10 ANCHORS - Hydraulic mechanical chemical evolution of bentonite for barriers optimization

Links and possible interactions between your WP and other proposed EURAD-2 2nd wave WPs (if any)?

GENESIS – Strategic study on (TE)NORM and DU
R&DWP9 – Self-Powered Monitoring Systems for Radioactive Waste Repositories
R&DWP3 – Detection and Evaluation of Electrochemical and pH Conditions for Corrosion and HEterogeneous Monitoring

PROPOSAL FOR SECOND WAVE:
EXPERIMENTAL INVESTIGATION OF NUCLIDE COMPOSITION IN SF FOR POST-CLOSURE CRITICALITY SAFETY
CONTINUATION OF WP17

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SCOPE, OBJECTIVE AND ADDED VALUES

Objective is to expand and improve the experimental basis

Due to short timeframe not possible to define actual experiments or investigations
Meet the goal by developing methodologies to 1) include other measurements and 2) improve current methodologies.

Subtask 6.3: Design a prioritised experimental programme to address the most significant data needs identified

Continue gap analysis in WP17 task 6

Discuss with possible interested parties and research institutes

Subtask 6.4: Method development targeting other measurements

Investigate if and how other databases could be used

Identifying and attaching non-destructive measurements

Subtask 6.5: Development to improve current methodologies

Improve selection of experiments

Investigate effects from neutron data libraries on long-term analysis

Meet identified needs	Combine disciplines and find enhancements	Cooperation between institutes	Understand weaknesses
• Large needs for more validation data. • For high-BU, different fuel types. Necessary to agree on details.	• Continue previous work in EURAD and at institutions in Europe. • Open for use of more of available data.	• Cooperation between organisations with similar research agendas.	• Current methods not tailored for long time-periods nor large variety of nuclides. • Reduce uncertainties.