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Establishing the Priorities: Views of the Research Entities

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Content of the Presentation

1. Starting point: the role of research entities
2. The guiding vision of RE(research entities)
3. Mission statement
4. How to ensure inclusiveness
5. Current status of SRA-RE(strategic research agenda)
6. Participation in joint “Horizontal activities”
7. Conclusions

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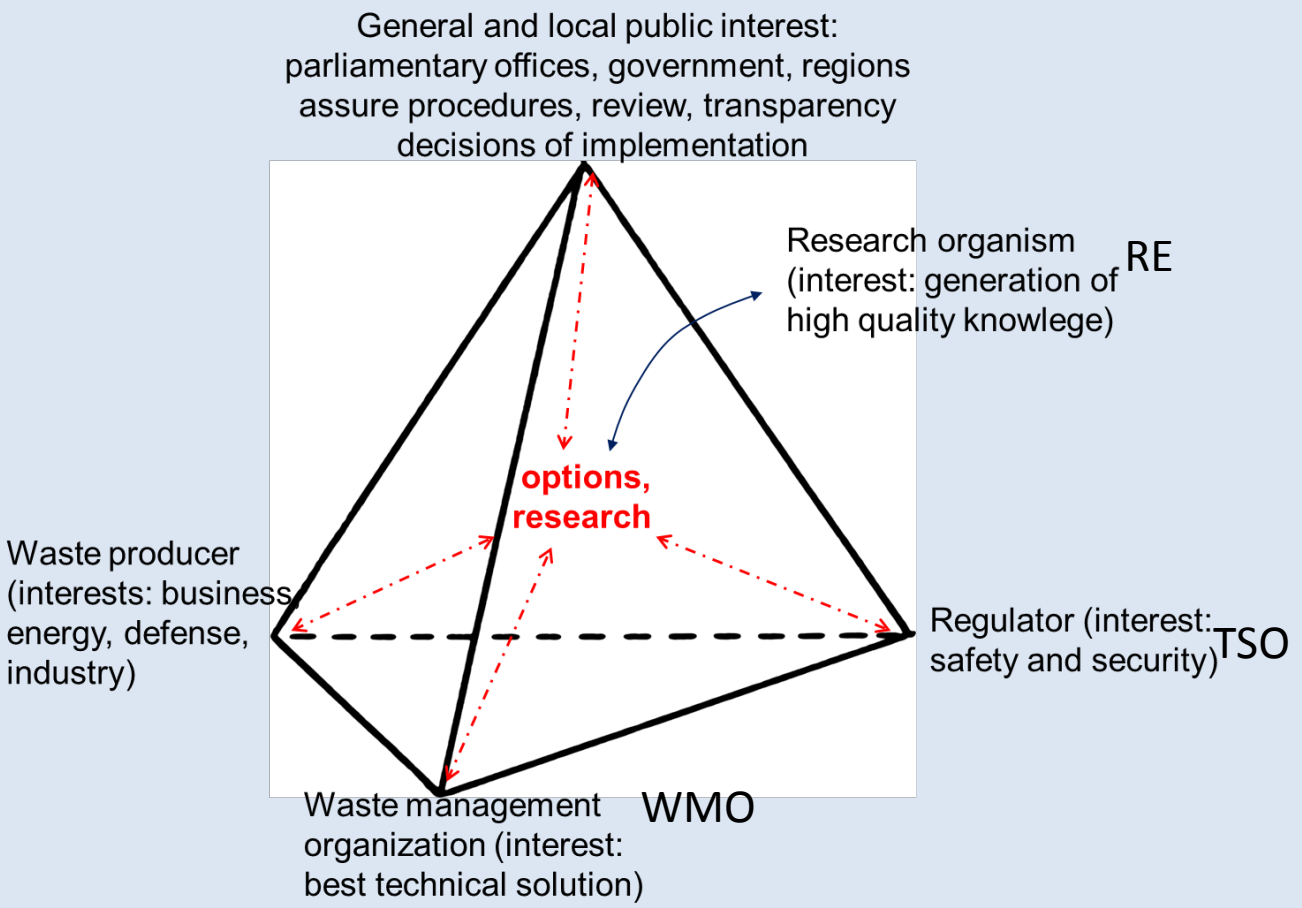
The role of research entities

A schematic vision on separation and role of actors



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Until now, the vision of RE is often forged by work for WMO and TSO, but…

- *Research is often driven by needs of parameters (Kd…) without being at the forefront of science*
- *Research is rarely guided by a common vision of the needs of developing a scientific safety case but by open questions in specific knowledge fields.*
- *Each research entity understands a certain aspect of this problem to a certain degree of scientific depth without having the resources and the understanding to address the multiscale coupled complex overall system.*
- ***The research objectives of RE go beyond the implementation or safety oriented needs of WMOs and TSOs***

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Guiding vision of research entities

- Scientific understanding of safety relevant issues must remain credible, verifiable, shared by large scientific communities, open to civil society stakeholders at any given time **in the hundred year lasting process**
  - ✓ From the first generic studies to site investigation,
  - ✓ From planning to licensing, construction, operation and monitoring
  - ✓ In Environmental Impact Assesment (EIA),
  - ✓ In Safety and Risk Assesments (SRAs),
  - ✓ Until closure of a geological repository for radioactive waste.
- This goal can only be achieved
  - ✓ If research on geological disposal continues to keep up with the evolution of worldwide leading edge scientific knowledge (example: 30 yr ago: 1D, today 3D, in future full integration of chemical couplings in the safety case….)
  - ✓ If RE have an overall vision on research needs in geological disposal

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MISSION

- The goal of research entities in the European joint programming is to develop an **integrated leading edge scientific understanding oriented on the long term for all concepts related to safe and environmentally sound disposal** of long lived intermediate and high radioactive waste and spent nuclear fuel in repositories within Europe.
- European Joint Programming must therefore aim to join advanced and less advanced European R&D programs for excellent research
  - ✓ on basic components and generic processes,
  - ✓ oriented towards complex systems understanding of long term repository evolution and safety.

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Why do European research entities need a strategic research agenda?

- Building and guaranteeing confidence in safety assessments and underlying scientific assumptions for many decades to come
  - ✓ Example: first HLW glass will be disposed in Europe not before 50 yr from now: how to assure that our scientific justification will keep up with evolving science
- Reduce over-conservative bounding conditions in safety assessment in view of progressive scientific understanding of multi-scale complex systems behaviour
- Joint Programming as a tool for **Building a European knowledge platform on waste disposal**
- Joint Programming as a tool for structured, long-term R&D commitment

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Towards a Strategic Research Agenda (SRA)

- Problems to be managed:
  - ✓ Large variability in academic research on waste disposal in various European countries
  - ✓ The less advanced programs often only have limited access to advanced characterization techniques, research infrastructure and overall systems understanding
  - ✓ Financial constraints: in-kind contribution, infrastructure…

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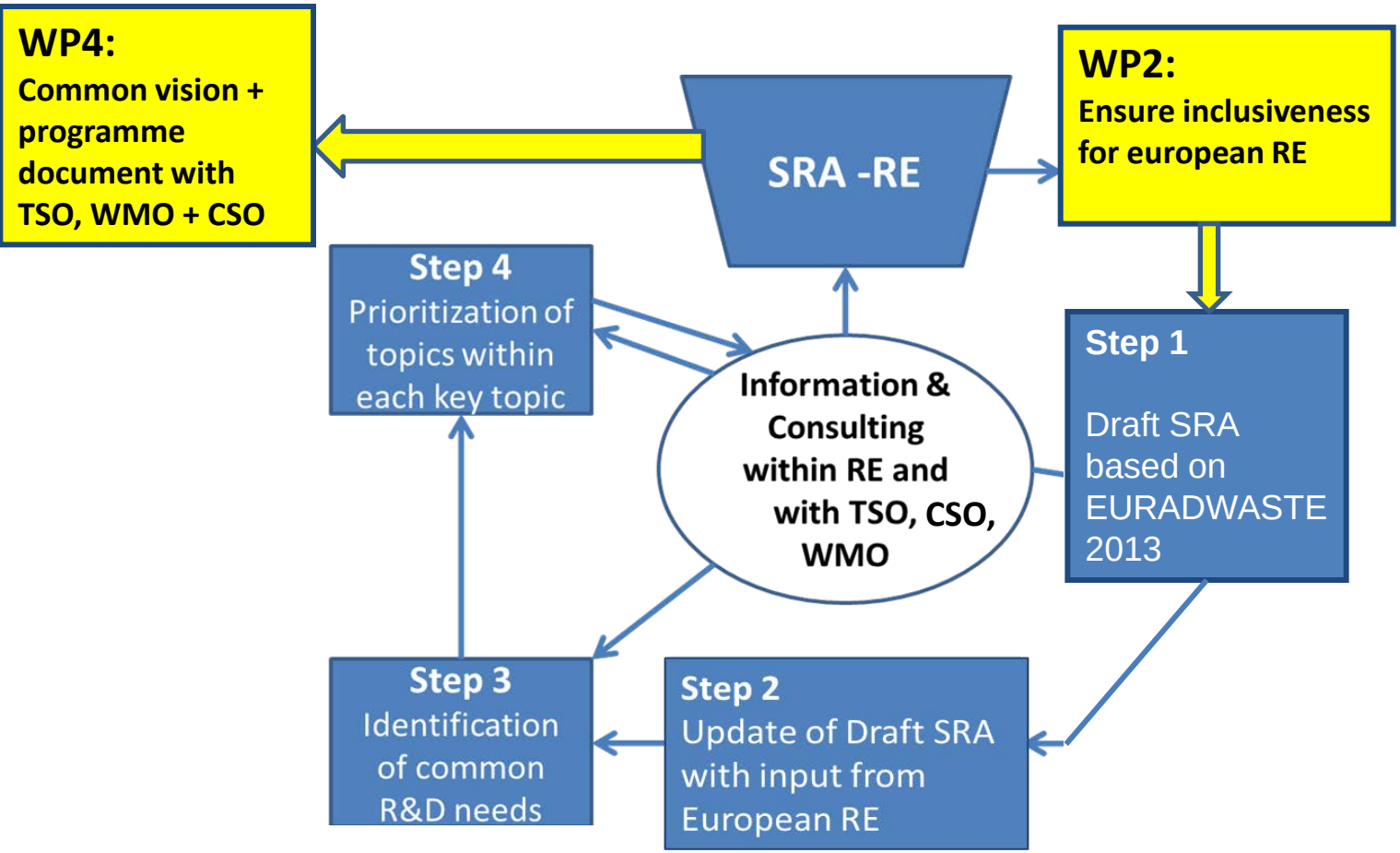
Procedure for development a SRA in WP3



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Status in the development of an SRA

WP2: Ensure inclusiveness

- Identification by the EURATOM national contact points of 45 potential mandated research actors were identified amongst the 28 (+ Switzerland) EU countries. Four countries have not identified a research entity (Latvia, Ireland, Malta and Sweden).
- The 22 research entities from 13 countries in **working group**, others have shown interest without participating: ENRESA, NNL…

WP3: build SRA

- Preparation of a draft document for vison and SRA in June 2015
- Preparation of document for SRA – RE in 4 meetings
- Since November 2015: identification of priorities and first projects
  - ✓ Discerning between Generic/ Specific/ Networking/ Review/ Think-tank projects
  - ✓ Considering individual processes, their couplings and up-scalings
  - ✓ In experiment, model and field work

WP4: towards a joint program document

- Identify subjects and priorities which can be put in common

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JOPRAD RE Working Group

Organisation	*Country*
CNRS, CEA, IMT, INIRIS, UPMC, U-Lorraine	France
CTU, UJV-REZ	Czech Republic
SCK.CEN	Belgium
HGF (Jülich, Karlsruhe, Dresden)	Germany
ENEA, INFN	Italie
LEI	Lithuania
U Delft/TNO	Netherlands
RATEN/INR	Romania
TU Sofia	Bulgaria
ITU	JRC
PSI	Switzerland
IST	Portugal
Geo ZS	Slovenia

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JOPRAD RE Working Group

- The WG includes a representation of **both advanced and less advanced programmes**
- Several RE have strong long term research programs of their own
- Others define their research program primary by the needs of WMO or TSO
- Some RE have access to advanced research infrastructure: hot laboratories, advanced light sources, supercomputing facilities,…
- Only the largest RE have an overall vision on all the various aspects of geological disposal

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ELEMENTS OF THE SRA-RE

- Integration of scientific understanding in the safety case and in assessment of its uncertainties
- Crosscutting ill and well defined processes
  - ✓ impact on radionuclide migration by colloids, organic matter, microorganism
  - ✓ incorporation of radionuclides in solids, considering thermodynamics, speciation and strong sorption
- Upscaling and complex THMC couplings, including reactive transport
- Work on waste forms, source terms, characterisation and integral HLW nearfield experiments
- The long term THMCB(R) performances of near field rock, EDZ, bentonites, seals and plugs
- Geotechnical studies on bentonite barriers (resaturation…)
- Transformations at interfaces of various materials
- Production and fate of gases and the understanding of resaturation of void spaces
- Geopolymers and cement systems
- Monitoring science: operational phase, radiological, criticality, leakage, redox, sensors, long term stability, …
- Social science studies: ethical framework, expectations of citizens in safety…

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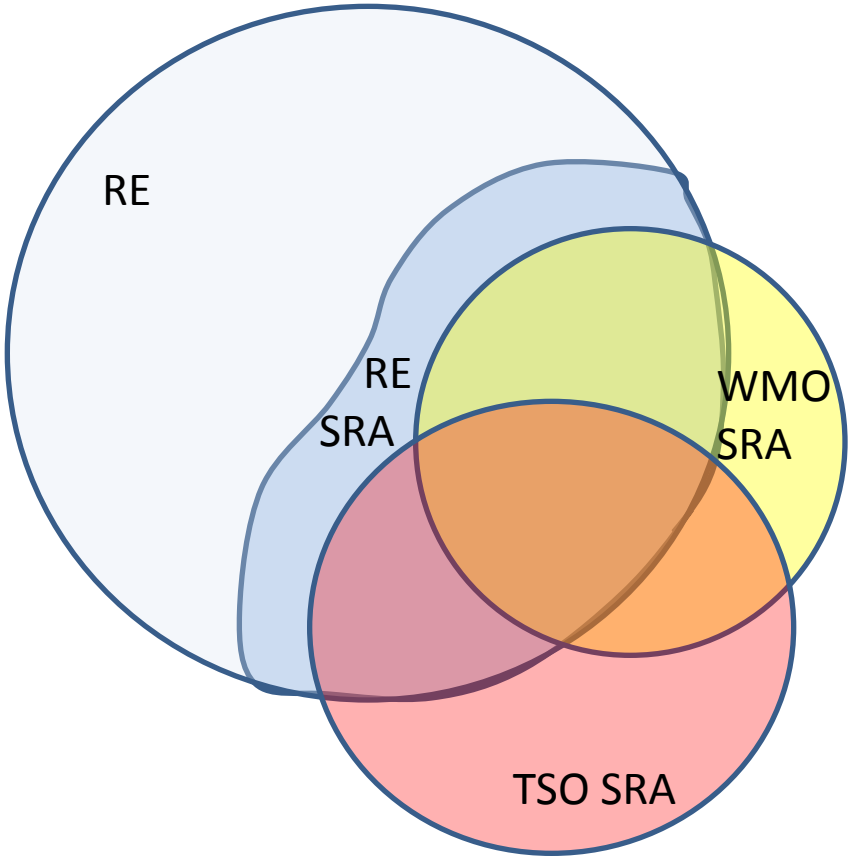
Towards creating a joint program in WP4



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RE will participe in Joint Horizontal Activities

- ✓ State-of-Knowledge activities (WIKI based?)
- ✓ Training activities
- ✓ Guidance & strategic studies
- ✓ Access to research infrastructure
- ✓ Think-tank activities

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Conclusions: RE in Joint R&D Activities

- 22 European research entities participated in working group
- RE provide services to WMO and TSO
  - This will continue but it is considered part of the research contribution of WMO and TSO
- Contribution of research by RE is needed:
  - ✓ To maintain excellence as base of scientific credibility of repository projects, licensing steps and safety evaluation
  - ✓ To provide a prospective and evolutionary knowledge base, whose scientific quality can be tested by peer review, impact factors…
  - ✓ To carry a long term vision (multi decennial) on research needs in nuclear waste disposal
- It was found that there is generally **no restriction on the topics** that can be shared among all actors

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