SITEX view on development of TSO´s RD&D programme for providing independent expertise

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Objectives

SITEX = SUSTAINABLE NETWORK FOR INDEPENDENT TECHNICAL EXPERTISE FOR RADIOACTIVE WASTE DISPOSAL

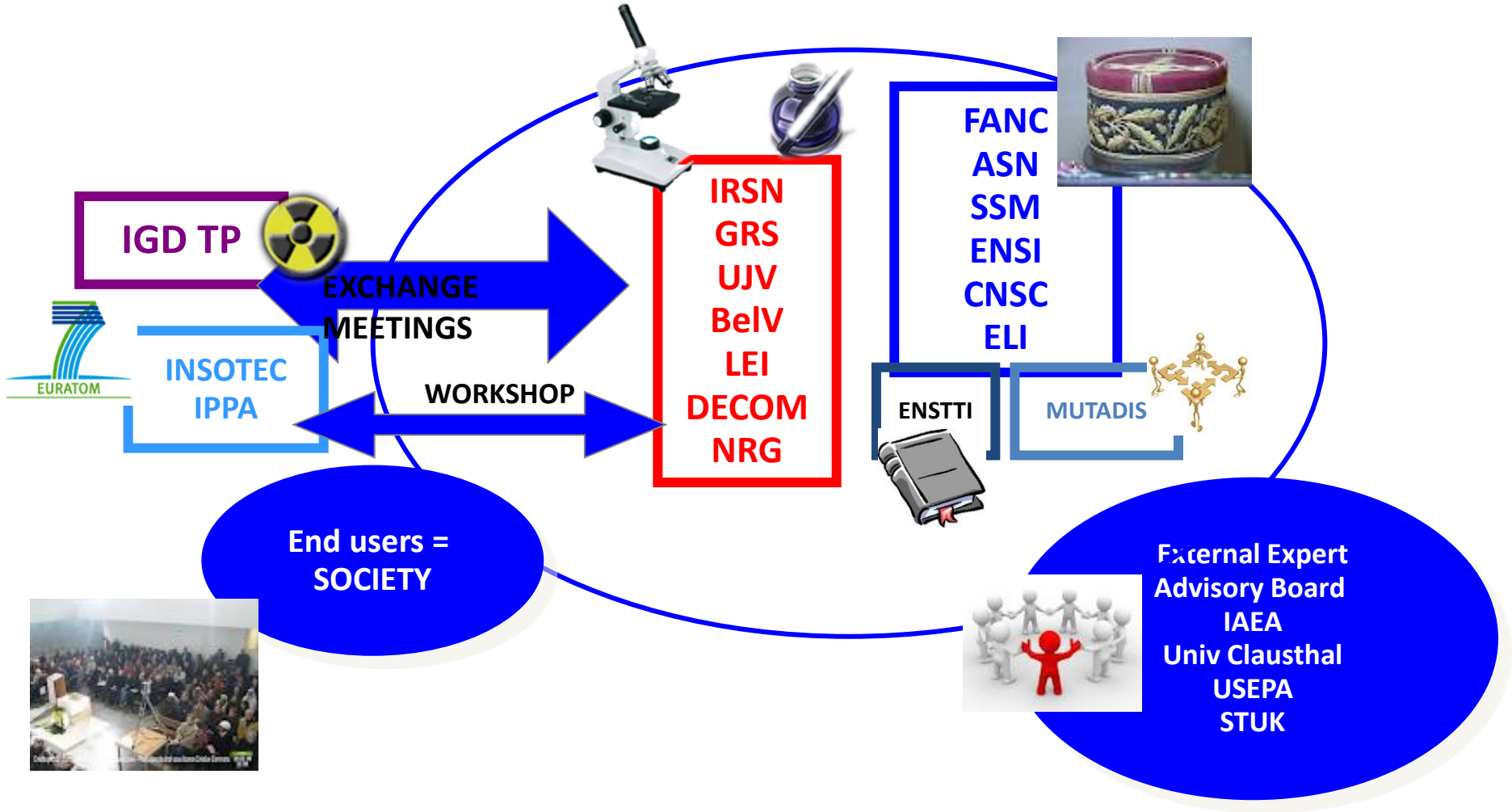
OBJECTIVES OF THE PROJECT

- ✓ establishing the conditions required for developing a sustainable network of experts from various horizons (authorities, TSOs, academic organisations, civil society…) capable of developing and coordinating the technical expertise that is required from the stakeholders in charge of delivering opinion, independently from the waste management organisations (WMOs), on the safety of geological disposals

"developing independent scientific capabilities of experts bodies"

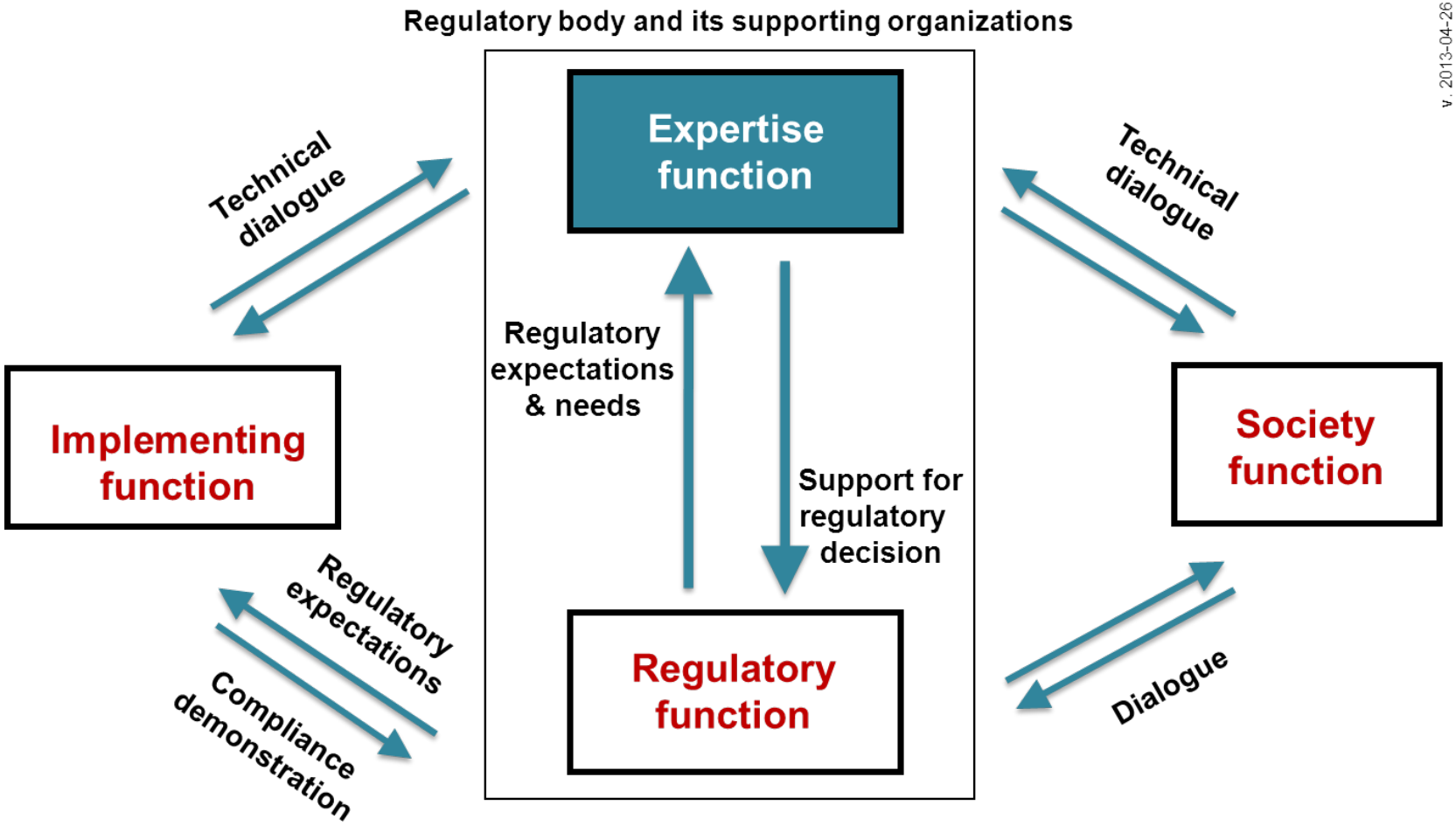
- ✓ Coordinated Action; December 2011 – December 2013 (24 M)
- ✓ http://sitexproject.eu/

SITEX cartography



15 organisations representing technical safety organisations (TSOs) and safety authorities, as well as civil society outreach specialists involved in the “regulatory” review process of geological disposals for radioactive waste.

Regulatory body and its supporting organizations



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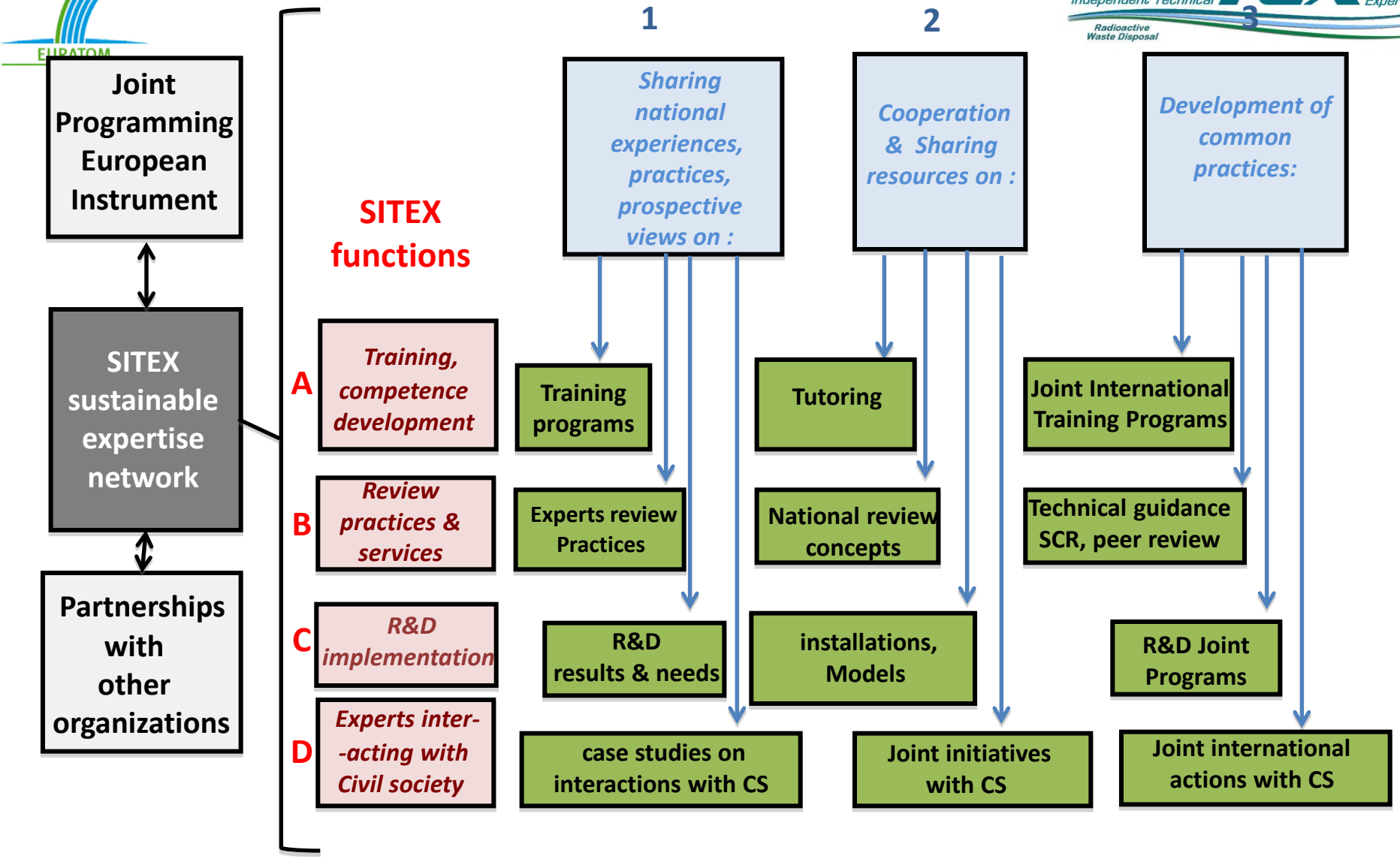
Opportunities of interactions offered by SITEX



Independent expertise function

- - required by IAEA SSR-5 (..*one of governmental responsibilities… to ensure that necessary scientific and technical expertise remain available both for operator and for the support of independent regulatory reviews and other national review functions* – potential TSO role).

The assessment of the scientific and technical issues, developed by the WMOs, requires specific skills from the assessor in order to evaluate whether they allow compliance with the safety requirements issued by the regulator.

Missions of the future expertise function network

4 major axis are further investigated within SITEX:

1. The needs for **mutual understanding between regulatory bodies, TSOs and WMOs** on (i) the regulatory expectations at decision endpoints and (ii) how the scientific and technical elements carried out by the WMOs comply with these expectations.

2. the definition of **TSO's R&D program** that would ensure independent scientific and technical capabilities for reviewing the Safety Case and assessing the scientific arguments provided by WMOs.

Missions of the future expertise function network 2

3. The needs in **guidance development** for harmonising the technical review method and in dedicated training and tutoring for spreading the expertise function culture and practices;

4. The interaction with the **civil society** involved in the decision making process, in a manner more integrated than only through communication or dissemination.

SITEX WP3 Definition of TSO´s R&D program

- **To set up the conditions for developing independent scientific capabilities of experts bodies (TSOs and other experts) for supporting the review of the Safety Cases by**

defining R&D program and priorities, seeking for possible joined research activities in order to foster common understanding of technical key points for safety and avoiding undue duplication where possible.

Key safety issues and the associated R&D actions

Based on national experience, SITEX has developed a common view on the key safety issues and the associated R&D actions

- **3 major axes of R&D activities:**
  - **Quality of data:** assessment of characterization methods and tools/devices, domain of validity and adequacy
  - **Understanding of complex processes** occuring in the GD environment, where few consensus/knowledge exists within the scientific community and that require independant views
  - **Verification of extent and intensity of processes** (near field/process level and far field/integrated level), uncertainty and sensitivity, robustness and margins

Link toward SRA (Jon Martin presentation)

- Derived by key safety issues;
- Similar to operator's research area because based on critical safety issues, but with a different range and scope (more targeted, limited resources, not for qualification purposes) interacting with IGD-TP;
- Capacity to cover all the key points of repository's project;

Compliance of SITEX WP3 result and IGD TP SRA in R&D

Key Topic 1 Safety case	
	Topic 1 Increase confidence in, and testing and further refinement of the tools Topic 3 Increase confidence in and further refinement of methods to make sensitivity and uncertainty analyses
Key topic 2 Waste form and their behaviour	
Key Topic 3a Technical feasibility and long-term performance of repository components. **Importance for licensing, description and timing of work (a) – technical feasibility**	
Key Topic 3b Technical feasibility and long-term performance of repository components. **Importance for licensing, description and timing of work - long-term performance**	
▪ **Key Topic 5: Safety of construction and operations**	
▪ **Key Topic 6: Monitoring**	

Link toward SRA (Jon Martin presentaion)

Key issues	Topics		Sub-topics of interest	Priority (H, M, L)	R&D actions by TSO
Quality of data	Data accuracy and relevance (methodology)		- Waste forms - Canister & overpack - EBS (geomaterials) - Geosphere	H H H H	A1
	Data representativeness (upscaling and extrapolation)		- Waste forms - Canister & overpack - EBS (geomaterials) - Geosphere	M M M H	A2
Understanding of complex processes	**Processes on which rest the performance of individual components**		**- Waste forms - Canister & overpack - EBS (geomaterials) - Geosphere**	**H H H H**	**B1, B2, B3, B4**
	Processes resulting from the perturbation of the GD system	Internal perturbations (from interactions between components)	- Waste/host-rock and waste/EBS interactions - EBS/host-rock interactions - Effects due to DGR operational transients	M L L	B5, B6, B7
		External perturbations	- Marine transgression - Permafrost/glaciations - Fresh water intrusion - Erosion - Seismicity - Human activities (gas storage and extraction, geothermal energy, …)	M M M L L L	B8

Proposed R&D actions (WP3)

A1 To assess the accuracy and the relevance of methods available for the evaluation of data necessary for long-term and operational safety demonstrations.

A2 To assess if the data evaluated at small scale (in time and space) are representative of the in situ repository conditions and future evolution.

B1 To develop independent understanding in the processes on which rest the performances of the waste form.

B2 To develop independent understanding in the processes on which rest the performances of the waste canister and its overpack.

B3 To develop independent understanding in the processes on which rest the performances of the Engineered Barrier System (EBS).

B4 To develop independent understanding in the processes on which rest the performances of the Geosphere.

B5 To develop independent understanding in the internal perturbations of the disposal system resulting from the waste/host-rock and waste/EBS interactions.

B6 To develop independent understanding in the internal perturbations of the disposal

B7 To develop independent understanding in the internal perturbations of the disposal system resulting from potential operational transients.

B8 To develop independent understanding in the potential external perturbations of the disposal system.

C1 To evaluate the reliability of methodologies followed by the operators for the assessment calculations.

C2 To develop independent models in order to evaluate the extent, the intensity and the radiological impact of processes resulting from internal and external perturbations of the repository.

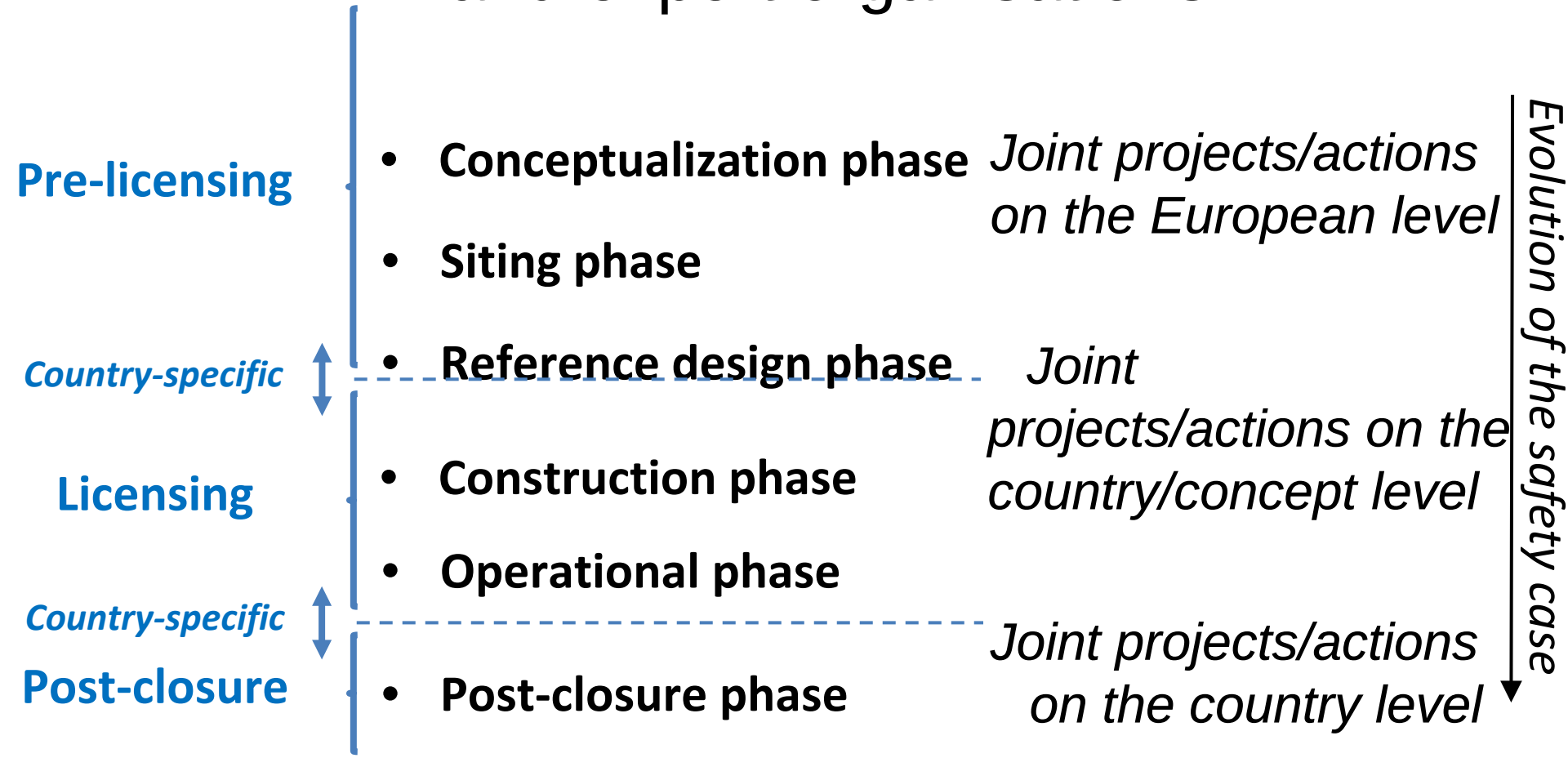
C3 To evaluate the methodology followed by operators for managing the uncertainties surrounding the safety assessments.

C4 To build confidence into monitoring methods in order to define the reference state of the system and its evolution during construction, operational and post-closure phases

- Because national programmes are at very different phases (conceptualization, siting, design…)
- Because concepts/host rocks are different
  - Needs and priorities are not homogeneous between expertise bodies
- Distinguish between areas where interest is concept/specific and where it is more generic

- Thematics more **concept specific** (not comprehensive):
  - Waste matrix and source term: bitumen, glass fracturing
  - Container: corrosion, µ-organisms, radiolysis
  - Engineered components: geochemical interactions
  - Host rock: methods to detect heterogeneities
  - …
- Thematics of more **generic concerns** (not comprehensive):
  - Modeling coupled processes during transient phase (evolution of data…): the « movie » of the disposal
  - Upscaling methods: from lab scale to site
  - Accounting for uncertainties in scenarios
  - Monitoring and measurement methods : what? where? when? (what is the « safe domain » of the disposal?...)
  - …

Safety case: the join possiblities of WMOs and expert organisations

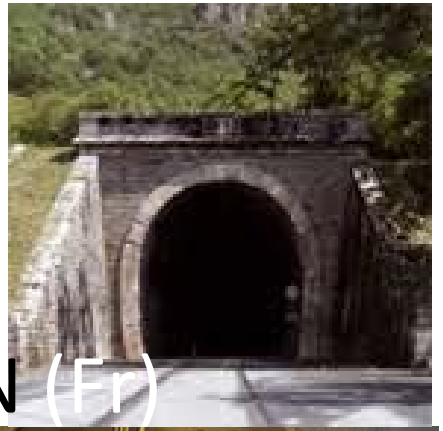


Potential areas of common actions in R&D

- Knowledge transfer
- Joint R &D projects
- Sharing capacities (people), know-how, laboratories, installations

  e.g. underground labs

Example of sharing possibilities: Underground labs in clay rock



- **Underground Research Laboratory site Bure** – ANDRA (Fr)
- **HADES** – SCK.CEN/ONDRAF.NIRAS (BEL)
-
- **Tournemire experimental station** – IRSN (Fr)
- **Mont Terri** (Swisstoppo + 15 research partners, CH)

Example of sharing possibilities: Underground labs in crystalline rock

- **Grimsel Test site** – NAGRA (CH)
- **Aspo Hard Rock Laboratory** – SKB (SE)
- **Oikiluoto Rock Laboratory** – Posiva (FI)
- **Horonobe** (JAEA)

- **Josef UEF (CZ)** – Czech Technical University
  - subsurface

Thank you for you attention