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Presented by: *F. LEMY[(a)]*

Overview of the

Strategic Research Agenda

in the field of safety of radioactive waste geological disposal developed by the Expertise Function in the

EC-H2020-SITEX-II project.

EUROSAFE 2016

Outline

- **Introduction to SITEX-II**
  - The SITEX-II project
  - The SITEX-II WP1
- **Presentation of the SITEX-II SRA**
  - Objective and commitments
  - Scope
  - Contributors
  - Methodology
  - Main topics of the SRA and associated needs
- **Conclusions and way forward**

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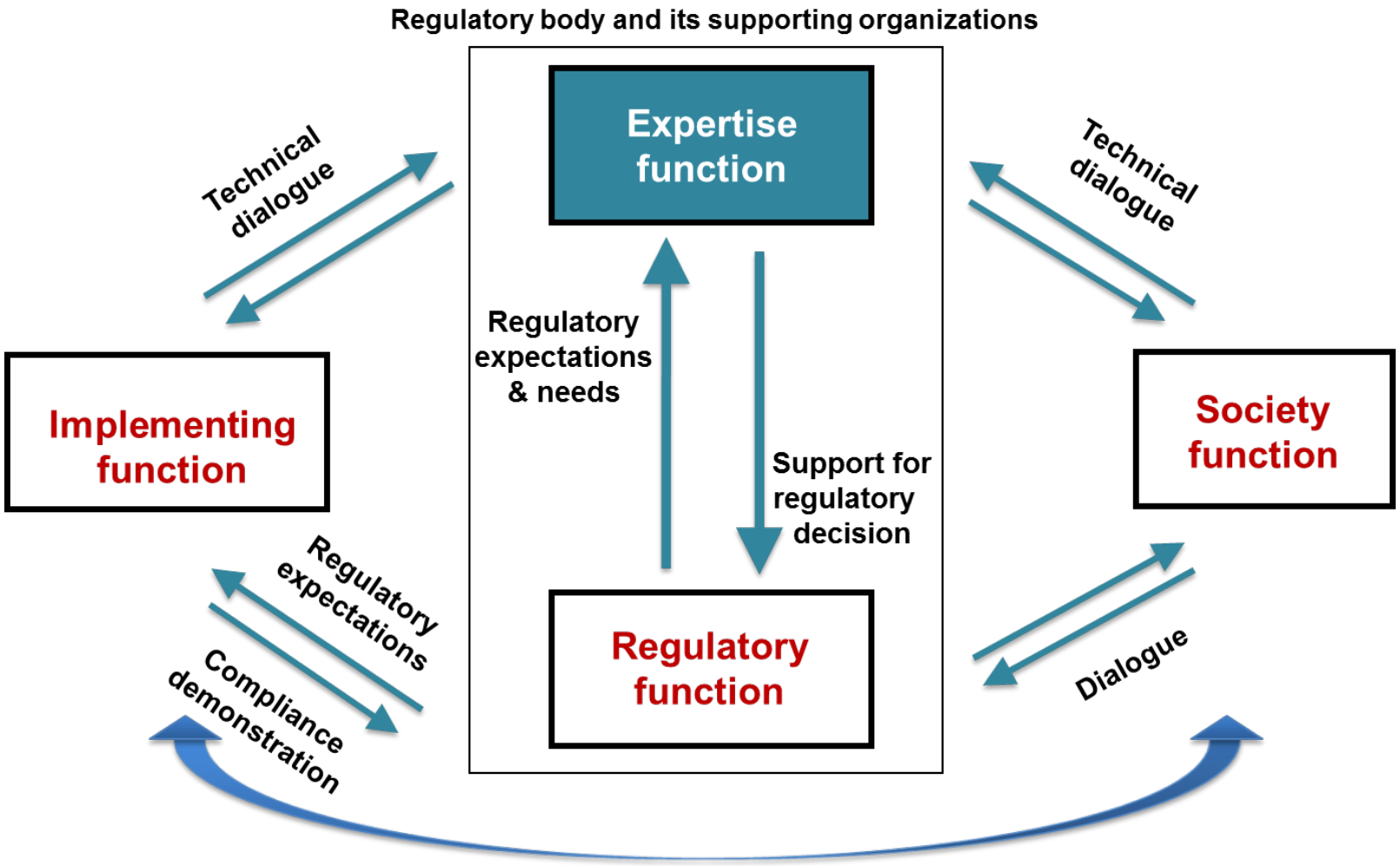
1. Introduction to SITEX-II

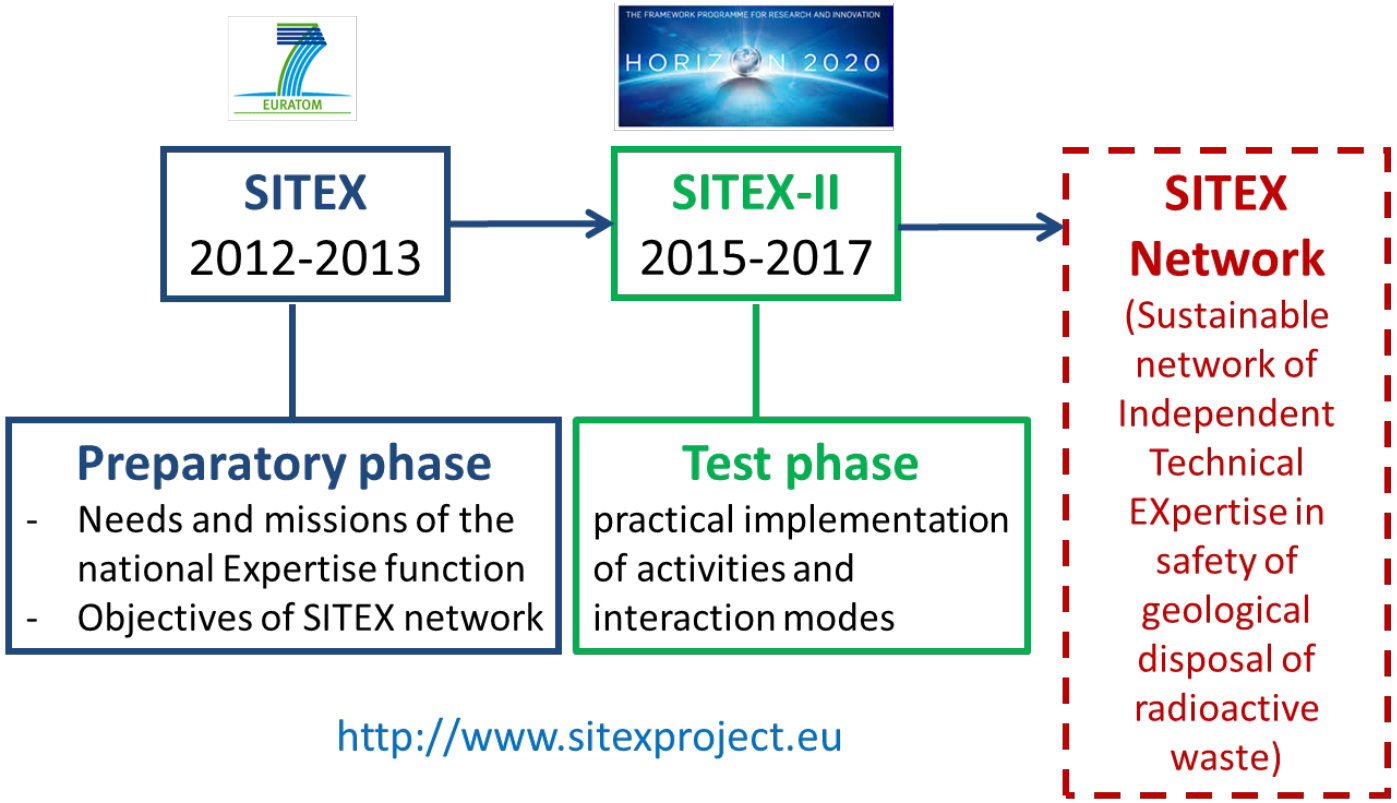
- What is the SITEX initiative?
  - Sustainable network for Independent Technical EXpertise of radioactive waste disposal
  - General objective: to meet the vision of fostering at the international level a high quality and independent expertise in the safety of radioactive waste management, including geological disposal as a first priority.
- How does SITEX define the expertise function?
  - The “expertise function” provides the technical and scientific basis for notably supporting the decisions made within the regulatory function

1. Introduction to SITEX-II



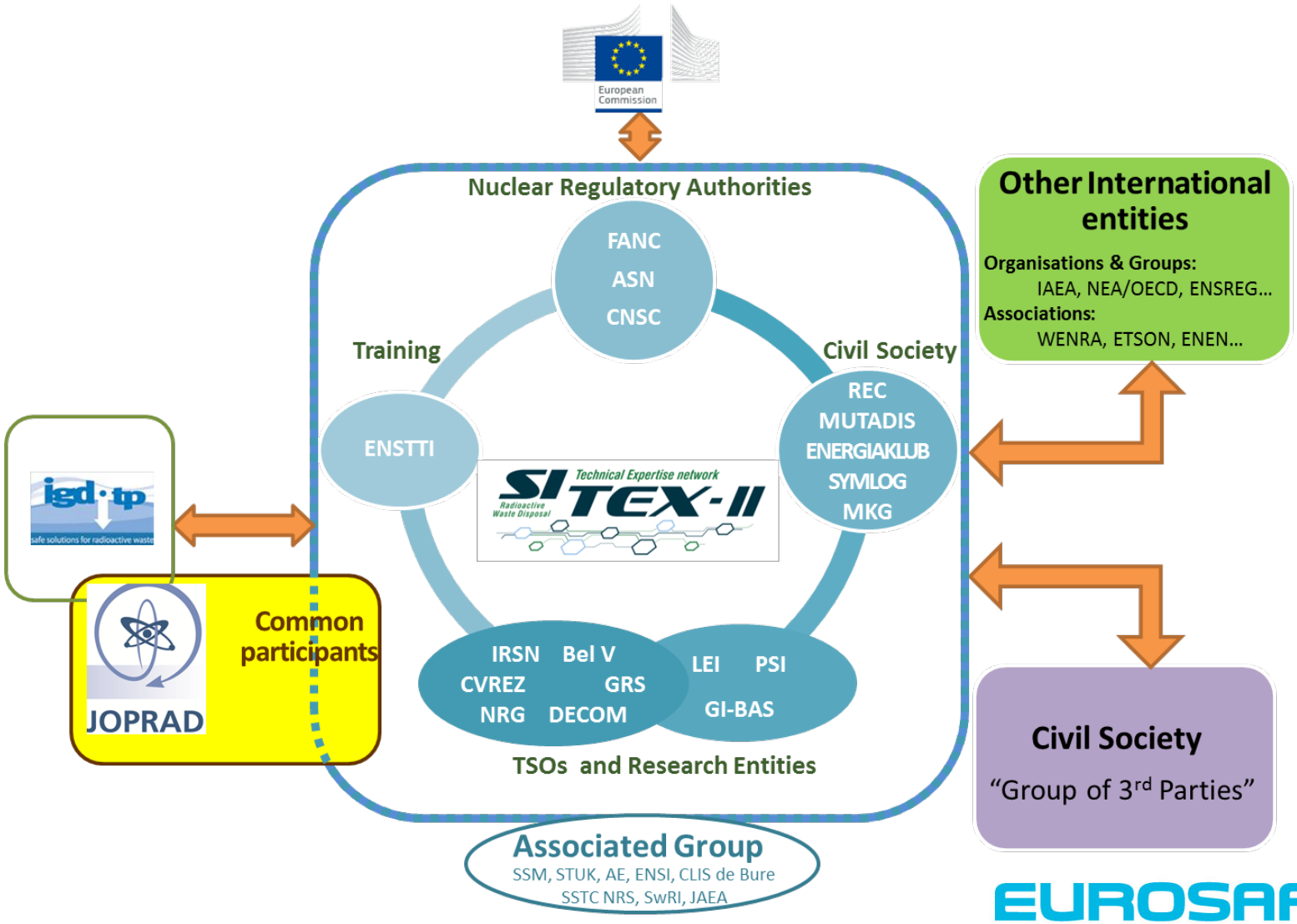
1. Introduction to SITEX-II

- What is the role of the SITEX-II project within the SITEX initiative?



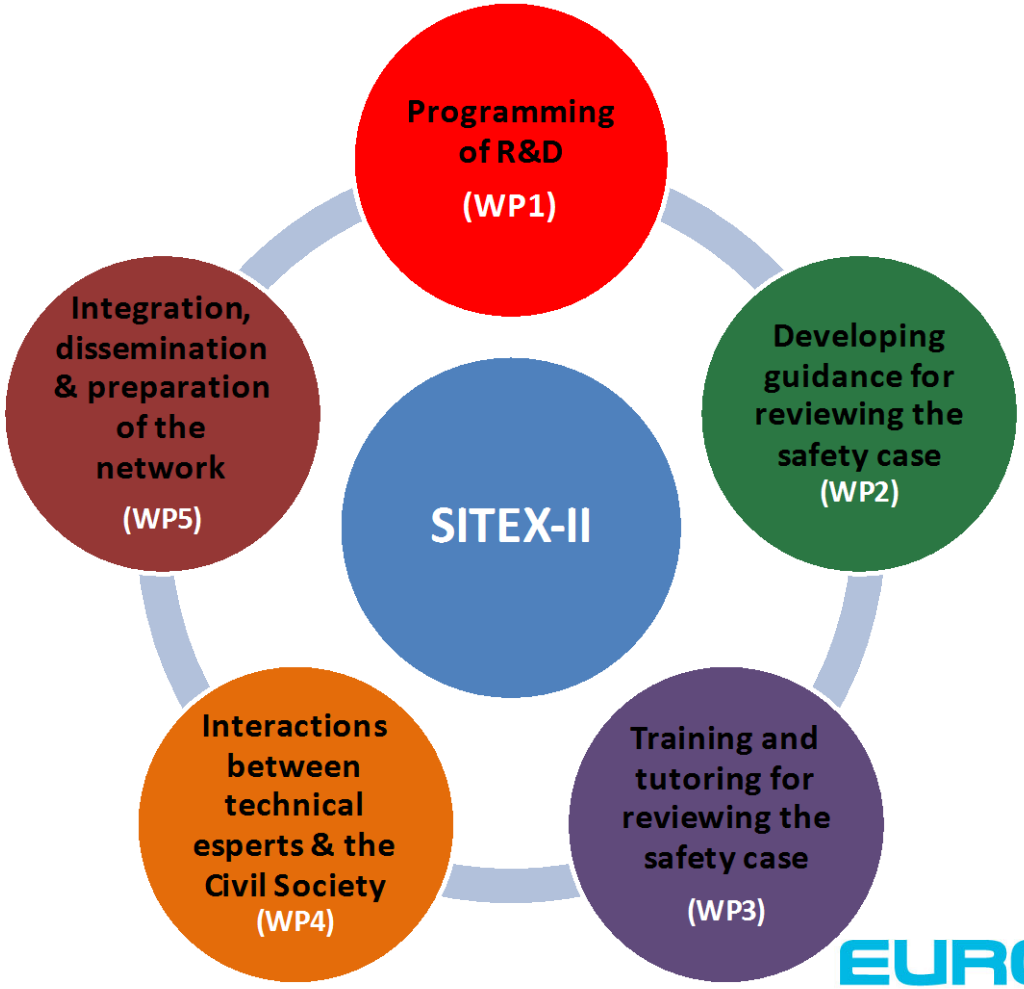
1. Introduction to SITEX-II

- Who participate and interact within SITEX-II?



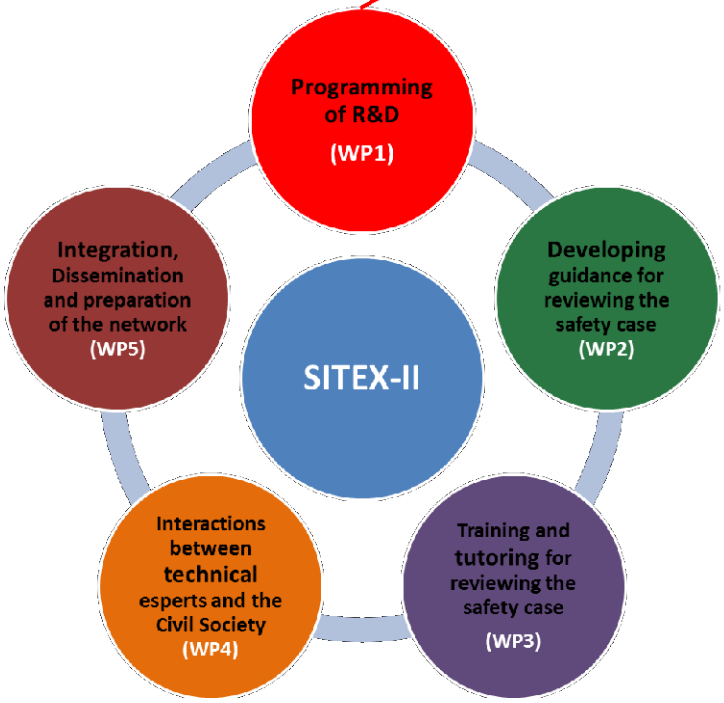
1. Introduction to SITEX-II

- What are the SITEX-II key tasks and Work Packages?



1. Introduction to SITEX-II

- What is the objective of this presentation?



*The objective is to present the SITEX-II "**S**trategic **R**esearch **A**genda" (**SRA**).*

- *It is developed within WP1.*
- *It is aimed at programming the future network's R&D.*

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2. Presentation of the SITEX-II SRA

- Objective of the SRA and commitments.
  - Objective: to identify and prioritize the needs for competence and skills development of the expertise function, at the international and in particular at the European level.
  - Our commitments:
    - The SRA is developed by applying a transparent methodology;
    - The SRA addresses the needs associated with the different states of advancement of geological disposal (GD) programmes;
    - The concerns of civil society are taken into consideration.

2. Presentation of the SITEX-II SRA

- Scope of the SRA.
  - All the topics relevant to the expertise function to assess whether geological disposal facilities are developed and will be constructed, operated and closed in a safe manner.
  - The scope thus encompasses all topics relevant to any waste type and spent fuel for which geological disposal is envisaged as a solution for its long-term management.
  - The following possible activities could be considered in the SRA:
    - R&D activities;
    - Exchanging on practices and developing common positions;
    - Developing state of the art;
    - Knowledge transfer (e.g. training or tutoring).

2. Presentation of the SITEX-II SRA

- Contributors to the SRA (1/2)

  WP1 participants with an expertise function:

  - Bel V, Belgium
  - Federal Agency for Nuclear Control, FANC, Belgium
  - GI-BAS, Bulgaria
  - Canadian Nuclear Safety Commission CNSC, Canada
  - CV REZ, Czech Republic
  - Institut de Radioprotection et de Sûreté Nucléaire, IRSN, France
  - Gesellschaft für Anlagen-und-Reaktorsicherheit, GRS, Germany
  - Lietuvos Energetikos Institutas, LEI, Lithuania
  - PSI, Switzerland

2. Presentation of the SITEX-II SRA

- Contributors to the SRA (2/2)
  - The society function represented by MUTADIS (France) and MKG (Sweden) was also involved in the process.
  - MUTADIS and MKG have interacted about the SRA with a larger group of 3rd parties from the Civil Society.
  - The SRA was reviewed by other SITEX-II partners and the SITEX-II associated group

2. Presentation of the SITEX-II SRA

- SRA development methodology.

Former SITEX Deliverable D3.1 « R&D orientations for TSO »

Step 1
Preparation of a first list of possible SRA topics

List of possible SRA R&D topics (about 100 topics)

Step 2
For each possible topic, participants define:
- ✓ Activities in which they would be interested (State of the art, knowledge transfer, topical working group, R&D)
- ✓ Their level of interest for common activities

First appraisal of level of common interest for identified topics and activities

Step 3
Discussion of topics for which a high common interest exists and consolidation of outcomes.

Consolidated list of 36 topics for SRA, distributed in 7 main topics.

See the associated paper for more details about the SRA content.

2. Presentation of the SITEX-II SRA

- Main topics of the SRA.

  Main topic 1: Waste inventory and source term.

  Main topic 2: Transient THMBC conditions in the near-field.

  Main topic 3: Evolution of EBS material properties.

  Main topic 4: Radionuclide behaviour in disturbed EBS and HR.

  Main topic 5: Safety-relevant operational aspects.

  Main topic 6: Managing uncertainties and the safety assessment.

  Main topic 7: Lifecycle of a disposal programme and its safety case.

- Description of Main topics.
  - In the next slides, a brief description of the activities of common interest is given.
  - For more detailed information on these activities, see the SRA or the associated EUROSAFE paper.

2. Presentation of the SITEX-II SRA

- Main topic 1 “Waste inventory and source term”.

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 1: Waste inventory and source term					
#1.	Uncertainty about databases and methodologies used for defining waste inventories (including historical waste)				
#2.	Evolution of the waste inventory due to possible neutron activation				
#3.	Understanding of the release processes and speciation of the radionuclides for different types of wastes				
#4.	Waste acceptance criteria				

2. Presentation of the SITEX-II SRA

- Main topic 2 “Transient THMBC conditions in the near-field”.

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 2: Transient THMBC conditions in the near-field					
#1.	Oxidative transient	■			
#2.	Chemical conditions induced by metallic and/or cement materials and components	■			
#3.	Transients associated with gas production and migration		■		
	#3.1 Generation processes and rates of safety-relevant gases other than H2	■			
	#3.2 Influence of gas on geochemistry and microbial activity in HR and EBS	■			
	#3.3 Gas migration through EDZ and EBS	■			
#4.	Co-disposal of waste: interactions between different types of wastes		■		

2. Presentation of the SITEX-II SRA

- Main topic 3 “Evolution of EBS material properties”.

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 3: Evolution of EBS material properties					
#1.	Heterogeneous behaviour of bentonite components				
#2.	Behaviour of metallic components				
#3.	Behaviour of cementitious components				

2. Presentation of the SITEX-II SRA

- Main topic 4 “Radionuclide behaviour in disturbed EBS and HR”.

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 4: Radionuclide behaviour in disturbed EBS and HR					
#1.	Competition between sorption of radionuclides and other elements from EBS/waste				
#2.	Influence of organic matter on radionuclide migration				
#3.	Influence of the thermal transient on RN migration in EBS and HR				
#4.	Influence of microbial activity on RN migration				
#5.	Transport of volatile radionuclides in the disposal system				

2. Presentation of the SITEX-II SRA

- Main topic 5 “Safety-relevant operational aspects”.

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 5: Safety relevant operational aspects					
#1.	Efficiency of the monitoring system over the operational period				
#2.	Assessment of the risk of fire and explosion				
#3.	Assessment of the risk of flooding				
#4.	Influence on long term safety of pre-closure disturbances				

2. Presentation of the SITEX-II SRA

- Main topic 6 “Managing uncertainties and the safety assessment”.

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 6: Managing uncertainties and the safety assessment					
#1.	Uncertainties associated with site characteristics				
#2.	Management of uncertainties associated with geodynamics and tectonic movements				
#3.	General methodologies for the safety assessment				
#4.	Safety assessment models				

2. Presentation of the SITEX-II SRA

- Main topic 7 “Lifecycle of a disposal programme and its safety case” (1/2).

SRA Main Topics and associated issues		Research activities (experiment and/or modelling works)	Horizontal activities		
			Exchange on practices, develop common positions	Develop states of the art	Transfer knowledge (eg. training, tutoring…)
Main Topic 7: Lifecycle of a disposal programme and its safety case					
#1.	Methods to review the safety case		[redacted]		[redacted]
#2.	Assessment of the technical feasibility of a geological disposal concept				
#3.	Evolution of the safety case content with the lifecycle of the disposal programme				[redacted]
#4.	Organization of the pre-licensing phase				
#5.	Reversibility and Retrievability				

2. Presentation of the SITEX-II SRA

- Main topic 7 “Lifecycle of a disposal programme and its safety case” (2/2).

SRA Main Topics and associated issues	
Main Topic 7: Lifecycle of a disposal programme and its safety case	
	Holistic topics for which technical and societal aspects could be investigated:
#6.	Application of the optimization principle
#7.	License of disposal operation
#8.	Conditions for closure
#9.	Site selection process
#10.	Safety culture in the context of geological disposal
#11.	Intergenerational governance of the operational phase

These ***holistic topics*** are the results of interactions with representatives of the Civil Society.
For these topics, both technical and societal aspects need to be investigated in an integrated manner, using specific interdisciplinary methodologies and involving CS participation.

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3. Conclusions and way forward

- Conclusions
  - SITEX-II has developed a SRA for the expertise function.
  - This SRA includes 7 main topics in which there is a common high interest for developing common activities.
  - Besides R&D, other activities such as exchanging on practices, developing states of the art and transferring knowledge are considered.
  - The concerns of the civil society were taken into account in the SRA development.
- Way forward – SITEX
  - Develop terms of reference for preparing the implementation of SRA activities.

3. Conclusions and way forward

- Way forward – interactions with JOPRAD
  - JOPRAD: “Towards a Joint Programming Project on Radioactive Waste Disposal”.
  - Its objective: to assess the feasibility and, if appropriate, to generate a proposal for Joint Programming (JP) in the field of Radioactive Waste Management, including geological disposal.
  - The SITEX-II SRA is an input to the JOPRAD project as it contributes to identify the R&D needs of TSOs.
  - Similar SRAs were developed by WMOs and REs.
  - Based on these SRA‘s, a first assessment of commonalities among WMOs, REs and TSOs needs in R&D is ongoing.
  - A programme document presenting these commonalities will be elaborated within JOPRAD.

THANK YOU FOR YOUR ATTENTION

For more information: http://www.sitexproject.eu

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