

# FIRST OUTCOMES OF THE UNCERTAINTY MANAGEMENT MULTI-ACTOR NETWORK (UMAN)

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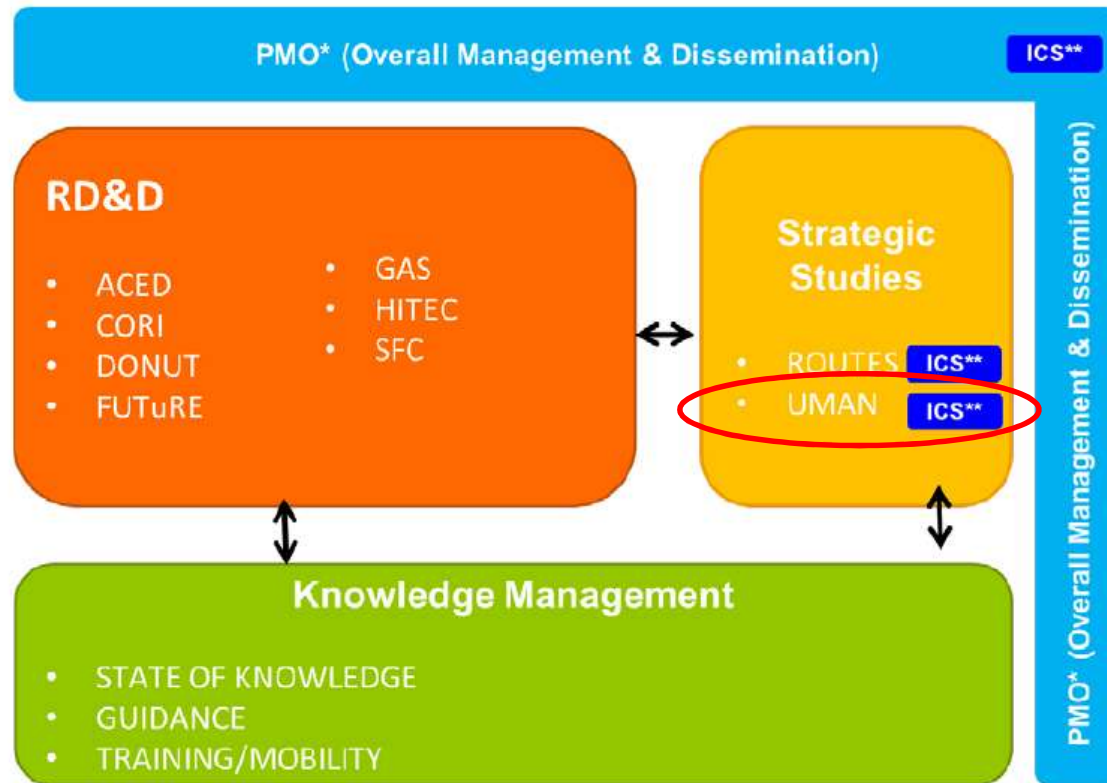
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## EURAD VISION

A **step change in European collaboration** towards safe radioactive waste management (RWM) through the development of a robust and sustained science, technology and knowledge management programme that supports timely implementation of RWM activities and serves to **foster mutual understanding and trust** between participants

## EURAD-1 OVERALL STRUCTURE OF THE WORK PROGRAMME



27/05/2021

\*Programme Management Office  
 \*\* Interactions with Civil Society



## UMAN RATIONALE

- **Decisions** associated with RWM programmes are made in the presence of **irreducible and reducible uncertainties**
- Several choices made on the basis of **limited information** in early programme phases may have to be confirmed before or during the construction and operation of the facility
- The Council Directive 2011/70/EURATOM requires that transparency be provided by ensuring effective public information and opportunities for all stakeholders concerned to **participate in the decision-making process**
- At the end of the process, uncertainties will inevitably remain and it should be demonstrated that these **uncertainties do not undermine safety arguments**
- Hence, the **management of uncertainties is a key element** of successful programme planning and of the safety case of waste management facilities and...
- ...in particular, of waste disposal facilities due to the long time scales during which the radiotoxicity of the waste remains significant



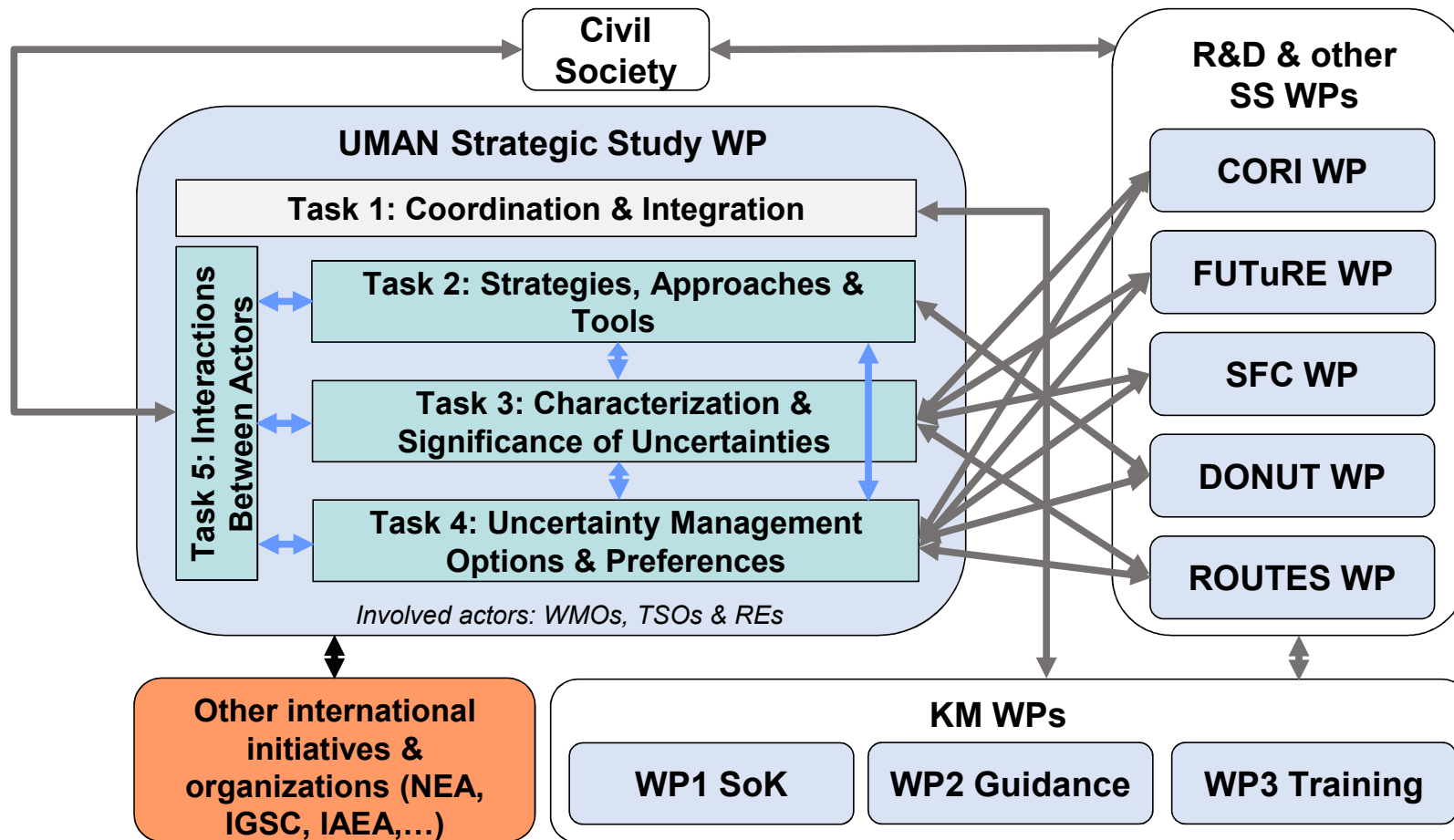
## UMAN OBJECTIVES

- Develop a **common understanding** among different categories of actors (WMOs, TSOs, REs & Civil Society) **on uncertainty management** and how it relates to risk & safety
- In cases where a common understanding is beyond reach, to achieve mutual understanding on **why views** on uncertainties and their management **are different** for various actors
- **Share knowledge/know-how** and discuss common methodological/strategical **challenging issues**
- Identify the **contribution of** past & on-going **R&D projects** to the overall management of uncertainties
- Identify **remaining and emerging issues and needs**

## UMAN PARTICIPANTS

Belgium	  	Netherlands	 
Bulgaria		Romania	
Czech Republic	 	Slovakia	
Finland	 	Slovenia	 
France	    	Spain	 
Germany	    	Switzerland	 
Hungary		UK	 
Lithuania	 	Ukraina	

## TASK BREAKDOWN & INTERACTIONS



## TASK 2 - STRATEGIES, APPROACHES & TOOLS

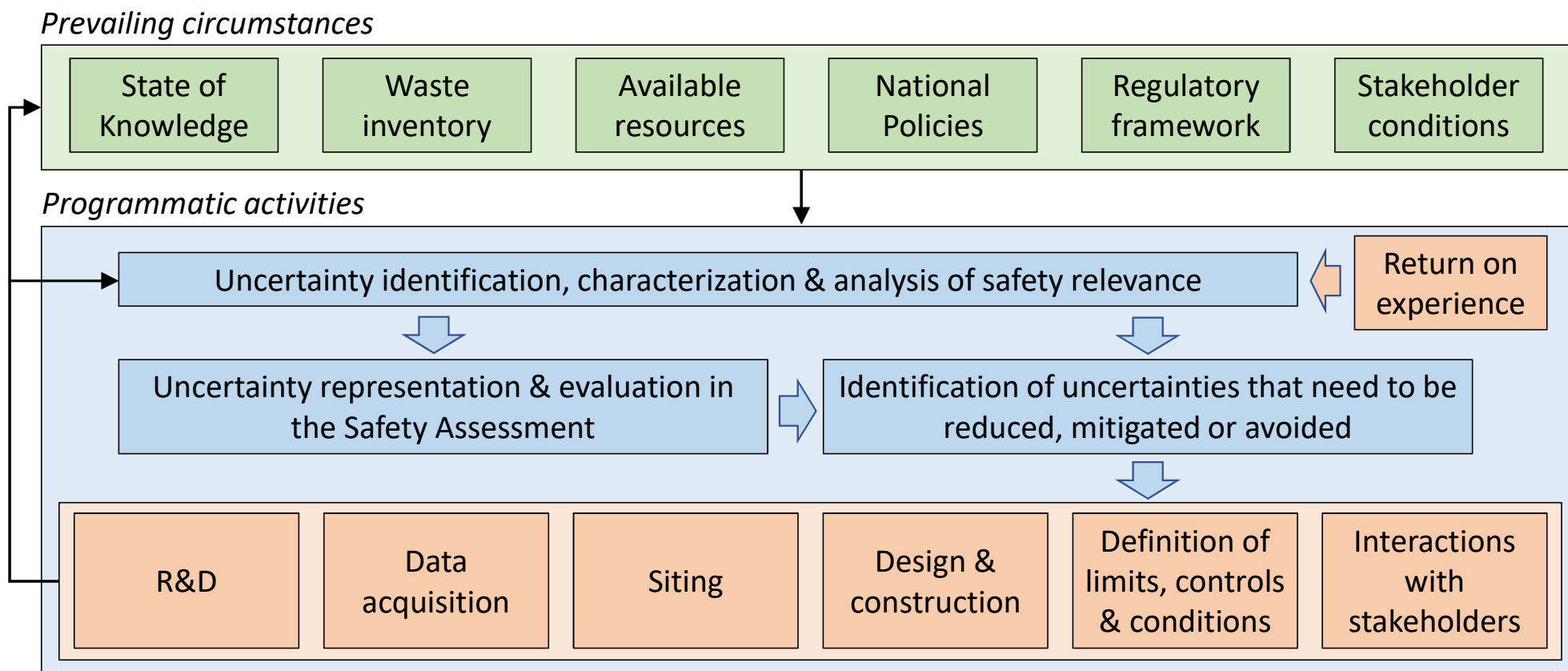
- **Objective:**

Compile, review, compare and refine strategies, approaches and tools for the management of uncertainties in the safety analysis and the safety case

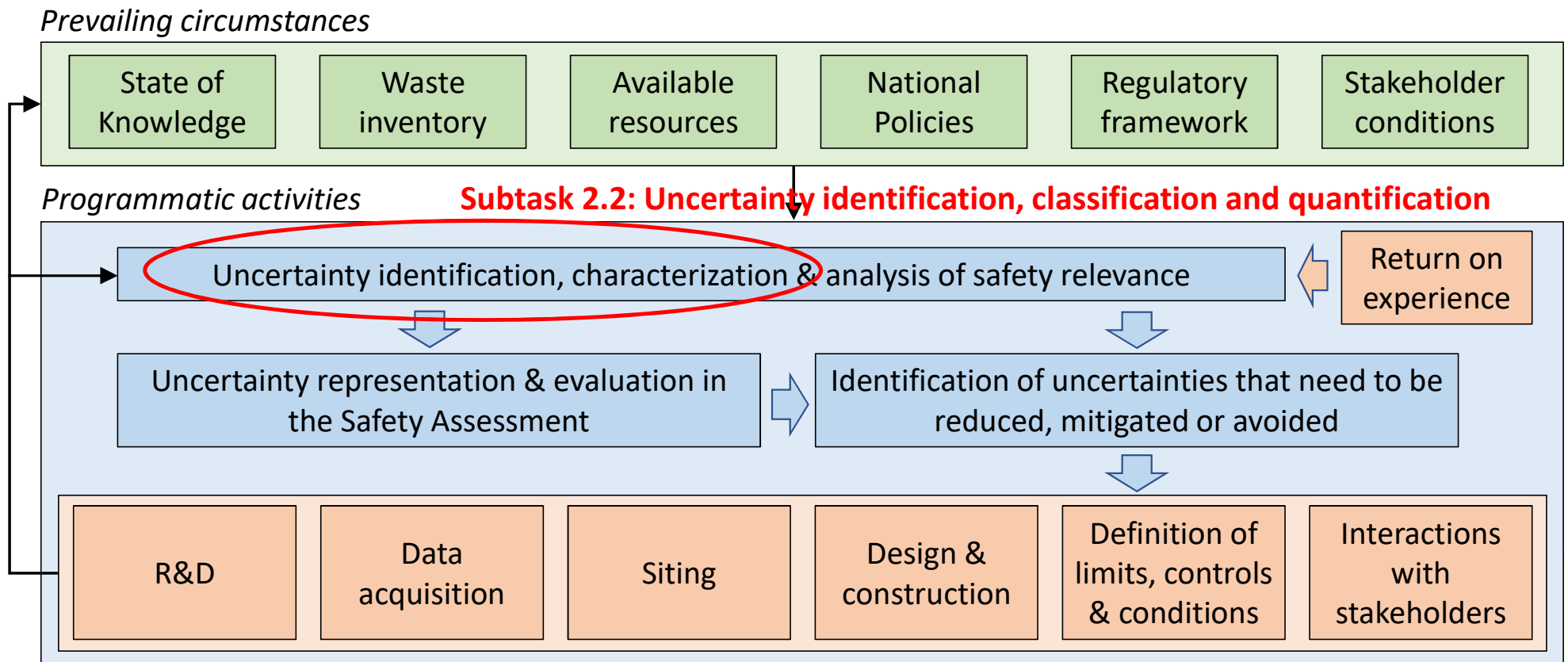




## SUBTASK 2.1 - ELEMENTS OF AN UNCERTAINTY MANAGEMENT STRATEGY



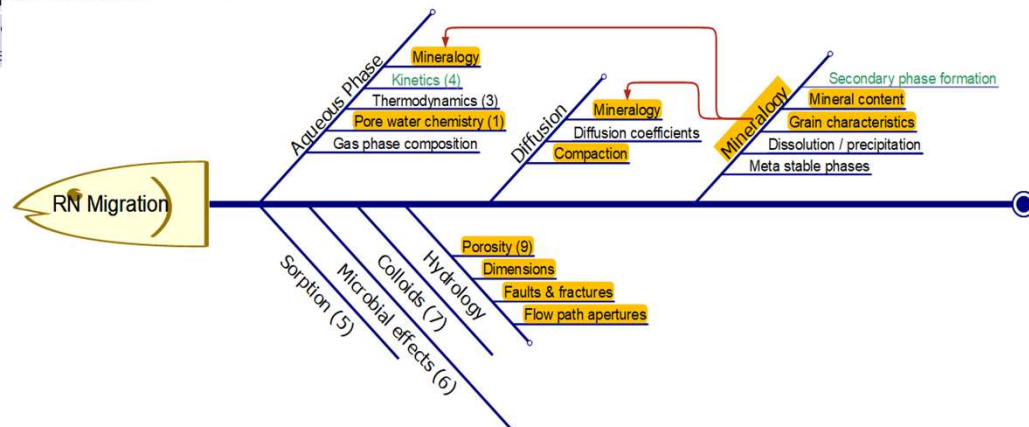
## SUBTASK 2.2 – UNCERTAINTY IDENTIFICATION, CLASSIFICATION & QUANTIFICATION



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SNF uncertainty table				
EURAD Subtheme	EURAD Domain	Induced effects	Associated uncertainties	Epistemic / Aleatoric
Wasteform	Spent Nuclear Fuel	Waste amount and volume, composition (radionuclide inventory)	Operational factors (time, load factor, burnup, stops), fuel composition (enrichment & impurities), fuel geometry & density, cladding, spacer, swelling, cross sections & fission yields, decay data, shielding data	
		Waste composition (radionuclide inventory)	Cooling & storage time, Conditions	
		Heat generation	Waste storage	

Identification: Methods based on “fishbone diagrams” or “uncertainty tables”



Major uncertainty components and their dependencies for radionuclide migration

## TASK 3 - CHARACTERIZATION & SIGNIFICANCE OF UNCERTAINTIES FOR DIFFERENT CATEGORIES OF ACTORS

- Objective:

Synthesize existing knowledge and views of different kinds of actors on the identification, classification, characterisation and (potential) significance of uncertainties associated with *specific topics*





## SPECIFIC TOPICS ADDRESSED IN TASK 3

- Subtask 3.1 – Types of uncertainties relevant to the safety analysis and the safety case
- Subtask 3.2 – Uncertainties on **waste inventory** and on the impact of predisposal steps
- Subtask 3.3 – **Site and geosphere** related uncertainties
- Subtask 3.4 – Uncertainties related to **human aspects**
- Subtask 3.5 – **Spent fuel** related uncertainties
- *Subtask 3.6 – **Near-field** related uncertainties*

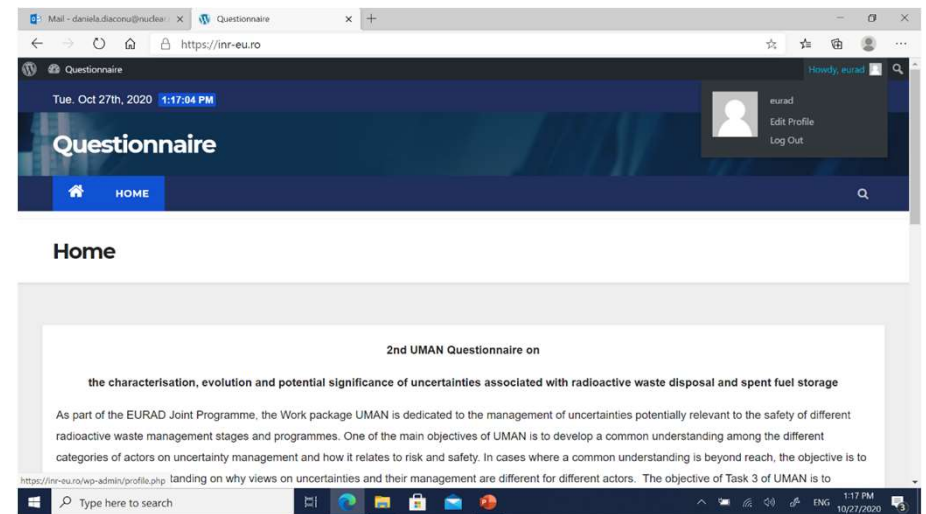
# COLLECTION OF THE VIEWS OF DIFFERENT ACTORS ON SIGNIFICANCE FOR SAFETY OF UNCERTAINTIES

## Actors:

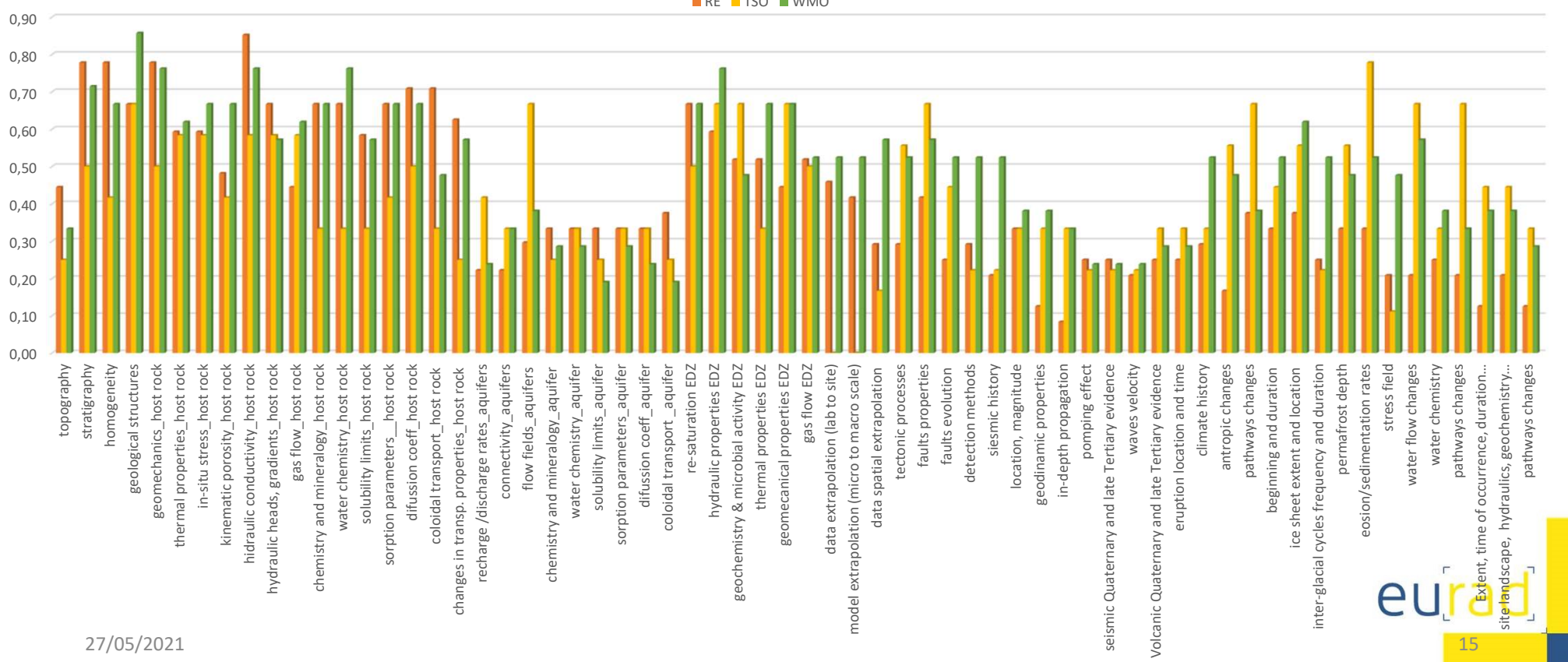
- WMOs
  - TSOs
  - REs
  - **Civil Society – via Task 5 Seminars**
- } via questionnaire

## Questions:

- Q1. Potential significance for safety and why ?
- Q2. Methods used for characterisation and further information (references, comments...) ?
- Q3. Evolution along the programme ?
- Q4. Other uncertainties not addressed by the questionnaire ?



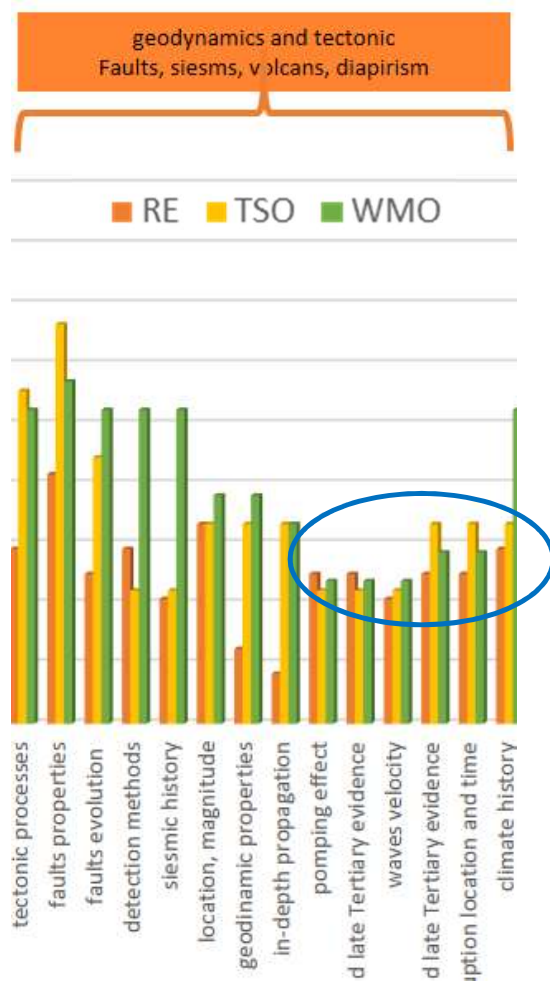
# UNCERTAINTIES ON SITE & GEOSPHERE: SIGNIFICANCE FOR SAFETY



27/05/2021



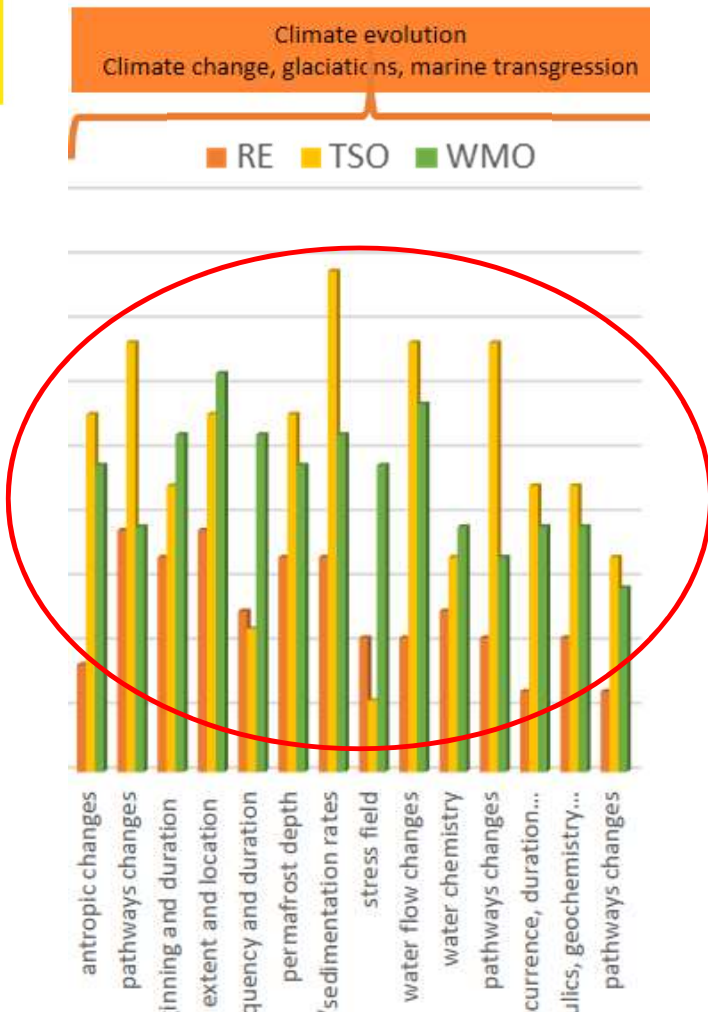
## UNCERTAINTIES ON SITE & GEOSPHERE: VIEWS OF THE ACTORS



- Generally - consensus on the potential impacts of uncertainties related to the site & geosphere
- Good agreement between actors on uncertainties of low significance (e.g. volcanism)
- Info provided by each actor complement each other



## UNCERTAINTIES ON SITE & GEOSPHERE: VIEWS OF THE ACTORS



- REs are mainly concerned by uncertainties related to natural barrier characterisation (host rock homogeneity, flow and transport parameters) – could be explained by the profile of REs participating in the survey
- Uncertainties related to the long-term evolution seem to be of higher significance for TSOs and WMOs:
  - WMOs: geodynamics and tectonic perturbations of the site
  - TSOs: future climate changes and glacial cycles

## TASK 4 - UNCERTAINTY MANAGEMENT OPTIONS & PREFERENCES OF DIFFERENT ACTORS

- **Objective:**

Identify, for different phases of a disposal programme and the associated decision-making, a bundle of possible **options** for:

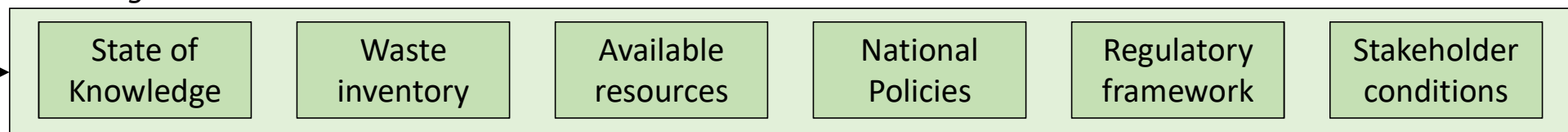
- treating uncertainties associated with *specific topics* in the SA
- avoiding, reducing or mitigating these uncertainties
- making a safety case robust vis-à-vis uncertainties



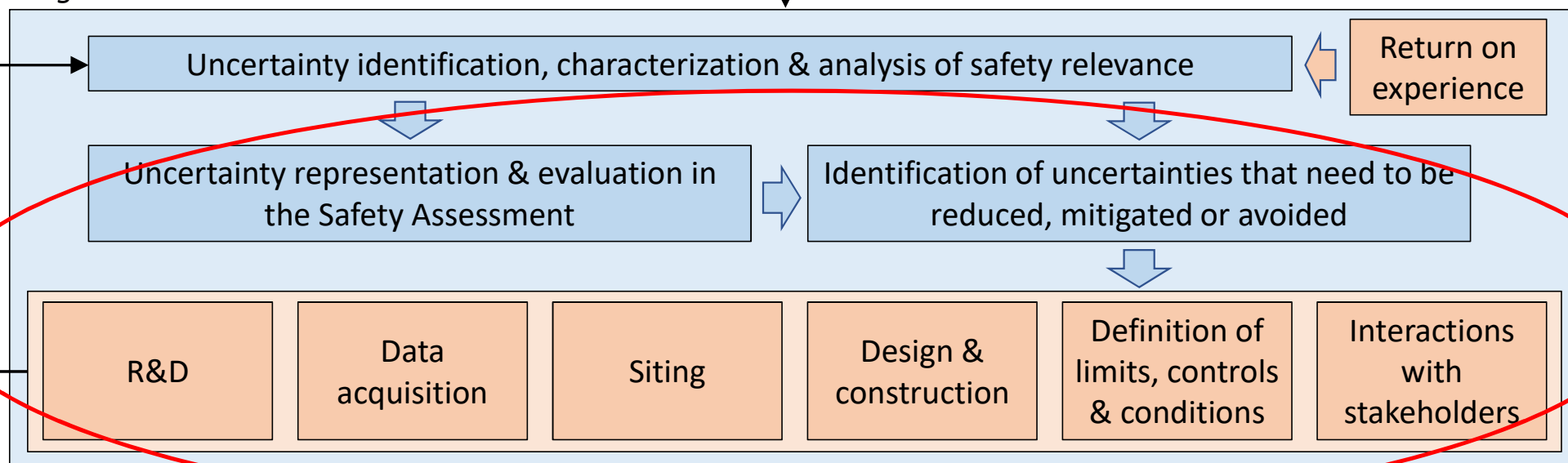
- The **views and preferences** of different kinds of actors on possible options are identified
- Platform for **networking** on uncertainty management options

## SUBTASKS 4.2 & 4.3: UNCERTAINTY MANAGEMENT OPTIONS & PREFERENCES

*Prevailing circumstances*



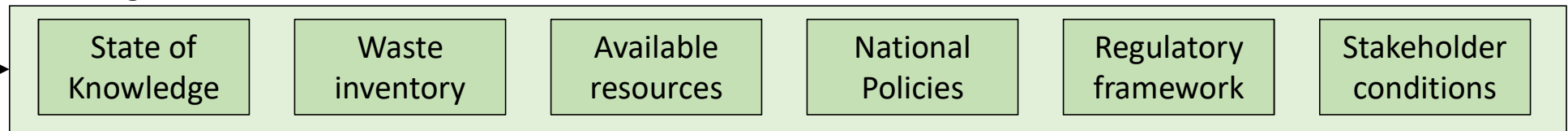
*Programmatic activities*



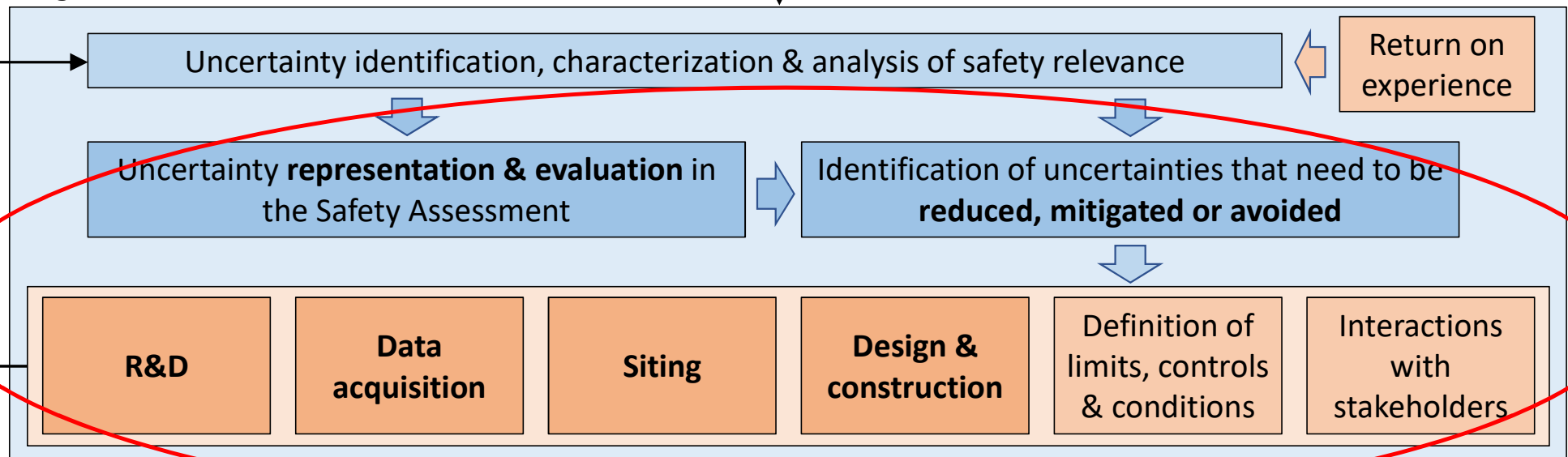


# MANAGEMENT OPTIONS OF UNCERTAINTIES RELATED TO SITE & GEOSPHERE

## Prevailing circumstances



## Programmatic activities



## TASK 5 - INTERACTIONS BETWEEN ALL CATEGORIES OF ACTORS, INCLUDING CIVIL SOCIETY (CS)

- Objectives:
  - Develop a **common understanding or an understanding of the different viewpoints** among different categories of actors on:
    - uncertainty management and how it relates to risk & safety
    - whether and why a safety case is robust vis-à-vis uncertainties
  - Share knowledge/know-how and discuss common methodological/strategical issues on uncertainty management among a **broader group of actors**
- This task organises analyses of key outcomes of other WP tasks with **pluralistic stakeholder groups** including CSOs, TSOs, WMOs and REs (Seminars)





## 1ST TASK 5 SEMINAR

### Topics addressed during the seminar:

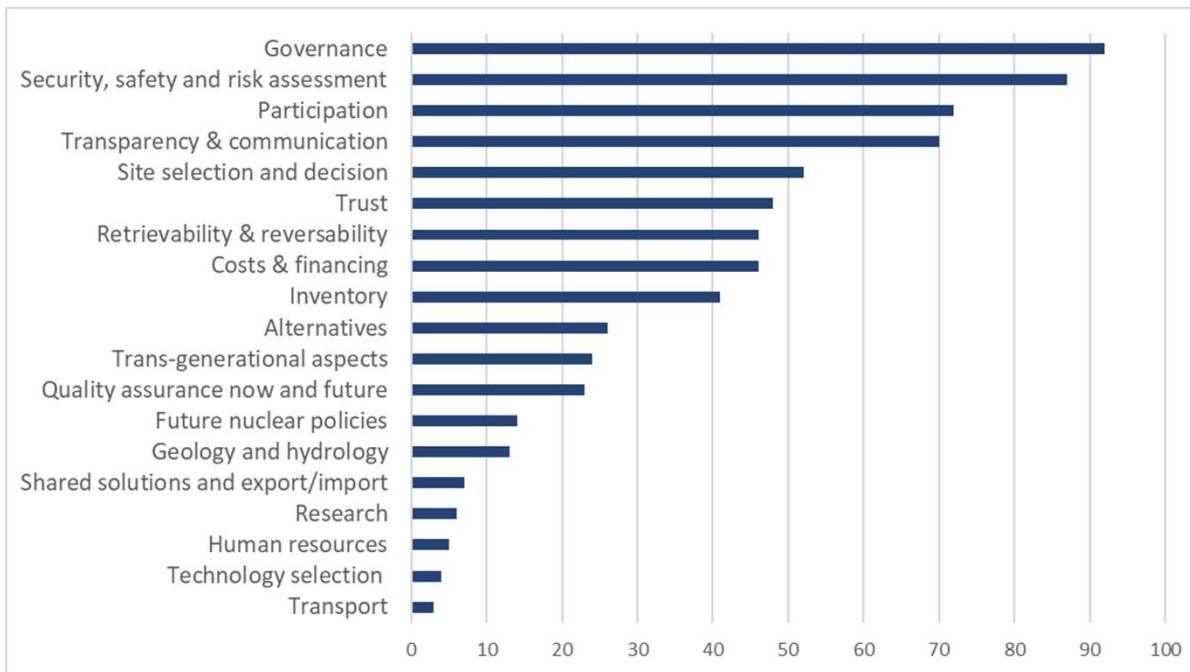
1. Meaning of Uncertainty management
2. Types of Uncertainty
3. Evolution of Uncertainty
4. Interaction with Civil Society

### Pluralistic discussions held for each topic:

- Presentations on the views of the following types of actors: WMO, TSO, RE, CS
- 49 participants (Equilibrium of views : 10 WMOs, 11 TSOs, 9 REs, 13 CSOs + 6 Regulators) divided in 4 working groups

## SOME HIGHLIGHTS OF THE 1ST TASK 5 SEMINAR...

### *CS Members see uncertainties on...*



- Technical uncertainties can be addressed, but **non-technical/programme uncertainties** which matter to CS are also important, e.g.:
  - uncertainties related to the “process” (governance) & stakeholder involvement
  - uncertainties related to knowledge management (storage, transfer of data over generations,...)
  - ...





## SOME HIGHLIGHTS OF THE 1ST TASK 5 SEMINAR...

- Not so many differences at the general level (agreement on the importance of uncertainty management in the safety case) but... **differences could appear in concrete implementation** (according to cultural contexts, advancement of RWM programme, role in the process, risk appetite,...)
- Attention to **“unknown/ignored knowns”** and **“unknown unknowns”** to be increased !
- **Reversibility, recoverability & rolling stewardship** as means to manage uncertainties ?
- Need for “mitigation” of differences seen as rather limited, but **open discourse is needed !**
- How to present information to the CS so that it is well perceived and understood ?
- **Independence of expertise** (What does it mean ? How can it be done in practice ?)



## UPCOMING UMAN ACTIVITIES

- The “UMAN process” is ongoing !
- Workshops 2 and 3 (Task 4) on human aspects & spent fuel will be held in 2021 = input to upcoming Task 5 seminars → feedback from Civil Society included in final outcomes
- Task 5 Seminar #2 on uncertainties associated with the site & geosphere and their management (October 2021)
- Activities associated with uncertainties related to the near-field of geological disposal facilities will start in June 2021 (including questionnaire on the views of different actors)
- Interested in UMAN ? Please feel free to join the End User Group !
- *Contact: frank.lemmy@belv.be*



THANK YOU FOR YOUR ATTENTION!

