Implementing Geological Disposal of Radioactive Waste Technology Platform (IGD-TP)

Prioritisation of RD&D Topics - The SRA Approach -

Exchange Forum, 08/02/2011

BMWi
(presented by Wernt Brewitz)

SRA aims outlined in the **Vision Report**

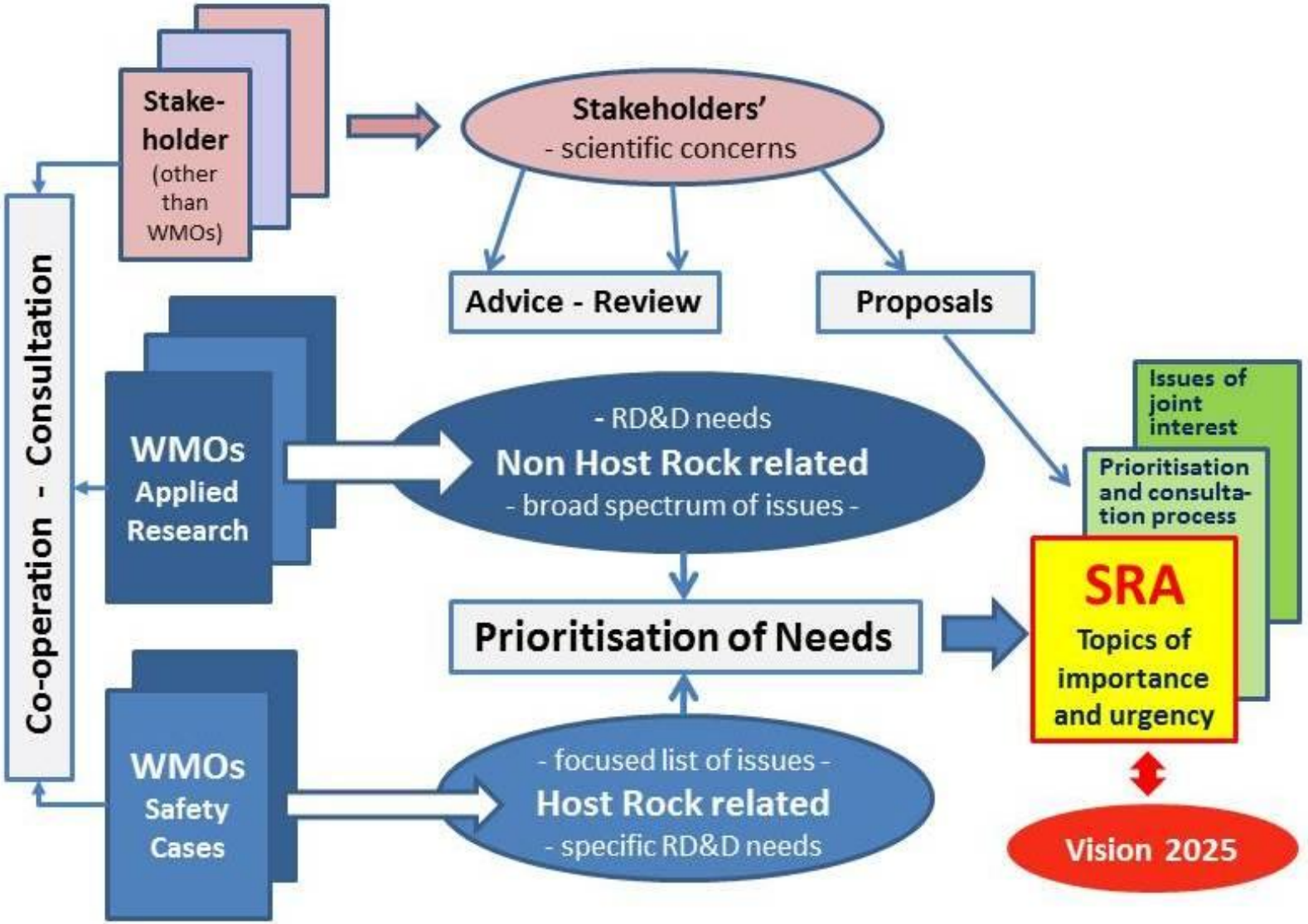
(see page 17 of Vision Report)

- Specific **scientific challenges** are encountered when reducing the uncertainties in order to improve confidence in long-term safety.
- The **technological challenge** is to transfer the studies and the results of RD&D activities into proven and reliable technologies for construction, operation and closure of a deep geological repository.
- **Social and political challenges** are related to the siting of repositories and bridging the chasm of knowledge between experts and general public.

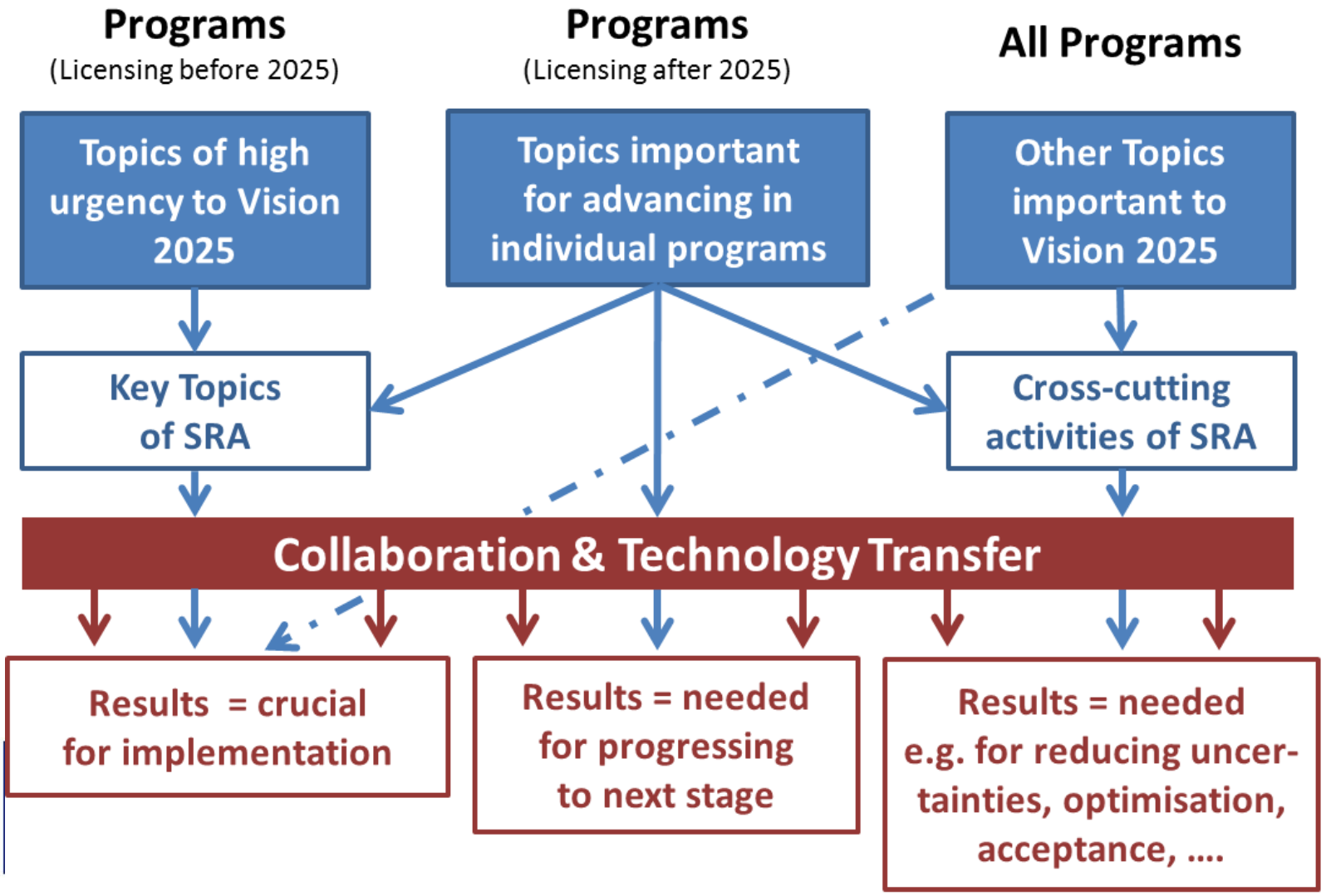
Scientific and technical basis for the SRA?

- Waste Management Programs & Conceptions
  - HLW disposal concepts - state of advancement - time frames - etc
- International & National Framework Conditions
  - regulations - legal requirements - safety standards - etc
- State-of-the-Art
  - radioactive waste management - engineering - sciences - RD&D
- WMOs needs for
  - licensing - construction - operation - final closure
  - confidence building - public acceptance
  - training and education

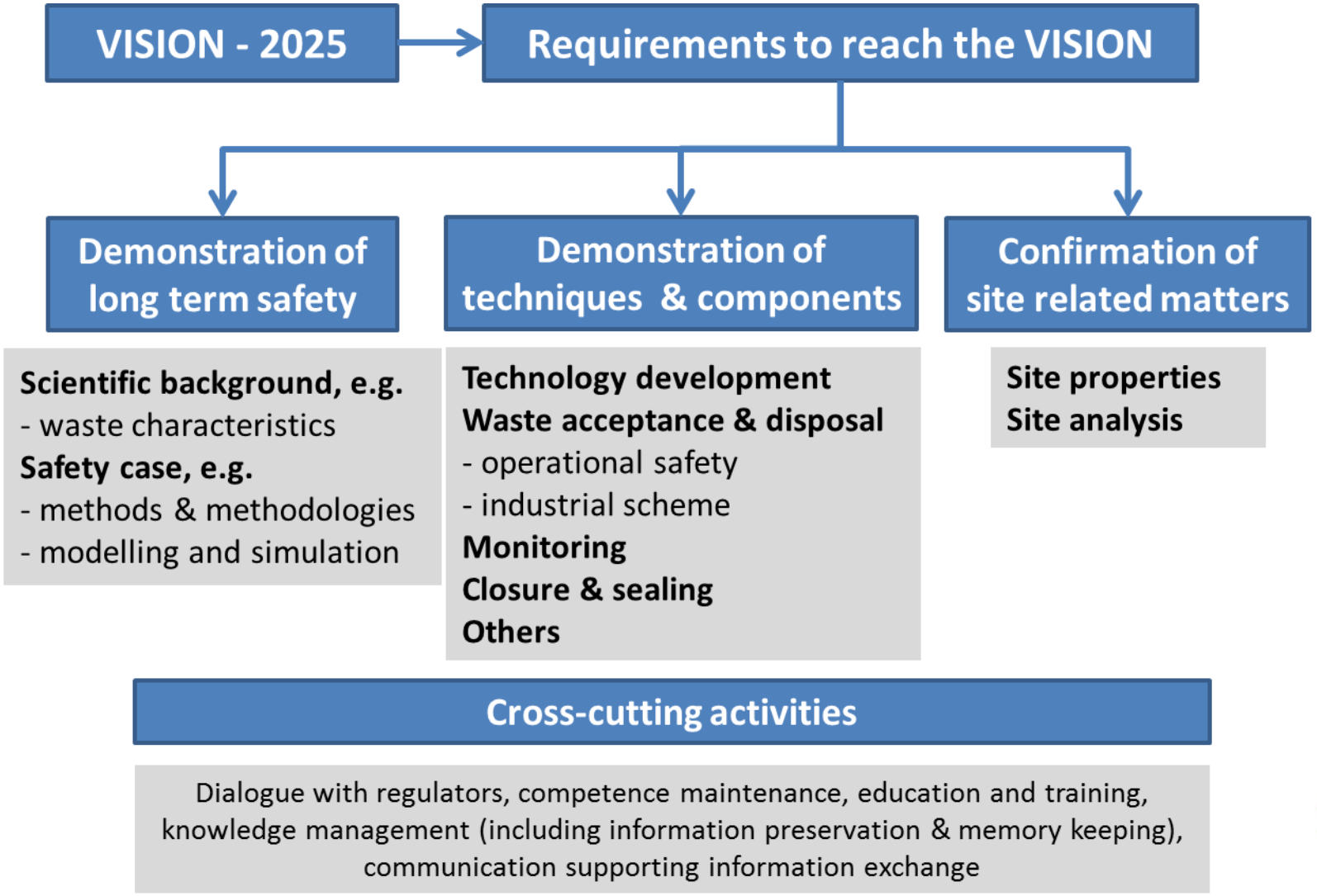
Main tasks on the road to the SRA



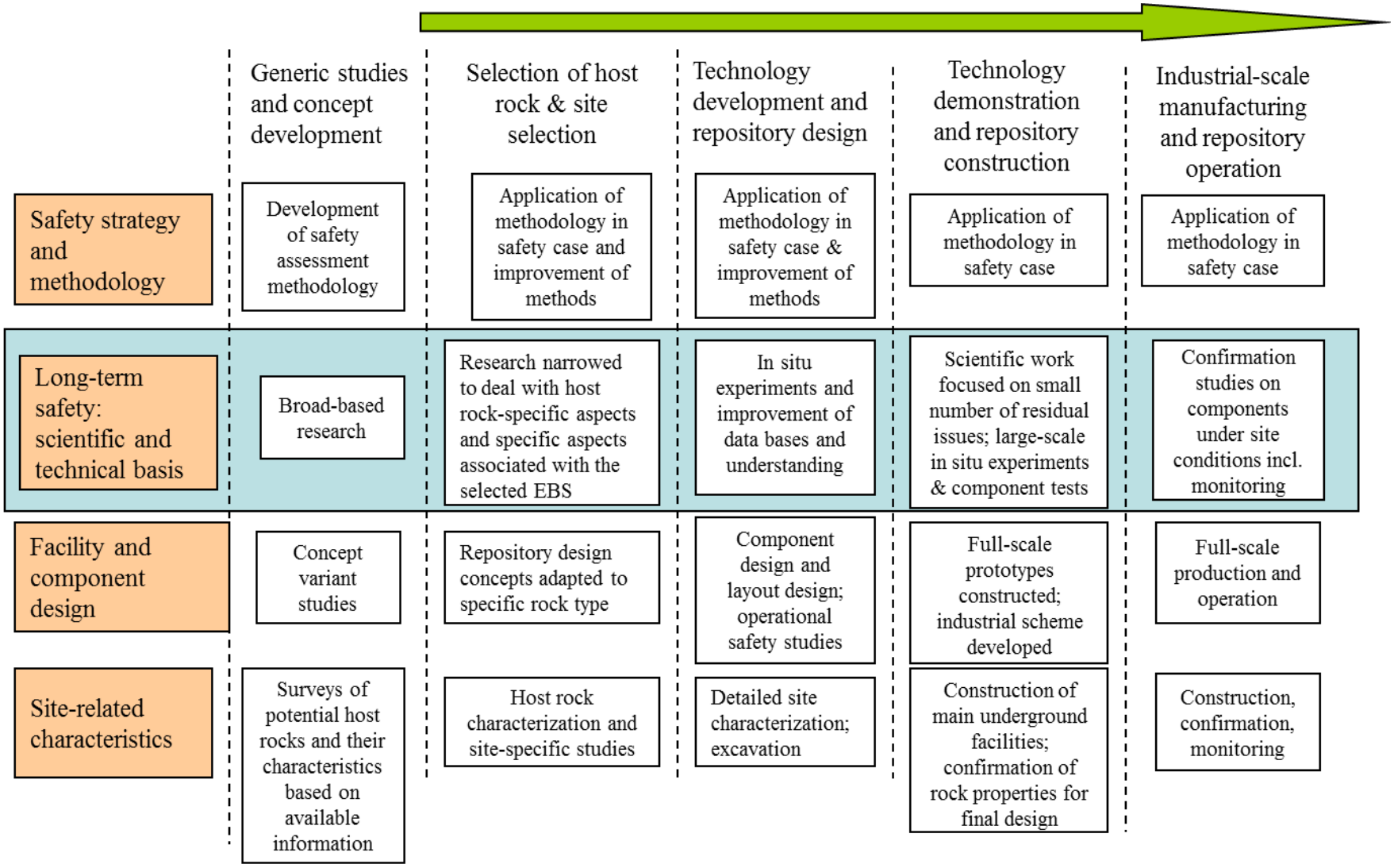
Co-operation of the participating WMOs



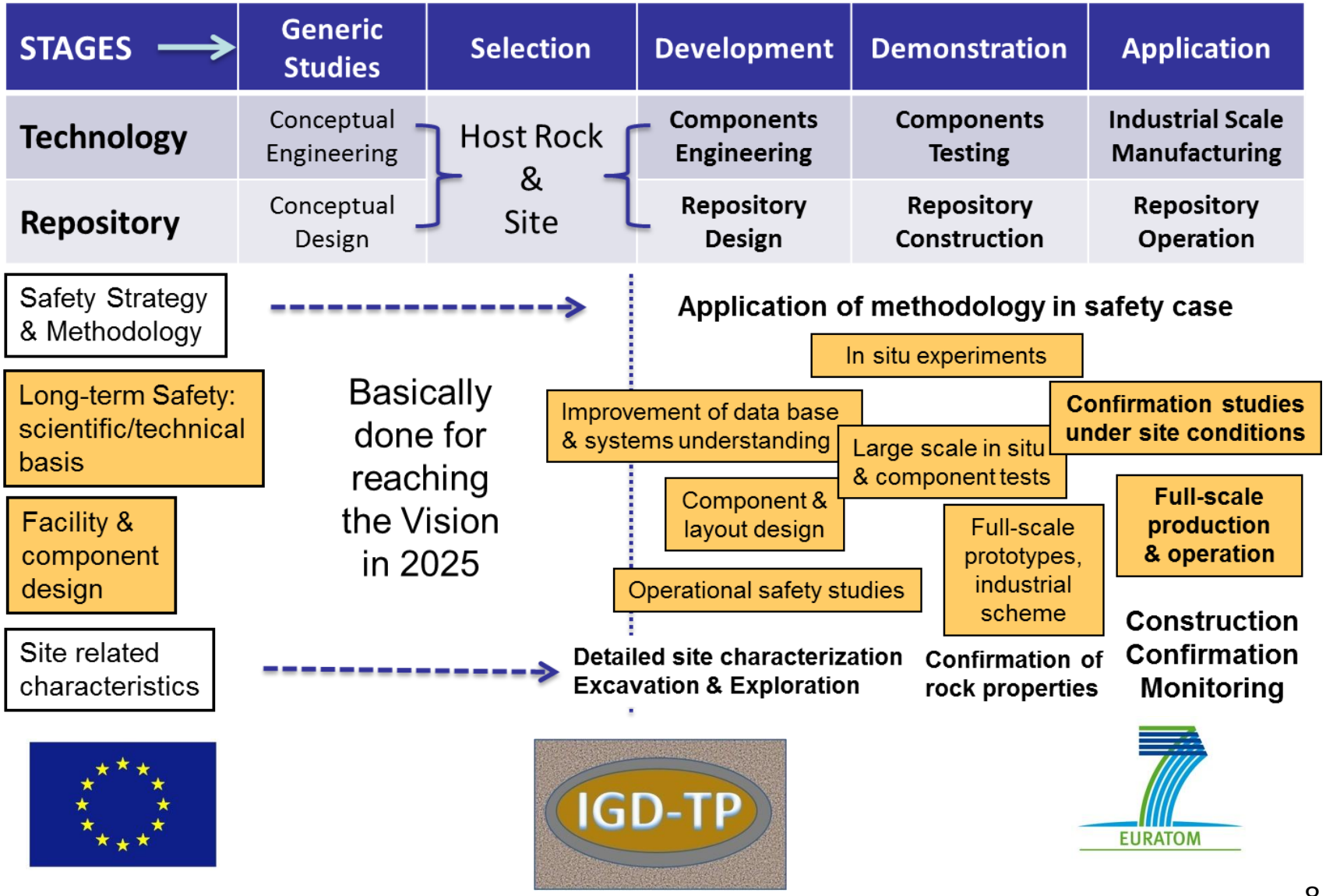
Needs for implementing geological disposal at an advanced Stage



Basic tasks in repository development and implementation



The path to implementation of geological disposal and its RD&D tasks



Grounds for uncertainties in geological waste disposal

- There are no “standards” for geological disposal systems !
- Long time-frames are a source of uncertainties !
  (Elements of aleatory and epistemic uncertainties)
- Safety criteria reflect todays understanding
  of the repository system !
- PA models deal with probabilities (high, moderate, low)
- Material properties have to match short-, medium- and
  long-term requirements
- Technical components are designed to engineering standards
- Coupled effects with short-, medium-, long-term consequences

Ways and means to reduce uncertainties

- Criteria based site selection
- Thorough site investigation & characterization
- Adaptation of disposal concept to site conditions
- Experiments on safety related issues
- Investigation of processes relevant to repository performance
- Demonstration of disposal techniques
- Natural analogue studies
- Repository system's performance analysis
- Scenario based safety assessment studies

Handling of uncertainties in view of implementing geological disposal

(Starting point for detailed discussions on remaining uncertainties)

	Scientific and technical basics	**Facility component design**	**Site related properties**	**Suitability of repository and site**
Nature of uncertainty	Borders of knowledge	Readiness “gap”	Knowledge “gap”	Confidence “gap”
Type of work	Underlying research	Adaptation of technologies to site conditions	- Data synthesis & evaluation - Site modelling	Site selection & disposal system development
Work needed	**Practical experience & analogues**	**Testing & demonstration**	**Safety case development**	**Qualification of site & repository design**

Addressing of “uncertainties” in the planning & performance of comprehensive RD&D programs

	Scientific basis	Technical components	Site properties	Safety case development
Nature of uncertainties	“Borders” of knowledge	Readiness “gap”	Knowledge “gap”	Level of “total” uncertainty arising from scientific-technical fields & site condition
Type of work needed for reducing uncertainties	- Verification of theories and models - Hypothesis testing - Analogue studies	- Development of components & technologies in view of safety and licens-ing requirements - Testing under site conditions	-Compilation of site data & site models -Synthesis & evalu-ation of all findings - Adaptation of disposal concepts to site conditions	- Compilation & evaluation of all safety relevant data - Scenario analysis - Sensitivity analysis & performance assess-ment models
Vision related aims	**Update of the state-of-the-art in the main R&D areas**	**Demonstration of functioning with respect to industrial scale operation**	**In-depth site performance & site evolution understanding**	**Definition of safety potential & margins** **Input to RD&D work for further reduction of uncertainties**

The handling of “uncertainties” in the scope of an advanced RD&D program

	Scientific basics	Technical feasibility	Site properties	Safety case
Main uncertainties	Borders of knowledge not defined	Engineering standards for limited time frame	- Heterogeneity of geologic formations - Future evolution	Framing of uncertainties & scenarios
Activities in progress	- Hypothesis testing - Works on models & analogues	Large scale in situ tests & demonstration	- Site survey & data compilation - Data synthesis & evaluation - Site modelling	- Sensitivity analysis - Performance assessment models
Current status regarding licensing by 2025	Sufficient basis exists for safety case & repository design	Testing in URLs in progress	Sufficient knowledge exists for safety case & repository design	- Sufficient safety potential & safety margins -Further reducing of uncertainties
Vision related aims	**Underpinning the robustness of theories and models**	**Establishing safe disposal technologies on industrial level**	**Increase of confidence in long-term safety**	

Key elements of the prioritization process

- Acknowledgement of the state-of-the-art
- Systematic approach in the identification of
  - RD&D issues
  - key topics of common interest
- Stepwise procedure in the prioritization of topics (importance, urgency)
- Transparency and traceability of procedure
- Monitoring of decisions
- Monitoring of stakeholders concern / advice

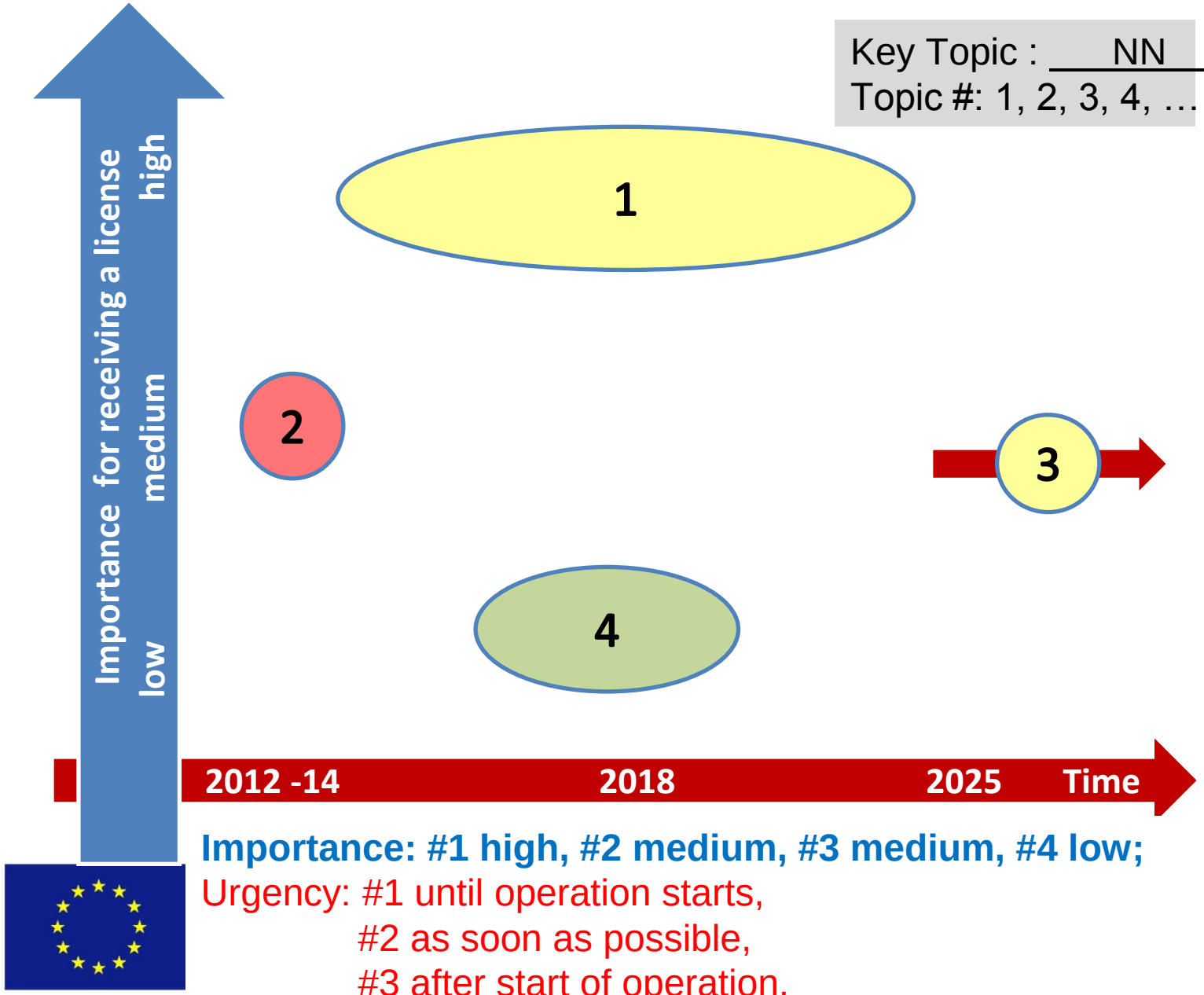
Structure of the **Prioritization Process**

1) Checking of WMOs programs for their specific RD&D issues and **compilation of the issues** important to WMOs
2) Overall **classification of main areas of issues** in view of their importance to Vision 2025
3) Detailed analysis of major trends in RD&D with **identification of common interests and common needs**
   (Brussels seminar: check up and input from stakeholders)
4) Definition of key topics and **prioritisation of topics** for vision related strategic RD&D
   (Paris exchange forum: consultation of participants, information of stakeholders)
5) **Finalization** of the **S**trategic **R**esearch **A**genda, followed by the development of the deployment plan

Key Topics – the basis of the SRA

- Safety case
- Waste forms and their behaviour
- Technical feasibility and long-term performance of repository components
- Development strategy of the repository
- Safety of construction and operations
- Monitoring
- Governance and stakeholder involvement

Key Topic : NN
Topic #: 1, 2, 3, 4, ……



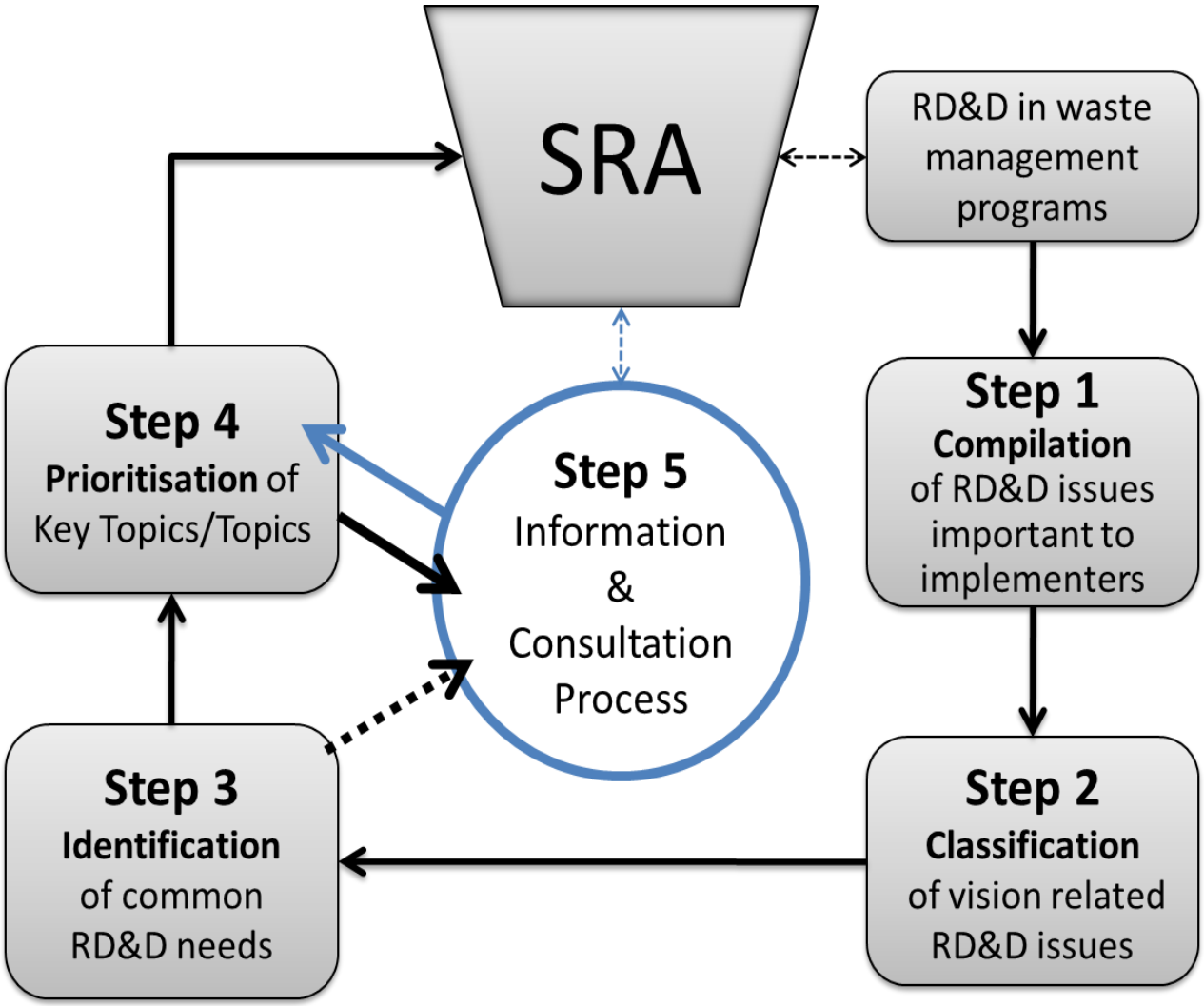
Importance: #1 high, #2 medium, #3 medium, #4 low;

Urgency: #1 until operation starts,
#2 as soon as possible,
#3 after start of operation,
#4 before licensing starts

Cross-cutting issues are important

- relevant to every program, at any stage -

- Dialogue with regulators,
- Competence maintenance,
- Education and training,
- Knowledge management (incl. information preservation, memory keeping),
- Communication and other activities supporting information exchange.



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