# EURAD Strategic Research Agenda and Deployment

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# Items for discussion

1. Introduction **EURAD Strategic Research Agenda/Roadmap**
2. What is the **EURAD SRA** ?
3. How has the current SRA been **developed**?
4. When will the SRA be **updated**, for what purpose and according to which **methodology**?
5. How has the **EURAD1 first wave of WPs** been **selected**?
6. When will the **WPs for the 2nd wave** be selected, according to which methodology?

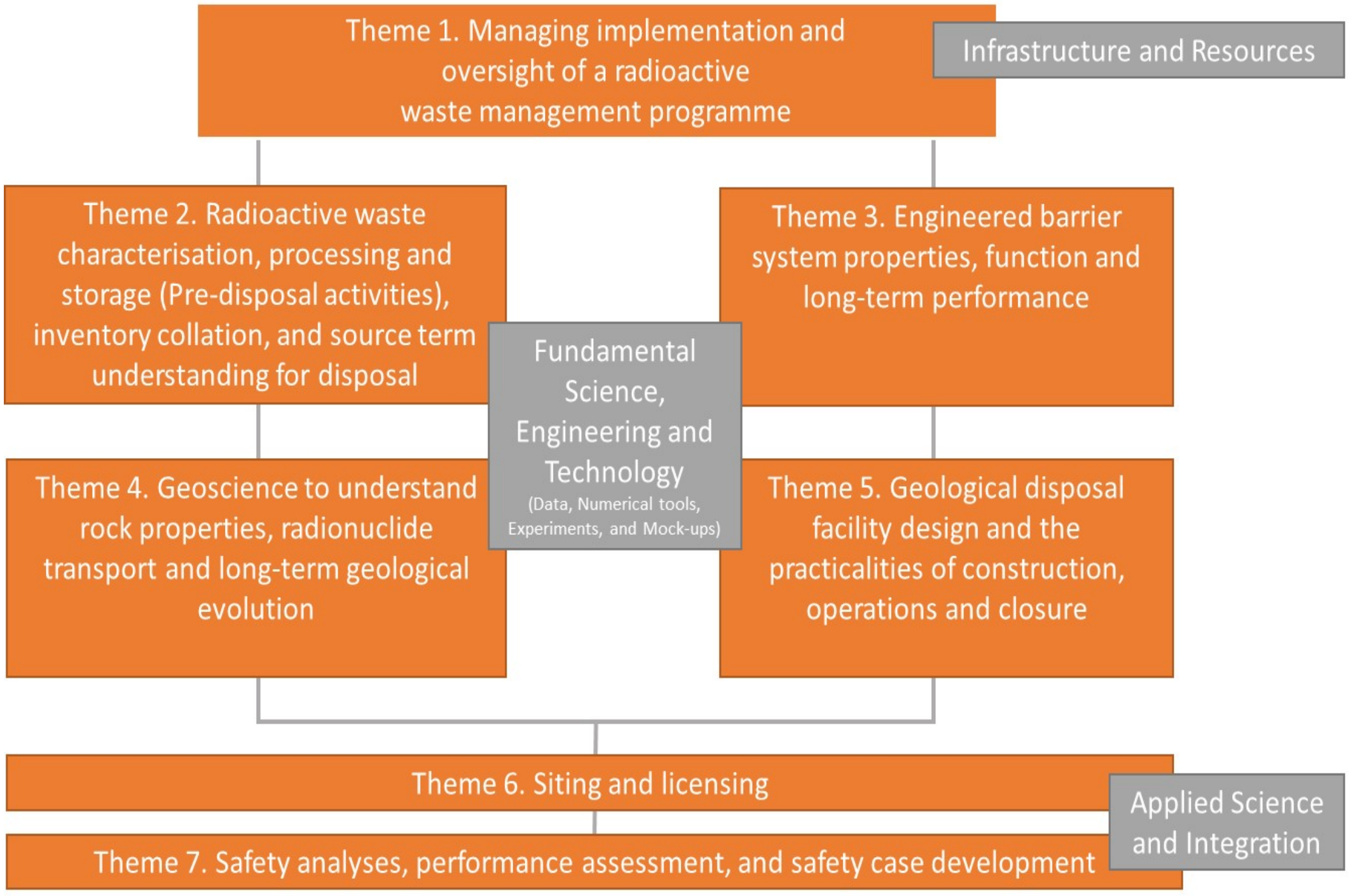
# 1. EURAD SRA and Roadmap

- EURAD **Strategic Research Agenda (SRA)** and **Roadmap**:
  - Main outputs of more than 3 years of collaborative efforts between WMO, TSO, RE and CSOs to develop and document RD&D aspects as well as strategic issues and knowledge management needs that would benefit from enhanced cooperation within EURAD Community.
  - Activities are :
    - grouped into 7 themes ;
    - prioritised using H/M/L-level of common interest; and
    - Integrated in the Roadmap that show how they relate to the different phases of implmenetation of a waste disposal programme
  - Both SRA and Roadmap are living documents, to be updated periodically to integrate emerging collaboration needs and RD&D results

# 1. EURAD Strategic Research Agenda (SRA)

- Exclusions and boundary conditions:
  - The SRA is not an exhaustive list of all RD&D needs, initiatives or active work within Europe – it is focussed only on scope considered suitable for Joint Programming between WMOs, TSOs and REs;
  - The SRA does not describe RD&D needs of individual Member States' RD&D Programmes;
  - It integrates RD&D / Strategic Studies/ KM to avoid silo mentality;
  - It intentionally avoids delineation of activities according to rock types (e.g. clay/hard rock/salt systems) or disposal concept to enhance cross-fertilisation between established communities of practice for specific areas of scientific and technical competence;
  - Scope is not prioritised according to a specific time (e.g. IGD-TP 2025 Vision), rather it aims to be a balanced programme and meet the needs of both advanced and early-stage programmes / small and large inventories.

# 1. EURAD SRA: Scientific Themes



# 1. EURAD SRA: Structure & Content

## Adopted SRA Format (see p28 – 65 of Founding Documents File on USB)

- Tables of Priorities & Activities of Common Interest (showing each JOPRAD RD&D sub-task, H/M/L) and Enabling KM, Strategic Studies and other Cross-cutting activities
- 1 Page description on active work (H2020 or EJP 1st Phase)

**Priorities to be addressed:**

| | |
|---|---|
| **Scientific Theme 2: Engineered barrier system (EBS) properties, function and long-term performance** | • **Improved understanding of the interactions occurring at interfaces between waste packages and different barriers in the disposal facility.**<br>- Expected outcomes and impact: Knowledge of the physical and chemical transformations at the interface between waste packages and different barriers and materials and development of pore-scale models describing the impact on radionuclide migration and fluid transport, potential clogging in bentonite/cement or host-clay/cement interfaces, or increase in porosity in other interfaces under real repository conditions (J1.2.1/High).<br>- Opportunities for cooperation: ? |
| | • **Developing alternative HLW and Spent Fuel container material options and improved demonstration of their long-term performance.**<br>• Expected outcomes and impact: Identification of alternative container materials or coatings beyond combined copper/cast iron or carbon steel, suitable for fulfilling container safety functions in current disposal systems and suitable for packaging novel wasteforms (J1.2.3/Medium).<br>• Opportunities for cooperation: Check for EU-wide waste producers forum? |
| | • **Characterised bentonite / clay-based material evolution under specific conditions to provide data on hydro-mechanical, thermal and chemical behaviour.**<br>• Expected outcomes and impact: Enhanced understanding of post-closure safety considerations of bentonite and clay based materials by extensive characterisation of different phenomena, including variations of properties arising from barrier installation, hydration history, elevated temperatures and chemical influences on long-term evolution behaviour (J1.3.1/High).<br>• Opportunities for cooperation: EC BENIPA and BELBaR project |
| | • **Improved chemical and microbial data to better quantity gas generation and the consequences of microbial processes.**<br>• Expected outcomes and impact: Improved mechanistic understanding, rather than bounding assumptions, to quantify kinetics of microbial catalysis of both gas consumption or gas production reactions, and the competition between them, and improved understanding of the topological description of rock surfaces interacting with gases (J1.3.2/High) |

**Enabling Knowledge Management activities that relate to Scientific Theme 2: Engineered barrier system properties, function and long-term performance**

- **Guidance on the use of clay-based materials in a geological disposal facility:** To understand the properties and performance of different clay-based materials depending on their origin or mineralogy (1.3.1/High).
- **State of knowledge on low pH cement understanding:** To consolidate existing knowledge on low pH cements, including their composition, impact on radionuclide migration and practical implementation (1.3.4/Medium).

**EJP-RWMD Actions addressing this Scientific Theme 2:**

There are several ongoing EC projects that will provide information and knowledge to support understanding of the Engineered Barrier Systems. The H2020 call supported the BEACON project running from 2017-2021 which will develop and test the tools necessary for assessment of the hydro-mechanical evolution of an installed bentonite barrier and its resulting performance in a disposal facility. Now that several European national programs are moving towards licensing, construction and operation of repositories, verification of EBS component behaviour is of high common interest.

Therefore within BEACON, cooperation between design and engineering, science and performance assessment experts is planned in order to verify the performance of current designs for buffers, backfills, seals and plugs as part of the EBS.

Completing in 2019, the CEBAMA project addresses key issues of relevance for long-term safety and key scientific questions related to the use of cement-based materials in nuclear waste disposal applications. It includes materials used as waste forms, liners and structural components as well as sealing materials in a broad variety of applications. It aims to provide insight on general processes and phenomena and to develop a model for predicting the transport characteristics such as porosity, permeability and diffusion parameters of cement-based materials in contact with the engineered and natural barriers of repositories in crystalline and argillaceous host rocks.

Within the EJP first phase, a work package is included to understand the influence of temperature on clay-based material behaviour – HOTCLAY. Both clay host rock and bentonite buffer and their behaviour at high temperature are included (ranging from 100 °C to ~150°C. Mechanical behaviour is the focus area, with an overall objective to evaluate whether an increase of temperature is feasible and safe. The programme of work will aim to provide results that are applicable to a wide range of buffer material and clay host rock, which can be useful for different national programmes.

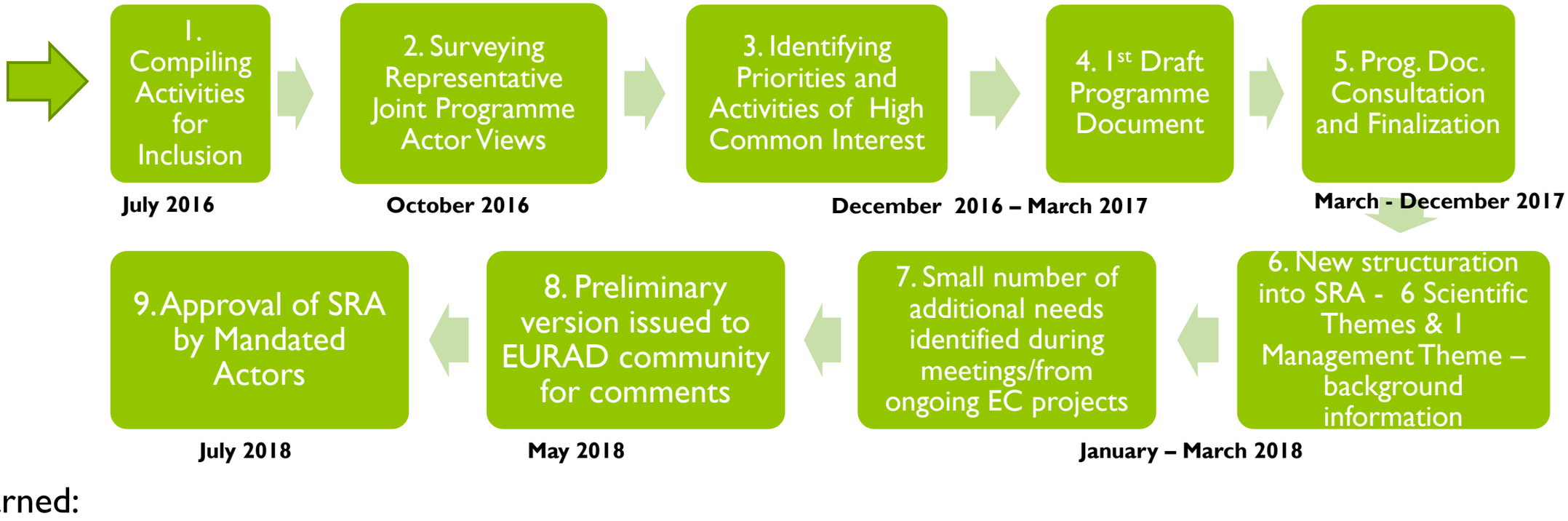
Add prioritised Knowledge Management tasks, or extract from above WP descriptions once mature.

# 2. SRA Staged Development (2013-18)

- EURAD Strategic Research Agenda (SRA) has been developed in a step-wise manner:
  - Step 1 - taking over entirely the scope developed by TSOs, WMOs, REs and CSOs within the EC JOPRAD Project (See D4.4 Programme Document)
  - Step 2 – enhanced and improved with:
    - a new structure: 6 Scientific Themes & 1 Management Theme
    - revision of the sub-topic titles and a small number of additional needs identified during meetings or by ongoing EC projects and approved for inclusion between the key contributors of the JP.

The detailed methodology used for both of these steps is described fully in Annex 2 of the Founding Documents.

# 2. Method for EURAD SRA Development

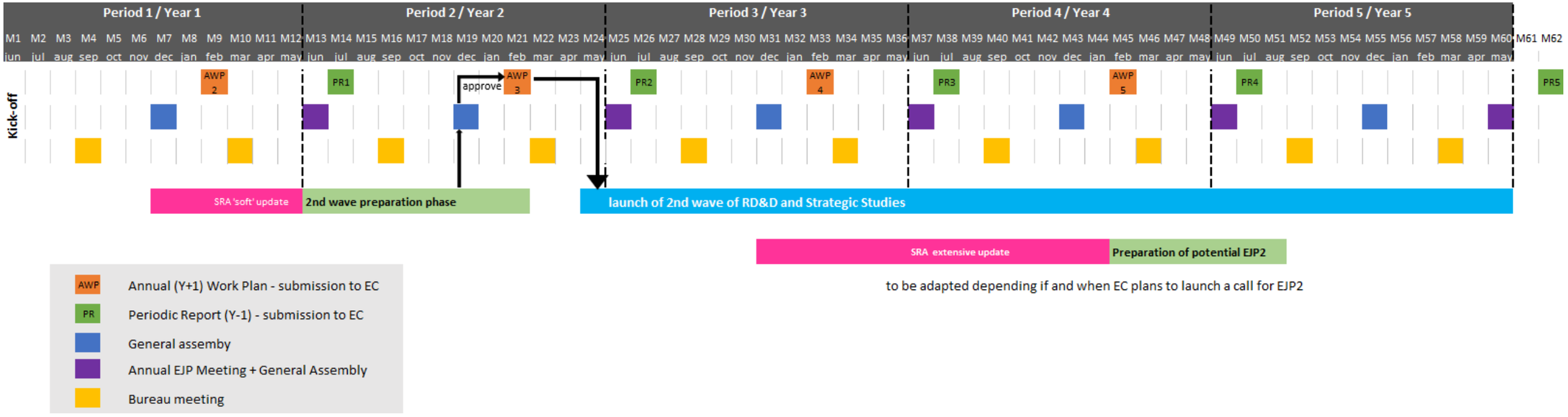



What we learned:

- Step 1: Compilation of activities by WMOs/TSOs/REs/CSOs was done in a different way with a different level of details (e.g. WMO list was pre-screened and done at a higher resolution) – For future EURAD SRA updates, clearer guidance is needed to ensure approaches used are more aligned (*we have framework now so this will be easier going forward*).
- Step 2: We elicited a lot of qualitative information from each organisation, it took a long time for responders to fill in the sheets, and was overly complicated – In future, a more efficient feedback will be possible via each of the Colleges, and we now have a common SRA.
- Step 3: Activities had to be supported by at least two of the three 'actor groups' – this worked well to screen-out activities specific to one group.
- Step 3/4/5: Activities were identified of low-common interest, but remained – could consider removal of these in the future as part of refinement/soft update.
- Step 6/7/8/9: With actors being officially mandated, iteration tend to be much easier and efficient

# 3. EURAD SRA update -Timing

- SRA = living document
- During EURAD1, 2 updates are foreseen:
  - **Soft-update** – by June 2020
    - To coincide with development of the second wave of RD&D / Strategic Studies WPs in EURAD1
  - **Extensive update –** June 2022 - 2023
    - To coincide with development of potential EURAD2

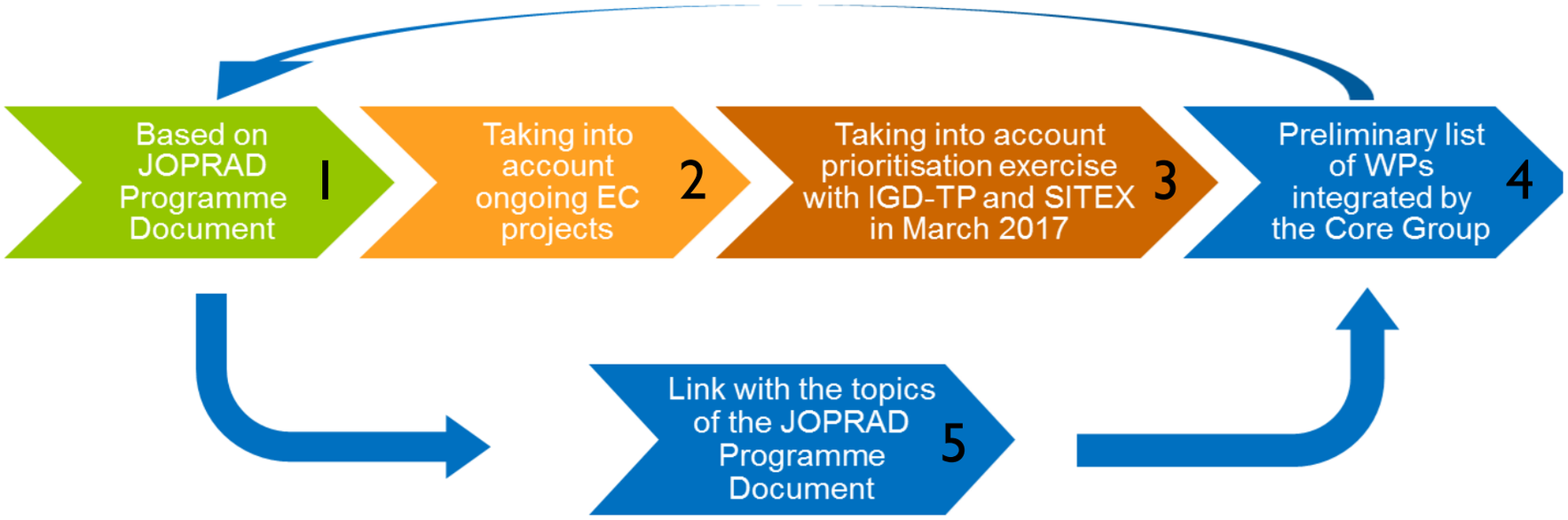


# 3. EURAD SRA update - proposed methodology

- **Soft-update**:
  - Replace JOPRAD numbers with new EURAD numbering system;
  - Remove activities of low common interest;
  - Assess the level of common interest for topics that emerged lately (after JOPRAD)
  - Integrate relevant outputs from Roadmap extension exercise (June 2019-June 2020),e.g. complete sections on *cooperation and relevant past projects*
    - Competence Matrix; mapping of existing KM initiatives/identification of key needs gaps),
    - to make minor edits and additions / Managed by PMO and approval and dissemination at GA

- **Extensive update**
  - Colleges to continue independent development and exchange to enable clear articulation of their consensus view on future priorities (e.g. IGD-TP EF, maintenance of their SRAs, etc.)
  - Each College to recommend own edits/additions to SRA at GA
  - Edits/additions may concern modification of the Scientific Themes/ update of the topics/sub-topics/ update the ranking of level of common level of interest
  - Taking into accounts needs for collaboration emerging from RD&D/ Strategic Studies WPs / from Member-States, etc.
  - RD&D needs may arise from e.g. regulatory challenge or even from local host communities.
  - Process needs to be decided

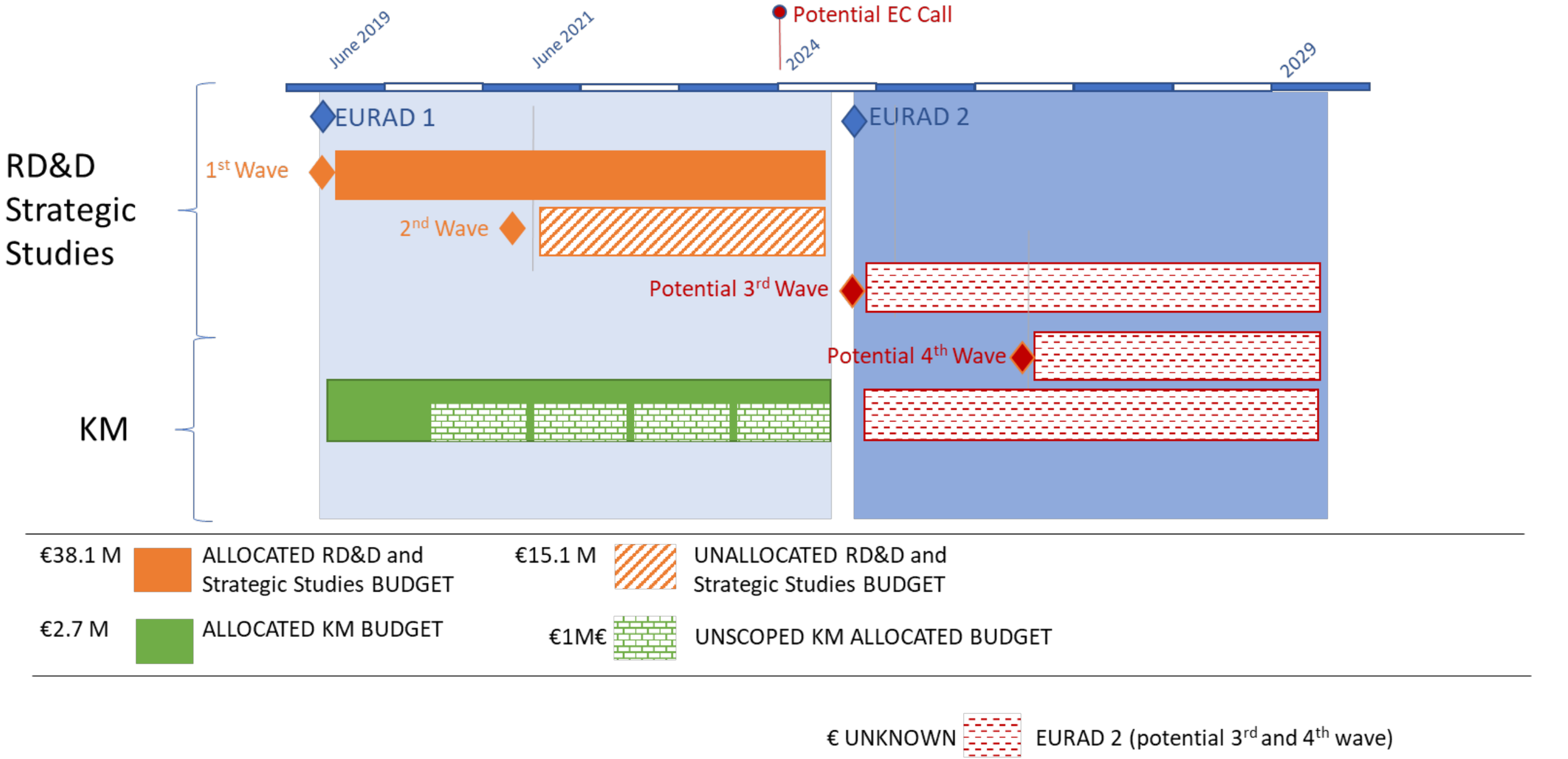
# 4. EURAD1 WPs selection – Method used for 1st wave




What we learned:

- Step 2: necessity to avoid overlap with existing ongoing projects/initiatives (EURATOM/IAEA…).
- Step 3: It was important to adopt a **top-down approach** to allow WMO/TSO College to act **independently** and propose their consensus view of priority WPs – This avoided the need for a bottom-up questionnaire.
- Step 4/5: integration of the propositions by the core group (incl. check alignment with Programme Document - at this time SRA was not issued), proposition to add the ROUTES WP to address discussions/needs of small/early stage programmes – list of WPs approved by all actors after two review exercises done by each college and the CSOs.

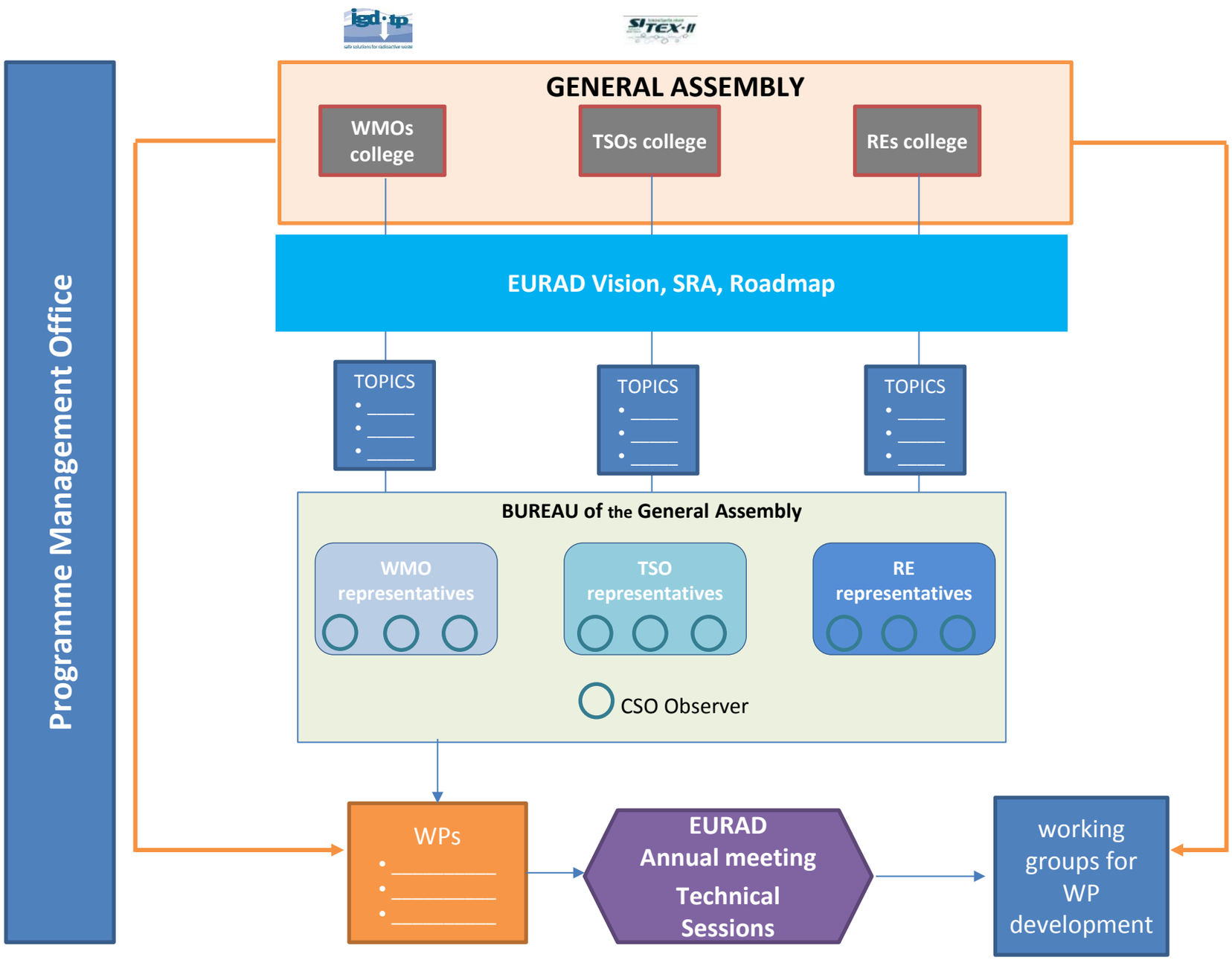
# 5. EURAD Terminology: Budget Cycles and Allocations



# 5. EURAD1 WPs selection – Method proposed for 2nd wave

| | |
|---|---|
| **June 2019** | Launch of EURAD1 |
| **January 2020** | Bureau (WMO/TSO/RE nominated representatives) will collect needs/topics from **SRA/Roadmap** of their respective college for **2nd wave of RD&D** (available budget: 13,7M€) **and Strategic Studies** (available budget: 1,4M€) and forward them to PMO. |
| **February 2020** | PMO compiles inputs from colleges, check strong alignment with **SRA/Roadmap** and send a consolidated document as material for discussion at Bureau meeting |
| **End of February/ early March 2020** | Bureau to issue a **list of WPs**<br>*Approval by General Assembly?*<br>*Or General Assembly delegates this approval to the Bureau?* |
| **June 2020** | EURAD Annual Meeting with **Technical sessions** dedicated to each WP |
| **September 2020** | Bureau Meeting: on the basis of Technical sessions outputs, Bureau to elaborate on: **WP scope, scope breakdown, budget, WP Leader and Coord. team** (trio: proposed by Colleges to guide WP development) |
| **September 2020 - February 2021** | **Scientific/technical development of WPs:**<br>• October/November 2020: **1st draft of WP descriptions**<br>> **Review** by PMO/Bureau/General Assembly representatives<br>• December 2020: General Assembly: presentation of the WPs, how they take into account review > **Go/No-Go for the continuation of WP development**<br>• End of February 2021: **submission** to EC (via a request for amendment of the Grant Agreement) |
| **June 2021** | June 2021: if approved**, launch of WPs** |

# 5. EURAD1 WPs selection – Method proposed for 2nd wave



# Thank you for your attention!