

TOSCA TOXIC SUBSTANCES& CHEMICALS BEHAVIOUR ASSESSMENT

Benjamin FRASCA – ANDRA
Anke NEUMANN – PSI

Strategic Study



Co-funded by the European Union under Grant Agreement n° 101166718

WHAT IS TOSCA?



Strategic study on addressing non-radiological toxicity in repository safety



26 partners
16 countries
EUG members – *opening soon*



Total budget 1M€



2 years

CONTEXT

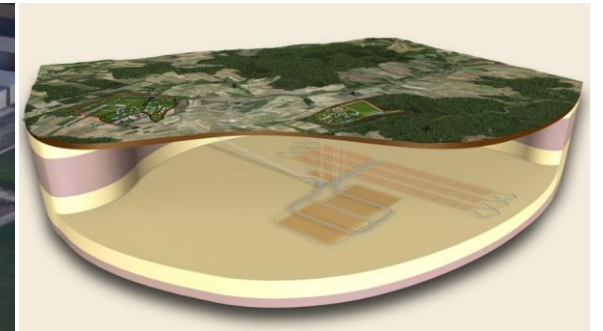
Repositories are primarily intended to afford protection against radiological hazards

BUT:

- the Safety Case must also demonstrate the safe disposal of any associated **non-radioactive, toxic substances**
- keep up with new environmental regulations (e.g., emerging contaminants) and potential new waste streams



*Example of a repository for **surface disposal***



*Example of a deep **geological repository***

OBJECTIVE

in a **strategic study**, collate current knowledge and identify existing gaps regarding toxic chemicals.

- source terms
- behaviour in engineered barriers and the geosphere, and
- interactions with the biosphere (including impact to humans)

TOSCA CONSORTIUM

- 26 partners
 - 10 RE
 - 7 TSOs
 - 8 WMO
 - 1 Civil Society Organization
 - Including 2 Associated Partners (from the UK)

- 16 countries – including 4 SIMS

COUNTRY		
Austria	Germany	Spain
Belgium	Hungary	Switzerland
Czech Republic	Italy	UK
<i>Europe</i>	Netherlands	Ukraine
Finland	Poland	Finland
France	Slovenia	



SCOPE – OVERVIEW OF PROPOSED TASKS



Task 1: Management & coordination / Task 2: Knowledge Management



Task 3

Determination of the **SOURCE TERM**
of toxic chemicals from different
wastes



COVRA_{NV}

Task 4

BEHAVIOUR of toxic
substances in the **BIOSPHERE**
(impact to human and non-
human biota)



CEPN

Task 5

BEHAVIOUR (solubility,
sorption, reactivity...) of toxic
substances in **GEOSPHERE**

AMPHOS²¹



eurad 2

TASIS
FROM

Aim to provide a clear view on the most concerning toxic chemicals and the current needs to better characterise them

- **3.1 Source term of toxic chemicals**
 - Inventory of toxic chemicals in radioactive waste
 - covering inorganic, organic and emerging substances,
 - Analyse and prioritise chemicals of greatest concerns

- F[C@H](F)[C@@H](F)C(F)(F)C(F)(F)C(F)(F)C(F)(F)C(=O)O



- **3.2 Characterisation**
 - Review characterisation methods & technologies
 - identifying and quantifying toxic chemicals in radioactive waste
 - Assess their performance and limitations across diverse waste matrices

- 

- **3.3 Mutual understanding on key uncertainties**
 - Map key uncertainties & challenges
 - Foster cross-cutting dialogue & identify priorities

- eurad 2

TASK 4 - ENVIRONMENTAL IMPACT



Address impacts on humans and non-human biota and contribute to identifying knowledge gaps and methodological needs

- **4.1 Impact on human health**

- Review human health impacts of priority toxic chemicals and relevant degradation products
- Compile & compare toxicity data and assessment approaches

- **4.2 Interactions with non-human biota**

- Review ecotoxicological effects of toxic chemicals
- Assess environmental impacts & existing approaches

- **4.3 Impacts assessment in perspective – biosphere**

- Translate results into insights relevant to safety & environmental assessment and safety function
- Support communication with end-users and Civil Society



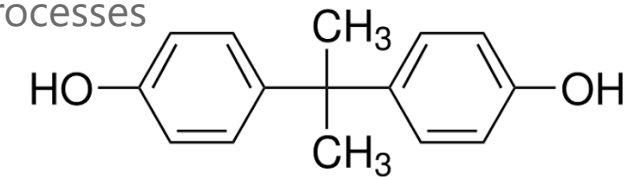
TASK 5 - BEHAVIOUR OF TOXIC SUBSTANCES IN THE GEOSPHERE



Review of knowledge about the behaviour of toxic substances in the geosphere and engineered materials, and the identification of knowledge gaps

- **5.1 Chemical behaviour of toxic contaminants**

- Assess speciation, solubility, complexation and transformation / degradation processes
- Identification of key uncertainties and data gaps



- **5.2 Interactions with natural & engineered barriers**

- Evaluate retention, transport and contaminant–barrier interactions
- Assess potential impacts on barrier integrity and performance
- Build on 5.1 results and identify key uncertainties and data gaps



- **5.3 Implications for safety assessment**

- Translate results into insights relevant to safety & environmental assessment and safety functions
- Support communication with end-users and Civil Society



EXPECTED OUTCOMES

- Overview of **potential source terms** of toxic chemicals in radioactive waste repositories, including contaminants of emerging concern and from potential future waste streams.
- Identification, critical assessment, and prioritization of **data gaps** relevant to the consideration of non-radiological toxicity in safety assessments.
- Identification of the **R&D actions needed** to address the behaviour and potential impacts of these substances within repositories.
- Propose an evidence-based approach for integrating non-radiological toxicity into repository safety assessments and contribute to **strengthen trust among all stakeholders**.



Thank you for your attention