

MIND

Microbiology In Nuclear waste Disposal

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Start

IGD-TP EF4 (2013) in Prague



→ Working Group on Microbial Processes

EF4 - Conclusions

- Microbes are everywhere including the underground – the deep biosphere
- Microbial life change chemical equilibria.
- Microorganisms influence and change the geochemical environment, e.g. pH, Eh

BUT

Microbial processes are missing in the current strategic research agenda

→ Request for TSWG

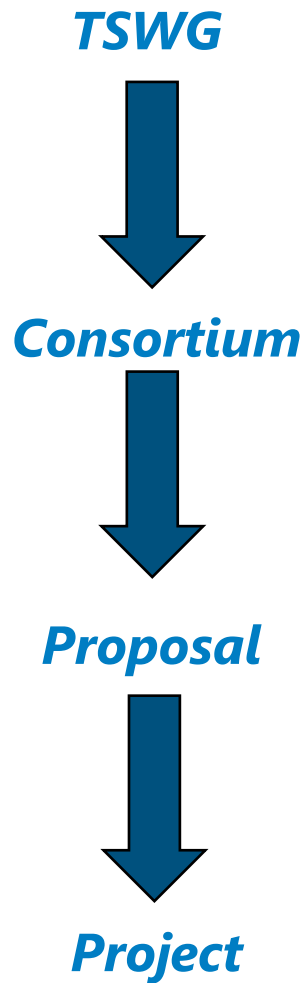
TSWG Mission

Scrutinize SRAs and Work Programmes

- WMO needs and wishes
- **EURATOM** 2014-2015 Work Programme topic NFRP6:
"Supporting the implementation of the first-of-the-kind geological repositories"
- **IGD-TP** Strategic Research Agenda
 - Key Topics of '*high importance and urgency*' in which microbial processes are considered an uncertainty

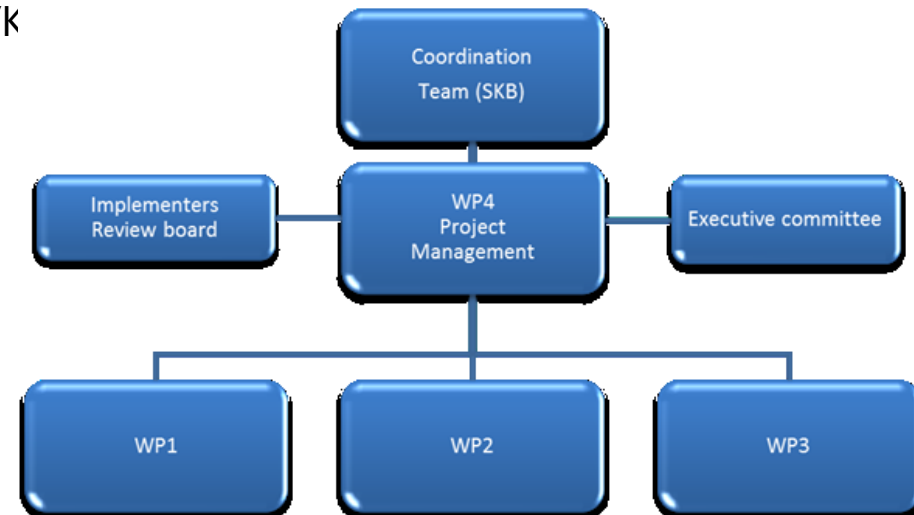


Evolution

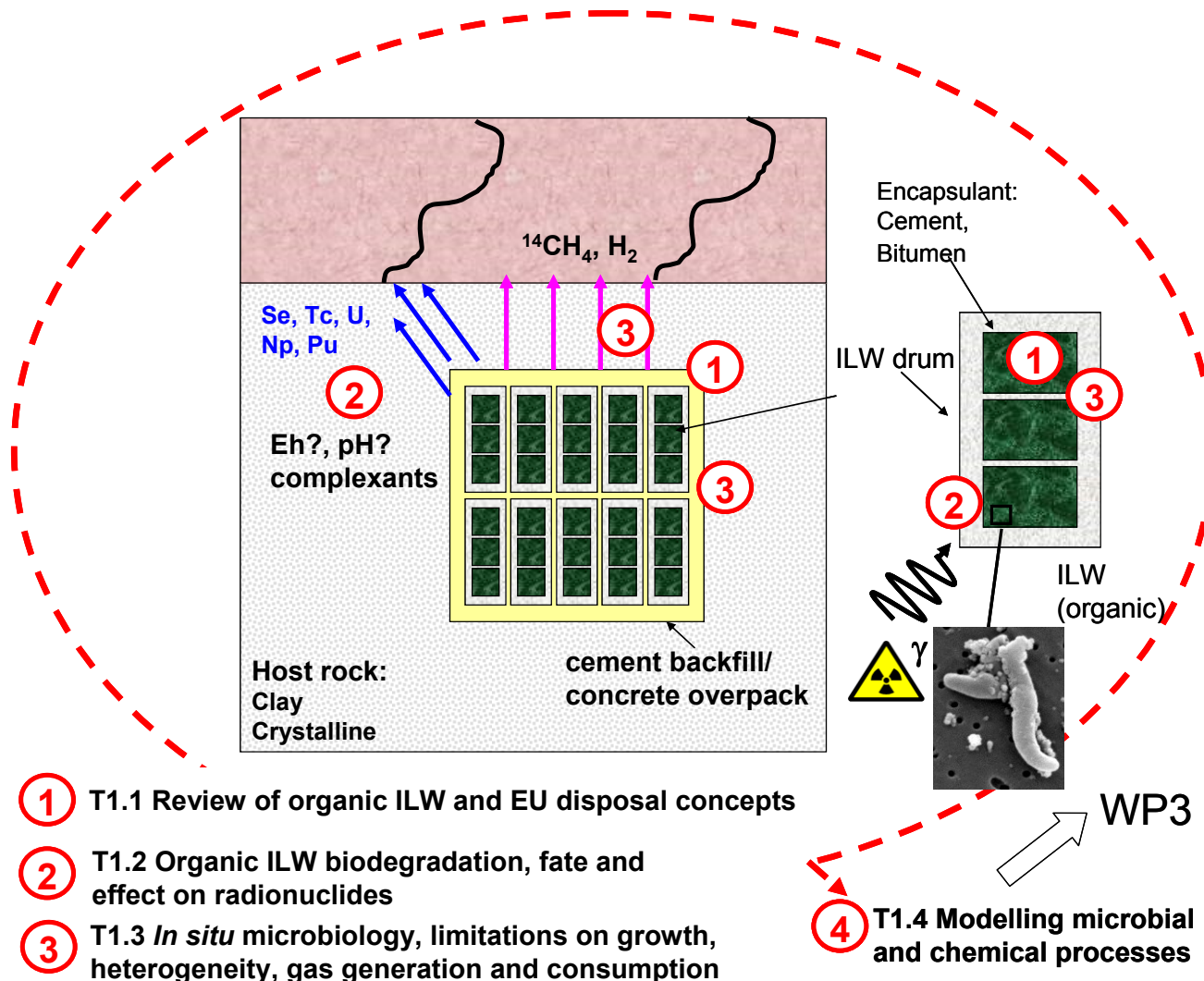


Work Packages

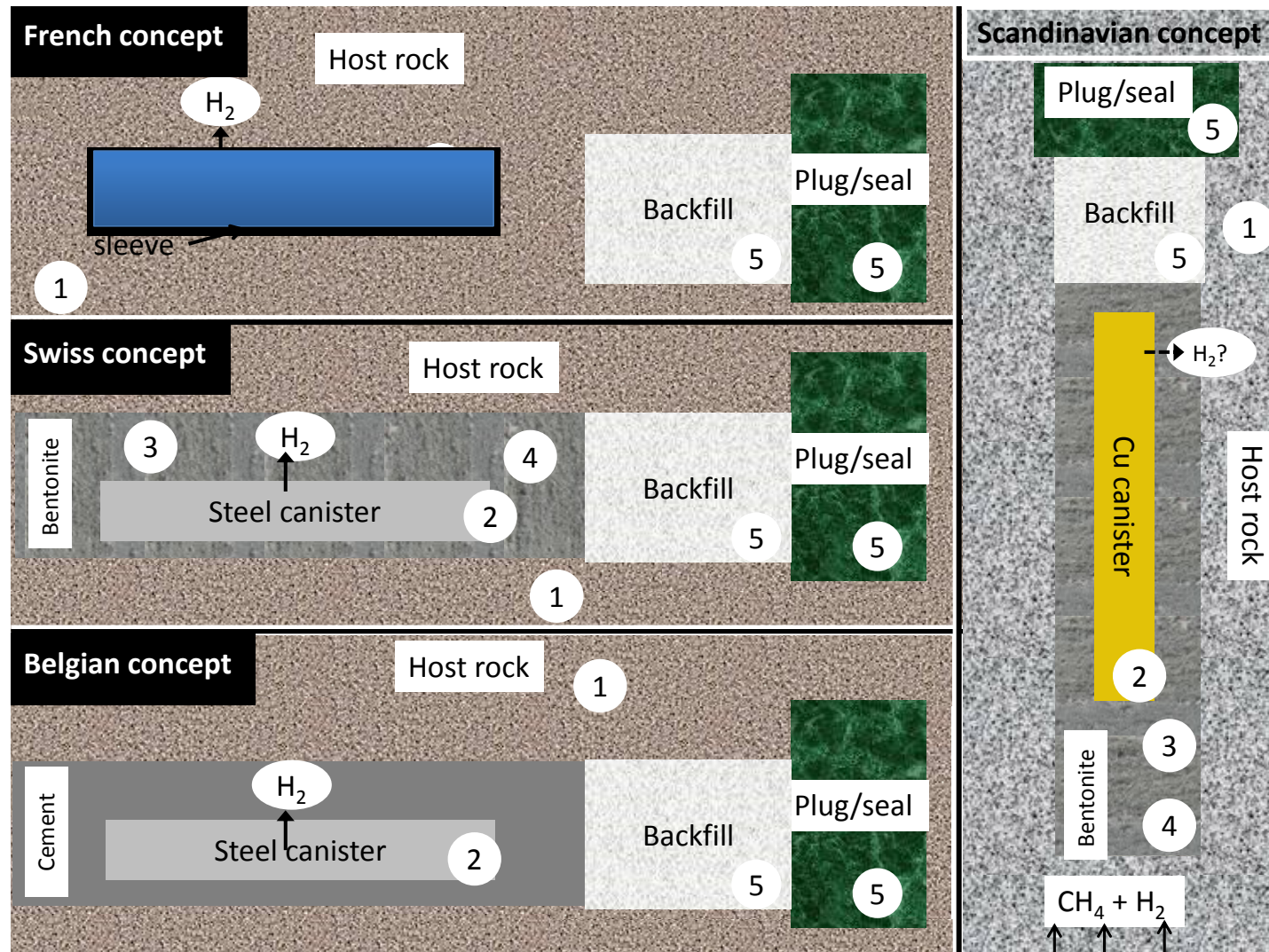
- **Key Topic 2:** "Waste forms and their behaviour"
 - **Work Package 1** ~ILW
 - Lead: NNL (UK, Joe Small)
- **Key Topic 3:** "Technical feasibility and long-term performance of repository components"
 - **Work Package 2:** ~HLW
 - Lead: MICANS (Sweden, Karsten Pedersen)
- **Work Package 3:** Integration, communication and dissemination
 - Lead: SCK•CEN (Belgium, Natalie Leys/k)
- **Work Package 4:** Management
 - Lead: SKB (Sweden, Petra Christensen)
- Implementer Review Board
- Executive committee
(NNL, MICANS, SCK•CEN, SKB)



WP1: Tasks



WP2: Tasks



Activities: Example

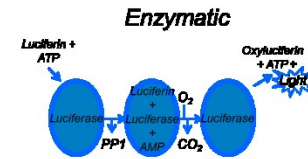
ILW Bitumen Biodegradation (WP 1, part of Task 1.2)

- Solid phase bitumen
- Low molecular weight organic leachates from bitumen
- Host rock water
- Nitrate/ Nitrite/ Sulphate
- High pH
- Host rock microbial inoculum



Incubation at 30 °C during 3 months

Analyses



Molecular



Microscopic



Chemical



Outcome

• Biodegradation or protection mechanisms

e.g. nitrate reduction, calcification...

• Intermediate and end products

e.g. N₂, biogenic acids

• Reaction kinetics and rates

e.g. [CO₂] / month, lag phase

• Boundary conditions

e.g. pH, energy sources

• Microbial community patterns

e.g. surface colonization, dominant species

HLW Cement Biodeterioration or Protection (WP2, Task 2.5)

- Cementitious materials
- Backfill materials
- Plasticizers
- Young and old cement water
- Host rock water
- Bicarbonate
- Host rock microbial inoculum



Incubation at 30 °C during 3 months

WP3 Objectives

Task 3.1

*Synthesis, evaluation,
abstraction and integration*



Task 3.2

*Expert conceptualization
and public perception*



Task 3.3

*Knowledge and
information exchange*



Partners

- SKB, **Sweden**, represented by Birgitta KALINOWSKI and Petra CHRISTENSEN
- MICANS, **Sweden**, represented by Karsten PEDERSEN
- National Nuclear Laboratory Limited, **United Kingdom** represented by Joe SMALL
- SCK•CEN, **Belgium**, represented by Natalie LEYS, proxy Katinka WOUTERS
- Natural Environment Research Council, British Geological Survey, BGS, **United Kingdom**, represented by Simon GREGORY
- VTT, **Finland**, represented by Merja ITÄVAARA
- TUL, **Czech Republic**, represented by Alena SEVCU, proxy Miroslav ČERNÍK
- CV REZ, **Czech Republic**, represented by Petr POLIVKA
- GTK, **Finland**, represented by Lasse AHONEN
- Universidad de Granada, **Spain**, represented by Mohamed MERROUN
- HZDR, **Germany**, represented by Thuro ARNOLD
- TVO, **Finland**, represented by Tuire HAAVISTO
- POSIVA, **Finland**, represented by Tiina LAMMINMÄKI
- University of Manchester, **United Kingdom**, represented by Jon LLOYD

