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M I N D

Microbiology In Nuclear waste Disposal

(GRANT AGREEMENT: 661880)

DELIVERABLE D4.2
Project Presentation (PP)
Compilation

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Date of issue of this report: 15.09.2015

Report number of pages: 5 Pages
2 Appendices

Start date of project: 01/06/2015

Duration: 48 Months

This project has received funding from the Euratom research and training programme 2014-2018 under Grant Agreement no. 661880		
Dissemination Level		
PU	Public	PU
PP	Restricted to other programme participants (including the Commission)	
RE	Restricted to a group specified by the partners of the MIND project	
CO	Confidential, only for partners of the MIND project	

1 Project Information

Website address: www.mind15.eu

Project type: Collaborative project

Project start date: 01/06/2015

Duration: 48 months

Total cost: EUR 4 712 985

EC contribution: EUR 4 160 234,50

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Partners (see Annex 1)

Date of issue of this report: 2015-09-15

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2 Introduction and main aim of the project

By 2015, three Member States (Finland, Sweden, possibly also France) should have submitted an application for authorisation to build and operate an underground repository, in particular for high level and long-lived radioactive waste and spent fuel. The EU Implementing Geological Disposal of Radioactive Waste Technology Platform (IGD-TP) has developed the vision, “that by 2025, the first geological disposal facilities for spent fuel, high-level waste and other long-lived radioactive waste will be operating safely in Europe” (Vision 2025). The IGD-TP has developed a Strategic Research Agenda (SRA) that identifies and prioritises the main Research, Development and Demonstration (RD&D) issues that need a coordinated effort over the next years in order to reach the 2025 Vision.

The MIND project is a multidisciplinary project addressing key technical issues that must be tackled to support the implementation of planned geological disposal projects for higher-level radioactive wastes across the EU. Our current understanding of the impact of microbial metabolism on the safety of geological repositories remains tenuous, even though microorganisms may have controlling influences on waste-form evolution *in situ*, multi-barrier integrity and ultimately radionuclide migration from the repository. The MIND project targets a number of “high urgency” and “high importance” topics identified in the most recent IGD-TP Strategic Research Agenda, focusing specifically on the influence of microbial processes on waste forms and their behaviour, and the technical feasibility and long-term performance of repository components.

The project brings together, for the first time, 15 European groups from 8 countries working on the impact of microbial processes on safety cases for geological repositories across the EU, focusing on key questions posed by waste management organisations. The emphasis will be on quantifying specific measurable impacts of microbial activity on safety cases under repository-relevant conditions, thus altering the current view of microbes in repositories and leading to significant refinements of safety case models currently being implemented to evaluate the long-term evolution of radioactive waste repositories.

The project is both unique and important, and will help the EU claim international leadership in the understanding of the impact of microbial processes on radioactive waste geological disposal, and indeed other technological areas pertinent to the exploitation of the subsurface.

3 Organizational structure

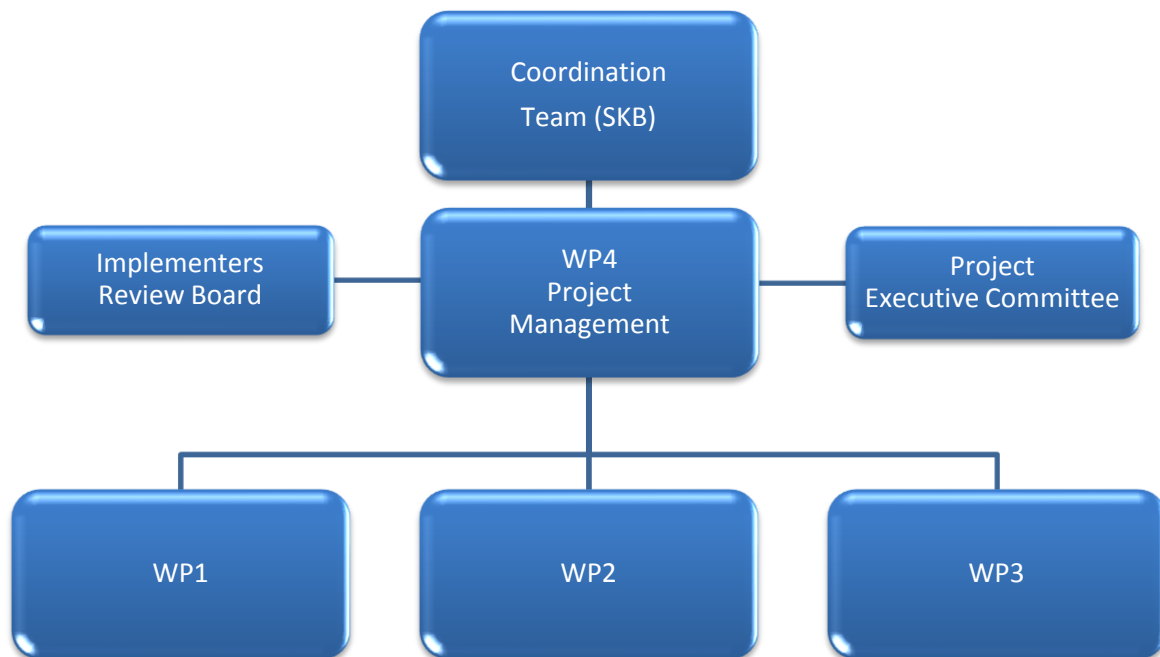


Figure 1. WP1: Improving the geological safety case knowledge of the behaviour of organic containing long-lived intermediate level wastes. WP2: Improving the safety case knowledge base about the influence of microbial processes on high level waste and spent fuel geological disposal. WP3: Integration, Communication and Dissemination. WP4: Project Management.

3.1 Project Executive Committee

The Project Executive Committee (PEC) have one representative from each of the 15 partners and meet at appropriate intervals in conjunction with Project Annual Meetings at the request of the Chair or at any other time when necessary at the request of one of the Parties.

The PEC provides technical guidance and is responsible for the management and financial control, through the Project Coordinator, who is supported by administrative personnel. The PEC has the ultimate responsibility for: all major decisions concerning the demonstration activities (within given time plans and budgets).

SKB convenes the first Project Executive Committee meeting in Brussels on September 3rd, 2015.

3.2 Implementers Review Board

The PEC appoints the members of the Implementers Review Board given the task to advise the PEC in technical matters, mainly soundness and relevancy of the technical approach and assessment of the scientific and engineering standard of the work carried out and produced Deliverables.

A list of representatives invited to the Implementers Review Board will be established at the first project PEC meeting in Brussels on September 3rd, 2015.

3.3 Project Coordinator and Coordination team

The Coordinator together with the Coordination Team is the intermediary between the Parties and the European Commission and performs all tasks assigned to it as described in the Executive Committee-Grant Agreement (EC-GA) and in the Consortium Agreement.

The position of Project Coordinator and the Coordination Team is entrusted to the SKB.

3.4 Work Package Leader

The Work Package Leaders are responsible for overall heading, planning, implementing, running, evaluating, discussing and reporting of the work in the respective Work Package within given mandates.

3.5 Project Annual Meetings

Project Annual Meetings will be organised approximately each twelve (12) months during the course of the Project, with the aim of assessing the progress made and discuss future plans. The Chair of the Project Executive Committee will summon these meetings. The Project Executive Committee appoints the Chair of these meetings.

3.6 Work Plan and Implementation

The MIND project targets a number of high urgency and high importance topics identified in the Strategic Research Agenda, SRA (IGD-TP, 2011), focusing mainly on Key topic 2: Waste forms and their behaviour (WP1) and Key topic 3: Technical feasibility and long-term performance of repository components (WP2).

The Scientific Technical Work Programme is divided into two operative Work Packages and one Work Package concerning data implementation and communication:

WP1

Remaining key issues for the geological disposal of ILW concern the long-term behaviour, fate and consequences of organic materials in the waste along with hydrogen generated by corrosion and radiolysis. The objectives of WP1 consequently are to reduce uncertainty of safety-relevant microbial processes controlling radionuclide, chemical and gas release from long-lived intermediate level wastes (ILW) containing organics.

WP2

Remaining key issues for the geological disposal of HLW concern the factors controlling sulphide production in the geosphere, including man-made artefacts to what extent microorganisms can accelerate canister corrosion in the near-field either by hydrogen scavenging or by sulphide and/or acetate production. Further, it is important to identify conditions (including buffer density) under which relevant bentonites inhibit microbial activity and to understand whether microorganisms can accelerate degradation of bentonite based buffers and influence the long-term behaviour of plug systems and seals.

WP3

The third Work Package focuses on Integration, Communication and Dissemination. In addition WP3 will evaluate and integrate microbial processes towards the conceptualization and performance assessment of geological repositories and in the respective state of the art knowledge base.

The fourth Work Package handles Project Management, WP4.

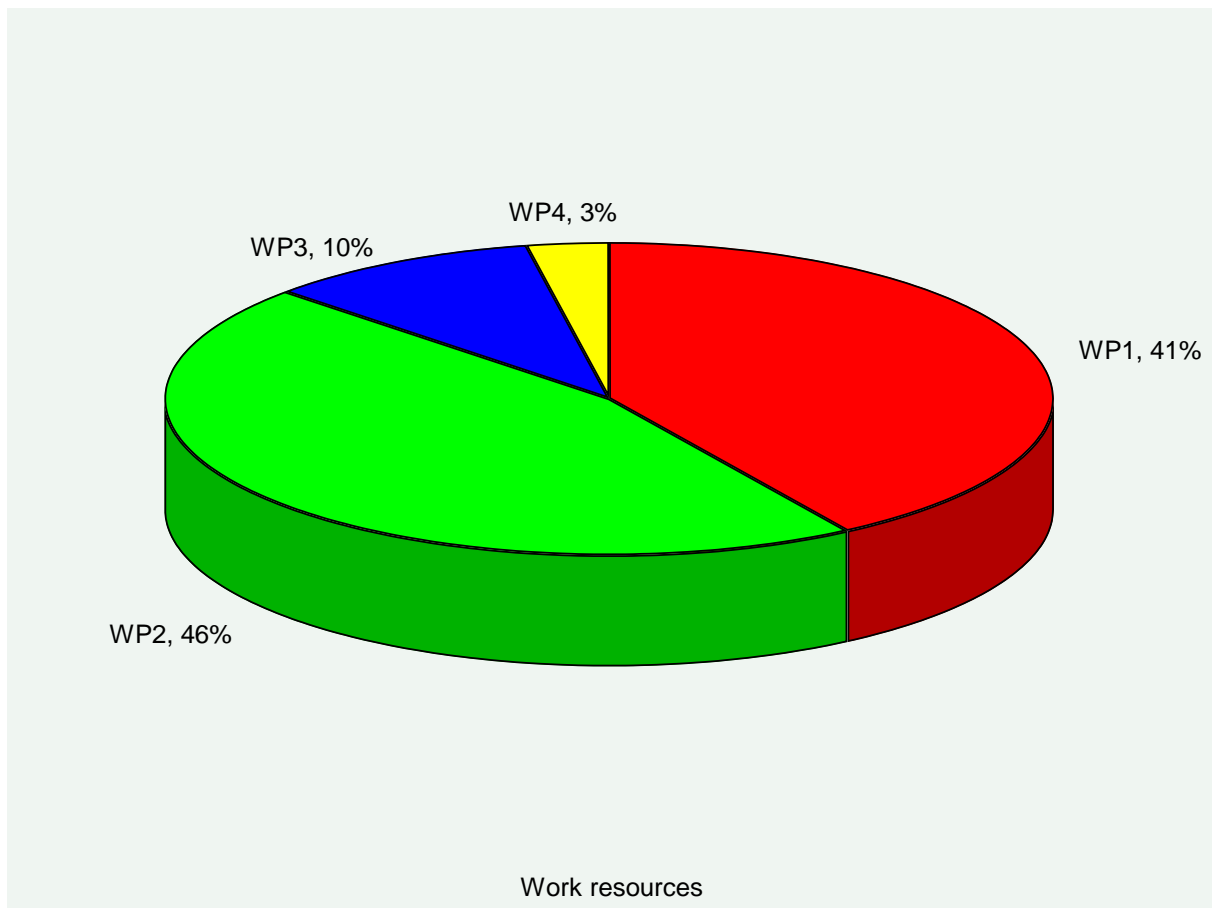


Figure 2. Distribution of work resources between the different Work Packages

3.7 Deliverables

See Annex 2.

3.8 Expected results

The objectives of WP1 are to reduce uncertainty of safety relevant microbial processes controlling radionuclide, chemical and gas release from long-lived intermediate level wastes (ILW) containing organics (SRA key topic 2, subtopic 2). The degradation products resulting from radiolysis and biodegradation of organic wastes will be characterised and their effect on radionuclide transport assessed. The *in situ* conditions (e.g. pH and heterogeneity of ILW) that may limit microbial processes in repository concepts, where cementitious materials are used, will be identified. A better understanding of microbial processes, such as controlling gas generation and consumption that may contribute to the degradation of barriers will be obtained.

In WP2 the objectives are to quantify the contribution of microbially produced sulphide in the geosphere and in buffers and backfill to the overall rate of canister corrosion (SRA key topic 3, sub-topics 9 and 10). There is also a need to gain systematic information on the efficiency of specific bentonite buffer in inhibiting microbial activity.

In WP3 the outcome of the experimental work packages will be distributed to a broad audience, including students, professionals, the scientific community, stakeholders and the lay community via e.g. Euratom Fission and Training Scheme programme PETRUSIII. Synergies of the MIND program and

consortium will be identified and cultivated with ongoing research lines of European laboratories and institutes outside the MIND consortium, with special attention for those in the less advanced member states.

3.9 Dissemination channels

Proper knowledge dissemination will allow the project outcome to benefit society maximally by reaching out to not only to the identified lead users, but also to the field's scientific community, students and professionals, and the lay public, by the most appropriate channels. Multiple tools covering a wide range of formalities are used e.g.: Website, Workshops, Project Meetings, Programme Meetings (IGD-TP), Conference Presentations, Journal articles, Reports and more.

Appendice 1. Partners

Partner (no.)	Participant organisation name	Country
1.	Swedish Nuclear Fuel and Waste Management Co, SKB	Sweden
2.	Microbial Analytics Sweden AB, MICANS	Sweden
3.	National Nuclear Laboratory Limited, NNL	United Kingdom
4.	Belgian Nuclear Research Centre, SCK•CEN	Belgium
5.	Natural Environment Research Council, British Geological Survey, BGS	United Kingdom
6.	Teknologian Tutkimuskeskus, VTT	Finland
7.	Ecole Polytechnique Federale De Lausanne, EPFL	Switzerland
8.	Technická Univerzita V Liberci, TUL	The Czech Republic
9.	Centrum Vyzkumu REZ S.R.O. RCR	The Czech Republic
10.	Geologian Tutkimuskeskus, GTK	Finland
11.	Universidad De Granada, UGR	Spain
12.	Helmholtz-Zentrum Dresden-Rossendorf e.V., HZDR	Germany
13.	Teollisuuden Voima Oyj, TVO	Finland
14.	Posiva Oy, POSIVA	Finland
15.	University of Manchester, UNIMAN	United Kingdom

* List of country codes: <http://publications.europa.eu/code/en/en-5000500.htm#ia5>

Appendix 2. Deliverables

Deliverable name	Work Package No.	Short name of lead participant	Type	Dissemination level
Website	4	SKB		PUBLIC (PU)
Project Presentation (PP)	4	SKB	R	PU
Review of organic wastes and their biodegradation under ILW repository conditions	1	NNL	R	PU
Dissemination and Exploitation Plan (DEP)	4	SKB	R	PU
Data Management Plan (DMP)	4	SKB	R	PU
Y1 Evaluation	3	GTK	R	PU
Risk Communication	3	SCK•CEN	R	PU
Inventory of reducing gases	2	MICANS	R	PU
Design, set up and operation of experimental equipment	2	NERC	R	PU
E&T package	3	MICANS	R	PU
Effects of radiation and microbial degradation of ILW organic polymers	1	UNIMAN	R	PU
Radiation and microbial degradation of bitumen	1	SCK•CEN	R	PU
Interim report on deep gases and sulphur compounds.	2	GTK	R	PU
Threshold densities	2	MICANS	R	PU
Y2 Evaluation	3	UNIMAN	R	PU
Publication Plan for project results in high quality journals	4	SKB	R	PU
Radionuclide speciation associated with degraded organic ILW	1	HZDR	R	PU
Microscopy and element mapping characterization studies of radionuclide microbe organic interactions	1	UGR	R	PU
Relevant metabolic processes and limits on chemical conditions leading to methane generation in LLW and ILW	1	VTT	R	PU
Methane generation in the Mt Terri URL and the underlying microbial processes	1	EPFL	R	PU

Deliverable name	Work Package No.	Short name of lead participant	Type	Dissemination level
Microbial activation due to addition of electron donors/acceptors in deep groundwater	2	VTT	R	PU
Microbial diversity in bentonite buffer of aged bentonite buffer experiment	2	VTT	R	PU
Microbial diversity in aged bentonite	2	TUL	R	PU
Long-term stability of bentonite in the presence of microorganisms	2	HZDR	R	PU
Evolution of stress in biotic and abiotic clay flow cells	2	NERC	R	PU
Microbial mobility in saturated bentonites of different density	2	RCR	R	PU
Cement deterioration boundaries	2	SCK•CEN	R	PU
Concrete stability	2	MICANS	R	PU
Y3 Evaluation	3	NNL	R	PU
Modelling of microbial processes relevant to ILW disposal	1	NNL	R	PU
Anaerobic microbial corrosion of canister material	2	TUL	R	PU
Role of bentonite density on the rate of corrosion of carbon steel	2	EPFL	R	PU
Survival of microorganisms in bentonite subjected to different levels of irradiation and pressure	2	RCR	R	PU
Microbial activity and the physical-chemical and transport properties of bentonite buffer	2	NERC	R	PU
Sulphide production	2	GTK	R	PU
Rate of corrosion of carbon steel in bentonite under biotic and abiotic conditions	2	EPFL	R	PU
Conceptualization and Perception	3	SCK•CEN	R	PU
Synthesis of research into biologically mediated ILW waste degradation and waste form behaviour	1	NNL	R	PU
Synthesis of research into microbial processes affecting HLW EBS components	2	MICANS	R	PU
Final Integration and Evaluation report	3	SCK•CEN	R	PU
Implementers Review Board evaluation report	4	SKB	R	PU
Preparation and publication of project summary	4	SKB	R	PU