

D2.5

National reports with a review and synthesis of the collated information

Belgium





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(* = including the Commission Services)

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1. Introduction

1.1 About INSPIRATION

The aim of INSPIRATION is to establish and promote the adoption of a strategic research agenda for land use, land-use changes and soil management in the light of current and future societal challenges. Main objectives are:

- **Formulate, consult on and revise an end-user oriented strategic research agenda (SRA);**
- **Scope out models for implementing the SRA;**
- **Prepare a network of public and private funding institutions willing to commonly fund the SRA.**

The proposed methodology is based on a multi-stakeholder, multi-national and interdisciplinary approach that covers the variety of stakeholders (public bodies, business, scientific community citizens and society) and the variety of relevant funders. The vehicle to engage with relevant stakeholders across the Member States is a National Focal Point (NFP) in 17 countries¹. Between March 2015 and March 2016 The NFP's interviewed National Key Stakeholders (NKS), performed a desk study and organized workshops with national stakeholders of funders, end-users and researchers across the various soil and land management disciplines. The goal of these exercises was to gather information and support the main objectives as stated above.

The collated results will be structured along four integrative themes: 1) resources demand and efficiency; 2) natural capital stewardship; 3) land management; 4) net impact on global, EU and local scale (see section 1.3) and merging into thematic knowledge needs to satisfy the as yet unmet societal challenges and to ensure that knowledge contributes primarily to enable meeting these challenges. Based on these results, a cross-border and cross-discipline dialogue will subsequently be organized among the relevant user communities, funding bodies and scientific communities in Europe in order to reach a trans-national, prioritized SRA as well as a model for execution of this SRA. Thus a SRA will be produced which will give national funders confidence that for each Euro they spend, they will get multiple Euros worth of knowledge in return in order to address their national societal challenges.

Learn more about the INSPIRATION coordination and support action on the project's website: www.inspiration-h2020.eu and follow us on twitter: [@inspiration4eu](https://twitter.com/inspiration4eu).

¹ The Swedish Geotechnical Institute (SGI) with support of Formas is currently mirroring the INSPIRATION approach in Sweden. SGI has proposed to act as Swedish National Focal Point and to become a full member of the INSPIRATION consortium. This has been welcomed by the consortium. Currently formal negotiations are in place between SGI, the consortium and the EC to effectively implement this collaboration. This report furthermore contains some information for Denmark and Luxemburg – representatives of both countries joined the Belgium workshop – and for the Republic of Ireland – representatives joined the UK workshop – see below.)

1.2 This report

This country report is an excerpt from the INSPIRATION Deliverable 2.5 “National reports with a review and synthesis of the collated information”, which integrates 17 national reports. These 17 countries, in alphabetical order, and respective report authors are:

1. **Austria**,
Pia Minixhofer, Sophie Zechmeister-Boltenstern, Rosemarie Stangl, Andreas Baumgarten, Martin Weigl, Peter Tramberend,
2. **Belgium** (including some information for **Denmark** and **Luxemburg**),
Nele Bal, Bavo Peeters,
3. **Czech Republic**,
Petr Klusáček, Stanislav Martinát, Bohumil Frantál,
4. **Finland**,
Antti Rehunen, Teija Haavisto, Ritva Britschgi, Outi Pyy, Jari Rintala, Petri Shemeikka,
5. **France**,
Marie-Christine Dictor, Samuel Coussy, Valérie Guerin, Corinne Merly,
6. **Germany**,
Uwe Ferber, Stephan Bartke, Detlef Grimski,
7. **Italy**,
Matteo Tabasso, Sarah Chiodi, Giulia Melis,
8. **Poland**,
Anna Starzewska-Sikorska,
9. **Portugal**,
Thomas Panagopoulos, Vera Ferreira, Dulce Antunes
10. **Romania**,
Mihail Dumitru, Sorin Liviu Stefanescu, Andrei Vranceanu, Valentina Voicu, Nicoleta Vranceanu,
11. **Slovakia**,
Maros Finka, Maria Kozova, Zita Izakovicova, Lubomir Jamecny, Vladimir Ondrejicka,
12. **Slovenia**,
Boštjan Cotič, Barbara Mušič, Ina Šuklje Erjavec, Matej Nikšič,
13. **Spain**,
Pierre Menger, Gemma Garcia-Blanco, Efren Feliu,
14. **Sweden**,
Yvonne Ohlsson, Lisa van Well, Kerstin Konitzer,
15. **Switzerland**,
Regula Brassel, Marco Pütz,
16. **The Netherlands**,
Linda Maring, Jos Brils
17. **The United Kingdom** (including some information on **the Republic of Ireland**),
Paul Nathanail, Matt Ashmore.



Deliverable D2.5 concludes the activities of INSPIRATION Work Package (WP) 2 “**Demands of research from industry, end-users and funders (State-of-the-art at national levels)**”, task 2.5 “**Review and synthesis of the collated information**”.

The WP2 activities were executed in the 1st year of the INSPIRATION project (month 1 – 12), i.e. in the period from March 2015 to February 2016. In the WP2 project description, the final task executed in this period is described in the following way:

“The NFPs will organize at national level a 2-day workshop, where the collated information (task 2.4) will be reviewed and synthesized and prioritized under guidance of the NFP by the NKSs. The WP-leader will prepare – in consultation with the INSPIRATION core group – a generic outline for the agenda of the 2-day national workshops. That outline will then be tailored to specific national situations by the NFPs. The results of the workshop – i.e. reviewed and synthesised information regarding topic a-d as mentioned under the WP2 objectives² – will be described in a national report (in English) by the NFPs. Before finalizing these reports, the NKSs as well as the International Advisory Board (IAB) will be given the opportunity to review the draft report. In these cases where English is not the native language, the national reports will also contain an executive summary (policy brief) of the report in the native language.” (INSPIRATION Grant Agreement - Description of Action - DoA).

Deliverable D2.5 describes the results of NKS interviews and of the desk-exercise as performed in participating countries aimed at collecting national research demands, science-policy-interface experiences and funding options. This report builds up on the interim results presented in Deliverable 2.4.³ The methodologies followed for the information collation and synthesis are presented in more detail for each country below. In general, the following approach was applied (see also Figure 1):

1. In each country, national key stakeholders (NKS) have been identified (in a way to ensure broad representation of soil and land-use/management topics and affiliations in research funding / end-use / science or policy making);
2. Interviews (structured according to a common template: see Annex I and II) with circa 20 NKS per country have been conducted in order to collect national research needs as well as information on science-policy-interface and financing options (with interim result presented as D2.4);
3. In each country, a national workshop with NKS was conducted. Basis for the workshops was the input provided in the NKS interviews before the workshop. It was presented in order to synthesize the collated info, discuss and review the key national research topics. The workshop thus aimed to check, verify and enrich, and in some cases also already prioritize the suggestions provided by the NKS;⁴

² See section 1.5 for a description of topic a-d.

³ Brils, J. et al. (2015): National report on collated information following the template. Final version as of 01.12.2015 of deliverable 2.4 of the HORIZON 2020 project INSPIRATION. EC Grant agreement no: 642372, UBA: Dessau-Roßlau, Germany.

⁴ In several countries besides the NKS interviewed also more stakeholders were invited (i.e. it were open events), and participated and contributed to the workshops.

4. The results of the interviewing plus workshop process were documented in a report to become the respective final national reports. A draft version was to be send nationally to the NKS for review;
5. The national reports were aggregated in a combined document, on which the International Advisory Board (IAB) of INSPIRATION was asked to give feedback, too;
6. The D2.5 report has been finalised taking into account the IAB recommendations.

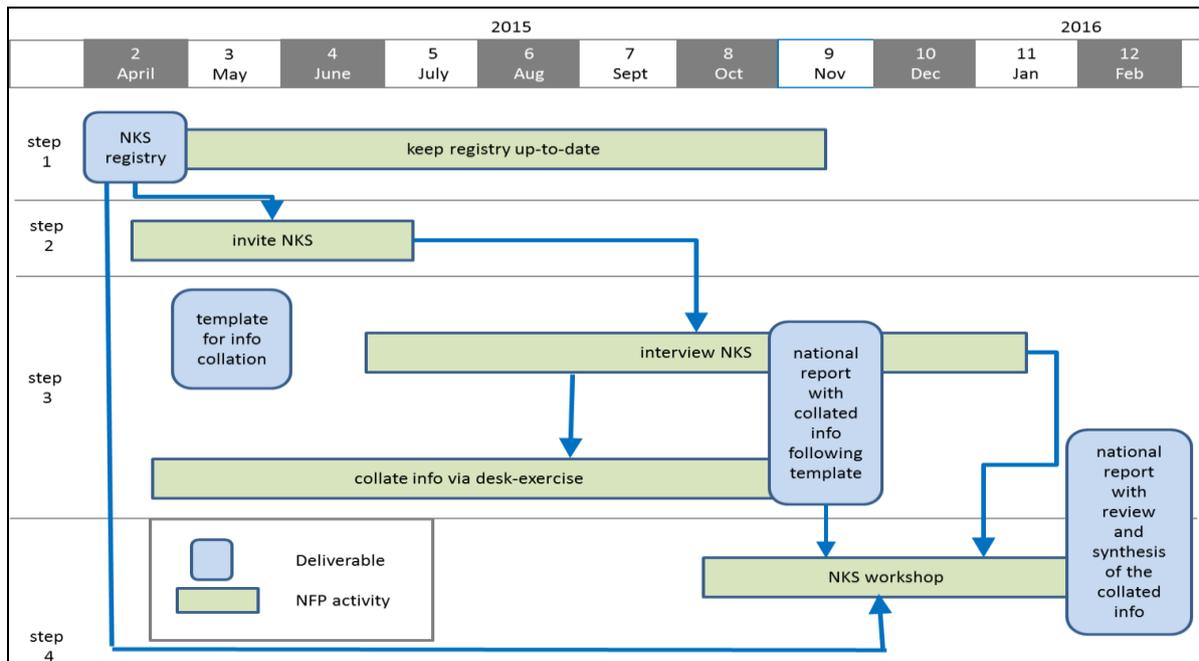


Figure 1: INSPIRATION's WP2 workflow.

The information collated in this report feeds into WP3 “Transnational commons aggregated under integrated themes”. According to the INSPIRATION DoA, the main objectives of WP3 will be to:

1. Achieve an overview of the transnational shared demands and experiences grouped under common themes based on the national state-of-the-art reports as produced by WP2,
2. Prioritise and elaborate the topics that could be included in the SRA (to be developed by WP4) under specific themes,
3. Elucidate the opportunity to match (to be done under WP4) individual stakeholders (as funders) to specific SRA topics that could be shared transnationally.” (INSPIRATION Grant Agreement - Description of Action - DoA).

Visit the INSPIRATION website for the up-coming deliverables of the network!

1.3 The INSPIRATION conceptual model and its themes

In order to identify cross-country and cross-sectorial knowledge gaps and research questions, the national Research and Innovation (R&I) needs will be analysed along four overarching themes identified in the INSPIRATION conceptual model. This model is presented in figure 2. It has been used to structure the information presented in this report on R&I needs following these guiding key-questions for each theme:

- **Demand:**
What does society demand from natural capital and ecosystem services including the SSW-system?
- **Natural capital:**
What has nature, including the Soil-Sediment-Water (SSW)-system, to offer and which determinants sustain the system?
- **Land management:**
What are options for an integrated, cross-sectorial land management to balance societal demands and natural capital?
- **Net-impacts:**
What are the impacts of different options of managing natural capital, including the SSW-system on global, regional and local as well as temporal scales?

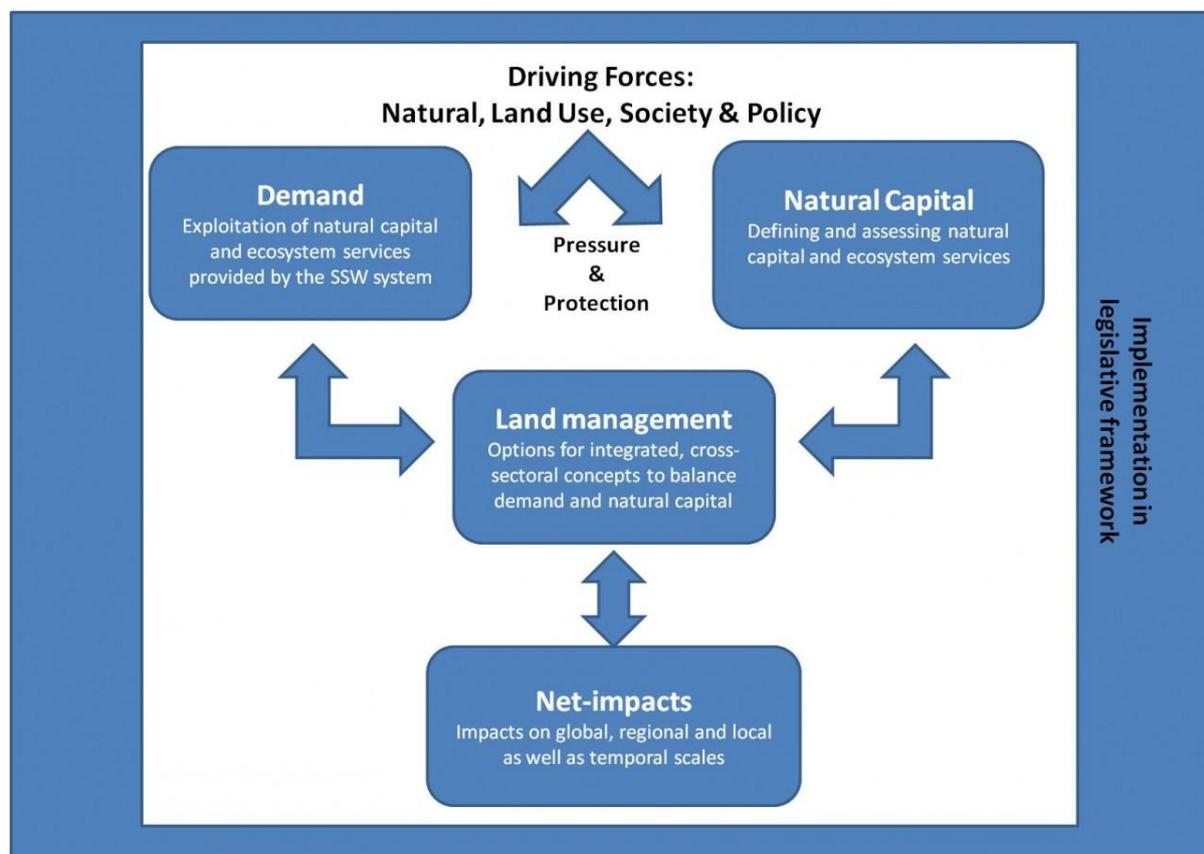


Figure 2: INSPIRATION's conceptual model.

1.4 Guide to the reader: outline of the country chapters

Each country chapter in Deliverable D2.5 follows a comparable outline:

Section X.1- Executive summary

This section provides an executive summary in English (X.1.1) as well as in the national language (X.1.2).

Section X.2 - Methodology followed

This section describes the methodology followed in the respective country including information on the stakeholder engagement (see also section 1.4).

The subsequent sections give a review and synthesis of the main results of the topics as mentioned under the WP2 objectives (see section 1.2).

Section X.3 Research and Innovation (R&I) needs

➤ **Topic a: Demand-driven*** suggestions for the Strategic Research Agenda (SRA), i.e. suggestions from the perspective of industry, end-users and funders.
*Related key question to be answered: **What (new) knowledge do these parties need to tackle societal challenges including the increase of job opportunities?***

* **Demand-driven** in INSPIRATION means focusing on the demands of those who are responsible or feel committed to tackle the societal challenges related to the INSPIRATION scope and themes, i.e. industry, end-users and funders. These parties could improve their business opportunities and/or take better informed decisions on what measures to take and execute in order to tackle other societal challenges if they would (be enabled to) use the knowledge as resulting from execution of the INSPIRATION SRA.

This section is divided in the sub-sections:

- Societal challenges and needs (X.3.1);
- Topics / research needs to include in the SRA (X.3.2).

The research questions under the topics in the X.3.2 sub-sections are divided by themes of the INSPIRATION conceptual model as described in section 1.3 of this chapter.

Section X.4 - Experiences regarding connecting science to policy/practice

➤ **Topic b:** Experiences regarding the exploitation of scientific knowledge to improve business opportunities and/or tackle other societal challenges.
*Related key question to be answered: **Where to improve the science-policy interface so that (new) knowledge can and will be more effectively exploited by the demand side?***

This section is divided in the sub-sections:

- Use of knowledge (X.4.1);
- Possibilities to set the agenda (X.4.2);
- Science – policy – practice (X.4.3).



Section X.5 National and transnational funding schemes

- **Topic c:** *Predominant, current as well as promising alternative funding schemes / mechanisms / programs for knowledge production and dissemination.*
*Related key question to be answered: **How to get with one Euro of national/regional funding a multitude of Euro's (from all sources) worth of knowledge in return contributing to EU and national demands? Or even how to get with one euro of EU funding a multitude of euro's (from national, regional, local, and private sector) worth of knowledge in return contributing to the R&I demands on Land and the Soil-Sediment-Water systems.***
- **Topic d:** *Experiences regarding the use of any trans-national, common budget for scientific knowledge production related to the scope of INSPIRATION.*
*Related key question to be answered: **How to set up/govern the appropriate funding option(s) resulting from INSPIRATION – based on previous learning experiences – so that: (1)the above demands will be fulfilled, (2) knowledge resulting from implementation of the SRA will be taken up and used and (3) funders experience that their invested, national Euros are indeed multiplied?"***

This section is divided in the sub-sections:

- Funding schemes and possibilities for research funding (X.5.1);
- Gaps in financial resources for research (X.5.2).

Section X.6 - Other remarks made by interviewees

This section is optional and is not taken up in all national reports. It contains remarks, points of attention and recommendations for INSPIRATION as given by the NKS.

1.5 Annexes

Annex I: NKS questionnaire template

This is the updated version of the questionnaire - reflecting inputs from the IAB and discussions at the NFP training in Vienna on 22nd – 23rd June 2015.

Note: this questionnaire template is meant to help National Focal Points (NFPs) to facilitate the interview/conversation with the National Key Stakeholders (NKS). Some questions are relevant to one NKS, other questions to another NKS. Hence, not all questions are relevant to each single NKS. The NFPs are required to adapt the template accordingly – keeping in it as many as possible of the issues to be addressed. If needed, the NFPs also translate the questionnaire into their national language.

The questionnaire (see next pages) has the following outline:

- A. **Interview information:**
To be filled out by the interviewer
- B. **Introduction:**
That the interviewer can use to start the NKS interview
- C. **Background information of the NKS interviewed:**
Mostly 'tick-boxes'
- D. **Strategic Research Agenda (SRA):**
NKS preferred topics, overarching themes and scope for the SRA and national state-of-the-art on research agendas that the NKS is aware of
- E. **Science-Policy-Interface:**
NKS experiences regarding the exploitation of scientific knowledge to: improve business opportunities; tackle other societal challenges; assist policy-implementation and/or policy revision
- F. **Funding:**
Predominantly used as well as promising alternative funding schemes / mechanisms / programs for knowledge production and dissemination that the NKS is aware of
- G. **Other:**
At the end there is some time advised to let the NKS give us their advice, some nice quotes (that we can use anonymously in our communications), examples etc.
- H. **Ending the interview:**
Explain follow up and if/how NKSs will be involved in the next steps of INSPIRATION

Questionnaire template

A. Interview information

Country:

Name of INSPIRATION researcher:

Date of Interview:

How does the NKS wish to be referred to: *[Anonymous, personal opinions, company's opinion. Choose when it is a good time to discuss this. In the beginning or later on.*

SHOW the interviewed NKS the ENGAGEMENT CONSENT FORM and ask him/her to fill it out. Please introduce the engagement consent form (available in 'D2.1 MoU' and editable by yourself) and hand a copy to the interviewee to read and fill in – make sure that you take this away with you and keep for your own records]

B. Introductions

[Please introduce your selves, the project and the purpose of the interview. You can use the handout as provided at the end of this template. This can also be sent beforehand to the NKS. Agree on a time span: approximately one and a half hour.]

C. Background information on the interviewee

1. Name of NKS interviewed:

2. Institution:

3. Role:

4. Are you a (multiple answers possible):

- National-regional-local authority
- University/research institute
- Small or Medium sized Enterprise (SME, i.e. < 500 employees) / consultant
- Business and industry
- Non-Governmental Organisation (NGO)
- Network representative / leader
- Other, specify: ...

5. Fields of expertise (multiple answers possible): *[Ask to specify background regarding the selected item(s) in order to understand expertise background of interviewee]*

- Soil
- Water
- Sediment
- Urban / spatial planning
- Landscape design
- Land management
- Other, specify:

6. Does your organisation provide external research funding?

- Yes. Please specify: ...
[e.g. as programme holder, public, private, ...]
- No

D. SRA

7. Which societal challenges do you regard as important?

[If needed, you can use the European Commissions (EC) list of societal challenges here. These EC themes are:]

- Contribute to food security and food safety;
- Ensure secure supplies of safe drinking water;
- Secure energy supply and distribution;
- Reduce raw material and resource consumption, Ensure efficient use of natural resources;
- Contribute to climate change mitigation and societal adaptation;
- Contribute to a healthy living environment;
- Ensure secure infrastructure

[Explain that these challenges may be used as bases for defining of the overarching themes for aggregating the research topics of our SRA.]

a. If applicable, what additional, other or alternative challenges would you suggest/prefer?

[When needed, you can mention challenges as nature conservation, sustainable use of ecosystem services, halting the loss of biodiversity]

8. Starting with your own experience: which specific topics (research needs) should be included in the SRA?

[For each single topic mentioned by the NKS, use the following follow-up questions. The a, b and c sub-questions are mandatory. The other sub-questions are optional]:

a. Explain – elaborate the topic

- *Who will be affected?*
- *Who is responsible?*
- *Is it a topic of concern of your organisation / department*
- *Is it only a national topic, or a shared topic by multiple countries?*
- *Where are we now, where do we want to be in x years (point on the horizon)?*
- *How can the newly gained knowledge be effectively used?*

b. Priority:

1. *High priority*
 2. *Some priority*
 3. *Neutral priority*
 4. *Low priority*
 5. *No priority*
- *What is the urgency, i.e. what goes wrong if we do nothing?*

c. Who wants to/should fund this kind of research?

[Optionally: check the following WP3 key-words for relevance, i.e. if they raise any additional topics by the NKS. The key-words can be used as support / check list

Be sensible as interviewer if this is needed.]

- *Assessment of land resources*
- *Potential productivity of land and soils*
- *Demand for soil/land resources, imports and exports*
- *Competition between land uses (land-use conflicts)*
- *Concepts to identify and quantify relevant impacts*
- *Instruments to avoid / minimize impacts (feedback to decision-making process)*
- *Opportunities of innovative land-use technologies*
- *Resource-oriented land management systems]*
- *Soil regeneration*
- *Soil and groundwater remediation*

9. Linked to topics mentioned by the NKS:

- a. What are the important / relevant documents, research agendas, research programmes underpinning these topics? (state-of-the-art)
- b. Related to these agendas and programmes: what are timelines of programming and windows-of-opportunities to influence agendas / programmes?

[Note: question 9b is input for work package 5]

E. Science-Policy-Interfacing (SPI)

10. How would you define 'scientific knowledge'?

11. For what do you use scientific knowledge in your job?

12. Which sources of (scientific) knowledge do you use for doing your job?

[Open question and you can mention some of the sources underneath as examples]

- | | |
|------------------------------------------------------|-------------------------------------------------------|
| ○ <i>scientific paper</i> | ○ <i>newspapers</i> |
| ○ <i>consultants</i> | ○ <i>television</i> |
| ○ <i>reports</i> | ○ <i>conferences Involvement in research projects</i> |
| ○ <i>colleagues</i> | ○ <i>data (bases)</i> |
| ○ <i>experiences /examples within my own country</i> | ○ <i>websites, such as:</i> |
| ○ <i>experiences /examples abroad</i> | ○ <i>other, specify:</i> |

13. To what extent do you use most recent/new scientific knowledge (i.e. state-of-the-art scientific insights/findings) for doing your job?

14. To what extent are you able to influence (and how) the setting of scientific research policies/agendas in our country?

15. To which extent do our national policies/agendas reflect your specific needs and priorities?

16. To what extent has been made use of the state-of-the art in scientific research for the formulation of existing policies in our country?

[Questions only for NKS from the non-science sector (business and policy):]

17. Have you ever been involved in:

- a. the formulation of scientific research questions?
- b. doing scientific research (i.e. knowledge co-creation)?
- c. synthesizing/wrapping-up of scientific knowledge, e.g. to feed into policy making or to increase business opportunities?

[When yes: Follow-up questions]

- How successful/satisfying was this, on a scale of 1-5?
 1. *Very successful/satisfying*
 2. *Successful /satisfying*
 3. *Neutral*
 4. *Unsuccessful/unsatisfying*
 5. *Very unsuccessful/unsatisfying*
- What went well
- What could be improved?
- What to avoid/not to do?
- Additional remarks?

[Question only to NKS who are likely to have insights here (e.g. research funders)]

18. (How) is the societal impact of scientific research related to the scope of INSPIRATION being assessed in our country?

[If they know: Follow-up questions:]

- How successful/satisfying is this, on a scale of 1-5?
 1. *Very successful/satisfying*
 2. *Successful/satisfying*
 3. *Neutral*
 4. *Unsuccessful/unsatisfying*
 5. *Very unsuccessful/unsatisfying*
- What indicators are used?
- What goes well?
- What can be improved?
- What to avoid/not to do?
- Additional remarks?

19. Which national Science-Policy-Interface documents do you know of / can you recommend?

F. Funding



20. Which experiences and expectations in funding schemes (public / private) do you have in your own field that could offer opportunities for future research on land-use and -management and related impacts to Soil-/Sediment-/Water-systems:

- Sub-nationally/regionally?
- Nationally?
- European? [e.g. H2020, Interreg, multi-lateral such as the Joint Programming Initiatives]
- International? [e.g. Belmont Forum, Foundations.]

[For all R&I questions aiming at achieving policy targets in the Land & SSW related system (like e.g. Sustainable Development Goals on soils, existing EU directives such as the Environmental Liability Directive, etc.) consider all Public and Private funding sources. Please ask to provide details and give most important references (documents, website) that could be relevant for explaining the answer]

21. How to increase the added value of different financial resources (i.e. achieve a multiplier) for doing research that contributes to EU and national demands, in particular to the R&I demands on Land and the SSW-system?

[CONSTRUCTIONS that (could) work. PP, PPI, etc. Just ask for, as open as possible for suggestions, ideas, experiences, good examples]

22. Are there areas of research and innovation (R&I) that you are aware of that are not (yet) covered by current funding mechanisms and which would need new/different funding schemes / infrastructures?

23. Integrated approaches (necessary for addressing particular societal challenges related to the use and management of land and related impacts to SSW systems) are usually difficult to fund / get recognized by the research funding communities. What would be necessary to improve this?

24. Based on previous learning experiences that you are aware of: how to best set up / govern funding option(s), so that societal demands will be fulfilled, knowledge resulting from execution of the SRA will be taken up and used; and funders experience that their invested, national Euros are indeed multiplied? *[if they know: follow-up questions]*

- How successful/satisfying was this, on a scale of 1-5?
 1. *Very successful/satisfying*
 2. *Successful/satisfying*
 3. *Neutral*
 4. *Unsuccessful/unsatisfying*
 5. *Very unsuccessful/unsatisfying*
- What went well?
- What could be improved?
- What to avoid/not to do?
- Additional remarks?

G. Other (remarks, suggestions, examples):

H. Ending the interview

Thank you for taking the time to participate in this interview:

- Would you like us to keep you updated about INSPIRATION progress?
- Would you suggest anyone else who we should be interviewed by us?
- Do you have further questions arising from this interview, or would you like to add anything else?
- What information are you interested in, and willing to give feedback on?

[Discuss the feedback mechanism and if they have expressed their opinions as a person or as a representative of their organisation/network. Checklist:]

a. Information to exchange / willingness to give feedback on:

- (complete interview, not recommended)
- summary of main conclusions
- national report, national contribution to D2.4
- complete D2.4, all countries

b. Preferred level of feedback:

- no feedback
- informal feedback
- formal feedback (e.g. on behalf of represented organisation)

[Check: have you discussed consent form / how to refer to interviewee]

INSPIRATION acknowledges the received funding from the
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under grant agreement no 642372





Annex II: NKS hand-out: INSPIRATION interview at a glance

INSPIRATION interview at a glance

Aim of INSPIRATION:

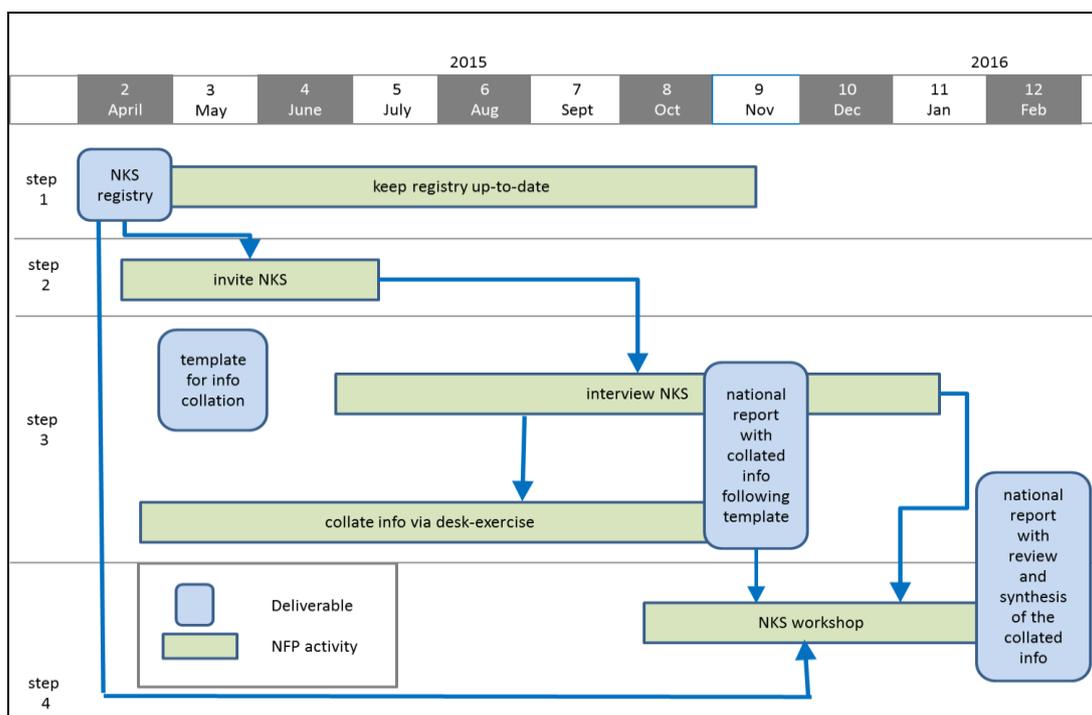
The main purpose of the EC-funded INSPIRATION project is to formulate an end-user driven strategic research agenda (SRA) for land-use, land-use changes and the related, impacted compartments of the Soil-Sediment-Water (SSW) system in order to meet current and future societal challenges and needs. Next to that, the project aims to scope out models of implementing the SRA and to prepare a network of public and private funding institutions willing to commonly fund the execution of the SRA.

National Key Stakeholders (NKS):

In a series of NKS interviews across EU nations the “National Focal Points (NFP) gather for nations individually information related to the INSPIRATION scope (land and SSW-system use and management) on:

- Research and Innovation (R&I) needs
- Experiences regarding connecting science to policy/practice
- National and transnational funding schemes

In the interviews we focus at NKS – like you – positioned at a strategic level, i.e. leading persons in their field of profession; with a good overview on opportunities; a clear vision on, and insight in knowledge demands (short, middle and long-term). Furthermore, these NKS are well positioned and participate in relevant professional network(s) and may also have potential to become an ambassador for INSPIRATION. We selected NKS to represent different disciplines and institutional backgrounds including: land-use planners; managers; soil, sediment and water experts; researchers, funders and regulators/policy makers.



Workflow in the first year of INSPIRATION



This interview:

Collecting input from you – an expert in your field – is crucial for the project in order to help us describing the state-of-the-art in our country as input into the European research agenda. In the interview we will go through a series of topics and questions: The interviews of NKS (ca. 20 per nation), together with a desk study on research needs and funding possibilities will be synthesized to a 'national report'. This synthesis will be reviewed in a national workshop, to prioritize the topics for the suggested Strategic Research Agenda (SRA) from our country's point of view. The national reports will finally be used as input for elaborating the European SRA and cross-nation matchmaking (matching research needs to possible funding).

Example questions:

Research and Innovation (R&I) needs

- Which societal challenges do you regard as important?
- Starting with your own experience: which specific topics (research needs) should be included in the SRA?

Experiences regarding connecting science to policy/practice

- How would you define 'scientific knowledge'?
- To what extent has been made use of the state-of-the art in scientific research for the formulation of existing policies in our country?

National and transnational funding schemes

- Does your organisation provide external research funding?
- Which experiences and expectations in funding schemes (public / private) do you have in your own field that could offer opportunities for future research on land-use and -management and related impacts to Soil-/Sediment-/Water-systems

Your benefits from participating:

- A chance to influence the European SRA on land and SSW management in the light of societal challenges and needs;
- Being able to make use of the results of the project: overview of research need and of existing and promising funding schemes on different levels (sub-national, national, European, international) and opportunities for a better connection between science and policy/practice;
- Use the matchmaking opportunity to get in contact with other networks in- and outside our country, and countries learn which shared challenges can be taken up jointly.

Contact and further information:

For general information on the INSPIRATION project visit our website: www.inspiration-h2020.eu

Contact the National Focal Point:	Contact the general project coordination:
See the INSPIRATION website for contacts	Stephan Bartke stephan.bartke@uba.de



2. Belgium

Report by Nele Bal, Bavo Peeters

2.1 Executive summary

2.1.1 English version

Building, implementing and funding a European research agenda on soil and land use in co-creation with National Key Stakeholders: summary INSPIRATION phase 1

Belgians, Luxembourgish, Danish, Europeans have **common future societal challenges**, like climate adaptation, ensuring food safety and security, safeguarding/creating a healthy environment, Soil and land use often play a crucial role in tackling these challenges. Changes in demography and the related economic pressure have a serious impact on the quality of soil and land. How can our society **safeguard the quality of soil and land** and at the same time **tackle the societal challenges in a sustainable way**? And which **supporting (new) knowledge** on soil and land use is needed to do this?

INSPIRATION, a 3 year research project joining 20 partners from 16 countries, aims to give an answer to these questions by building an end-user oriented strategic research agenda (SRA) on soil and land use. The agenda includes the **development, the implementation and the dissemination** of new knowledge. Another aim is to develop a network of public and private funding institutions willing to **commonly fund** the SRA.

During the first phase of the project, the National Focal Points (NFP) must collect the necessary national information to build the research agenda: they have to make an inventory of National Key Stakeholders (NKS), interview NKS, perform a desk study and organize workshops with different national stakeholders among which funders, end-users and researchers across the various soil and land management disciplines.

This report summarizes the **results of the first phase of INSPIRATION for Belgium, with input from Luxembourg and Denmark**. OVAM is the NFP for Belgium. Interviews took place during the summer of 2015; the workshop was held on the 29th and 30th of October 2015 in Brussels.

A primary conclusion is that a **fragmentation** of the research landscape and policy field exists in Belgium (especially for soil and land use related topics), related to the specific state structure (federal state, composed of 3 communities - with their own language - and 3 regions). Each institution or administration has its own expertise, domain or competence, and a global Belgian vision (on the research) on soil and land use is not available. In Luxembourg and Denmark, this fragmentation plays a minor role. The consulted NKS are however unanimous about the importance of soil and land use on tackling future challenges: this role is fundamental, and intertwines with important societal issues. A first recommendation is therefore to approach the research on soil and land use in a **more integrated and systemic focused way** and to bridge the boundaries of the own expertise or policy domain. Systems process related synergies and tradeoffs can be taken into account more easily in this way. Reliable knowledge about the distinct parts of the global system remains indispensable, being the building bricks of the whole.



Future research needs vary from very specific expertise (like risk evaluation for contaminated sites) to “more horizontal oriented” themes (like conflicts about land use). Given the intertwining of the themes, a “separated” thematic description of each theme is difficult, as they tend to overlap, mix and influence each other. The soil and land use topics and their related research questions should therefore always be considered within the bigger soil and land use system. An **integrated research approach** or **focusing on the more horizontal oriented themes** are stressed as a priority: this kind of research is currently not part of the research agendas and the necessary knowledge, and expertise is lacking.

Most of the research needs are common for Belgium (and its different regions), Luxembourg and Denmark, each country/region with his own accents. The relevant differences are described in the report.

A second recommendation concerns the need for **more intensive collaboration between stakeholders**: during the formulation of research questions and during the knowledge development, co-creation between stakeholders is the key to come to a well-balanced distribution of short term versus long term issues, of practical-applied versus fundamental-theoretical research, for the different scale levels (in time and space) and for the different sectors and policy domains. Co-creation (and co-funding) also **fosters the implementation and dissemination** of the developed knowledge. However, his approach takes more time.

Participants also stressed that beside the development of new knowledge, it is important to pay more attention to unlocking, connecting, translating, implementing and disseminating **existing knowledge**. **Knowledge brokers** can play a coordinating and facilitating role in this process, they can also be partners in stakeholder coaching. Stakeholders need a tailor-made translation and dissemination into **applicable knowledge**. **Interactive digital platforms** and **learning stakeholder networks** could also foster the exchange of data, knowledge and experience.

Concerning the research funding, NKS indicate that budgets are often **fragmented** because of the extreme portioning of expertise and competences between different disciplines and sub-disciplines and research agendas. **Putting funds together** is recommended to fund larger integrated long term research (e.g. under the form of spider web constructions). Research on soil and land use is not a popular topic with funders at the moment: it is important to **clearly show the added value** of this research to the decision makers, e.g. by **assessing** and taking into account the societal costs linked to unsustainable soil and land use or by **visualizing** inspiring win-win approaches (showing recognizable examples).

Mind shift and change in behavior are the engine and the catalyst for change. NKS make a plea for the **integration of social sciences** into soil and land use related research. These sciences feed the “why” and “how” of this awareness raising. Providing tailor-made knowledge and communication fosters the **awareness and “call to action”** of sustainable soil and land use at all levels in society. The support of “best practice **pioneers**” encourages a faster transition.

Finally participants stressed that set requirements should ensure and support the research agenda: a reliable **legal framework**, a stable **political climate** and a **regulation of the (economic) market**.



In the next phases of the project, the European strategic research agenda will be built based on the collected information from each country. The follow up will be reported on the website <http://www.inspiration-h2020.eu/>.

2.1.2 Dutch version

Samen een Europese onderzoeksagenda over bodem- en landgebruik opstellen, implementeren en financieren: samenvatting van INSPIRATION fase 1

Belgen, Luxemburgers, Denen, Europeanen hebben gemeenschappelijke uitdagingen voor de toekomst, denk maar aan klimaatadaptatie, het garanderen van voedselzekerheid- en veiligheid, een gezonde leefomgeving, Bodem- en landgebruik spelen vaak een cruciale rol bij het aangaan van de transitie naar een samenleving binnen de grenzen van de planeet. Door de wijzigingen in demografie en de daar bijhorende economische belasting staat de kwaliteit van bodem en land echter onder steeds grotere druk. Hoe zorgen we er als maatschappij voor dat de kwaliteit van bodem en land gevrijwaard blijft én dat maatschappelijke uitdagingen op een duurzame manier aangepakt worden? En welke (nieuwe) kennis op vlak van bodembeheer en landgebruik is hiervoor nodig?

Om een antwoord te bieden op deze vragen stelt INSPIRATION, een drie jaar durend onderzoeksproject met 20 partners uit 16 Europese landen, een strategische onderzoeksagenda voor bodem- en landgebruik op, die bottom-up up vertrekt vanuit de noden van kennisgebruikers en financiers. Zowel het verwerven van nieuwe kennis, als de verspreiding en de toepassing ervan komen aan bod. Een andere belangrijke doelstelling is een netwerk op te zetten voor samenwerking en financiering, zodat de onderzoeksagenda ook effectief uitgevoerd wordt.

In een eerste fase van het project verzamelen de Nationale Focus Punten (NFP) binnen hun eigen land de nodige informatie om deze onderzoeksagenda op te bouwen. Zij inventariseren de Nationale Key Stakeholders (NKS), interviewen een aantal van deze stakeholders over de state-of-the-art binnen het onderzoek over bodem- en landgebruik, voeren een literatuurstudie uit en toetsen de resultaten van interviews en literatuurstudie tijdens een workshop.

In dit rapport worden de resultaten van de eerste fase van INSPIRATION voor België, met eveneens input vanuit Luxemburg en Denemarken, weergegeven. OVAM treedt op als NFP voor België. De interviews werden uitgevoerd in de zomer van 2015; de workshop vond op 29 en 30 oktober 2015 plaats in Brussel.

Een eerste vaststelling is dat zowel het onderzoeks- als het beleidsveld in België door de specifieke bestuursvorm (een federale staat, samengesteld uit 3 gemeenschappen (met een eigen taal) en 3 gewesten) versnipperd is, zeker op het vlak van bodembeheer en landgebruik. Elke instelling of administratie heeft zijn eigen expertisedomein of bevoegdheid, en een globale Belgische visie over (onderzoek over) bodem- en landgebruik is er niet. In Luxemburg en Denemarken speelt deze versnippering minder. De bevraagde NKS zijn wel eensgezind over het belang van bodem- en landgebruik bij het behalen van toekomstige uitdagingen: deze rol is fundamenteel en is sterk verweven met de belangrijke maatschappelijke vraagstukken. Een eerste aanbeveling luidt bijgevolg om onderzoek naar bodem- en landgebruik meer geïntegreerd en systeemgericht aan te pakken en daarbij de



grenzen van het eigen expertiseveld of beleidsdomein te overbruggen. Synergiën en tradeoffs tussen systeemprocessen kunnen zo gemakkelijker in kaart en in rekening gebracht worden. Betrouwbare kennis over de aparte onderdelen van het grotere geheel blijft uiteraard belangrijk als bouwsteen van het systeem.

De actuele of toekomstige onderzoeksnoden variëren van specifieke expertisedomeinen, zoals risico-evaluatie voor verontreinigde bodems, tot bredere thema's, bv. conflicten in landgebruik. Omdat thema's verweven zijn, treedt vaak overlap, vermenging en beïnvloeding tussen de topics op, wat een "aparte" inhoudelijke beschrijving soms bemoeilijkt. In feite moeten de thema's, met hun gekoppelde onderzoeksvragen, steeds binnen het grotere bodem- en landgebruikssysteem beschouwd worden. Onderzoek naar een geïntegreerde aanpak of naar meer horizontale, holistische thema's wordt als prioritair aangeduid, omdat deze nog niet (of beperkt) in de huidige onderzoeksagenda's zijn opgenomen en de nodige kennis en expertise hierover bijgevolg ontbreekt.

De meeste onderzoeksnoden zijn gemeenschappelijk voor België (over de verschillende regio's heen), Luxemburg en Denemarken, hoewel elk land/regio zijn eigen accenten heeft. Waar relevant zijn deze verschillen in het rapport besproken.

Een tweede aanbeveling betreft het intensiever samenwerken tussen relevante belanghebbenden: zowel bij het formuleren van onderzoeksvragen, als bij het uitwerken van onderzoek is co-creatie tussen belanghebbenden dé sleutel om tot een evenwichtige verdeling te komen tussen korte- en lange-termijn-issues, tussen toegepast-praktijkgericht en fundamenteel-theoretisch onderzoek, tussen de verschillende schaalniveaus (in tijd en ruimte) en tussen de verschillende sectoren en beleidsdomeinen. Co-creatie bevordert ook de effectieve toepassing en verspreiding van de ontwikkelde kennis. Dit geldt ook voor co-financiering van onderzoek. Deze aanpak vergt meestal wel meer tijd.

Daarnaast benadrukten de deelnemers aan de workshop dat er naast het ontwikkelen van "nieuwe" kennis ook de nodige aandacht moet bestaan voor het beter ontsluiten, verbinden, vertalen, gebruiken en verspreiden van de reeds bestaande kennis. "Knowledge brokers" (of kennis-makelaars) kunnen een coördinerende en faciliterende rol spelen bij dit proces en bij de coaching van kennisgebruikers. De vertaling en verspreiding van de kennis moet gebeuren op maat van de kennisgebruikers. Naast knowledge brokers worden interactieve (digitale) platforms en lerende netwerken van belanghebbenden aangehaald als katalysator voor de uitwisseling van data, kennis en ervaringen.

Op vlak van financiering van onderzoek geven de belanghebbenden aan dat de budgetten dikwijls versnipperd zijn omwille van de versplintering van bevoegdheden en onderzoeksagenda's. Het samenleggen van financiering en fondsen is bijgevolg aangewezen voor groter, geïntegreerd lange-termijn-onderzoek. Onderzoek naar bodem- en landgebruik is momenteel niet populair bij financieringsinstanties: hier is het belangrijk om de meerwaarde van dit onderzoek in de verf te zetten bij de beslissers, bv. door de maatschappelijke kost ten gevolge van niet duurzaam land- en bodemgebruik te berekenen en mee te nemen in beleidsbeslissingen, of door inspirerende win-win-oplossingen (met voorbeelden) te visualiseren.

Een mind shift en de daaruit volgende gedragsverandering worden gezien als dé motor voor verandering. Deelnemers hielden een pleidooi voor het integreren van de sociale wetenschappen bij het onderzoek naar bodem- en landgebruik. Deze reiken stof aan over



het “waarom” en “hoe” dit proces van bewustwording kan bewerkstelligd worden. Het verstrekken van kennis op maat in een aangepaste communicatiestijl zorgt dat het bewustzijn (en van daaruit de stap naar actie) rond duurzaam bodem- en landgebruik bij alle lagen van de maatschappij groeit. Het ondersteunen van pioniers bevordert een snellere transitie.

Tenslotte benadrukten deelnemers dat belangrijke randvoorwaarden het ontwikkelen, implementeren en financieren van onderzoek naar bodem- en landgebruik moeten ondersteunen en verzekeren: een degelijk wettelijk kader, een stabiel politiek klimaat en een regulering van de (economische) markt.

In een vervolgfase van het project zal de verzamelde informatie per land verder verwerkt worden tot een gezamenlijke Europese onderzoeksagenda. Het verdere traject kan gevolgd worden op <http://www.inspiration-h2020.eu/>.

2.1.3 French version

Établir, mettre en œuvre et financer ensemble un agenda européen en matière d'utilisation du sol et des terres : résumé de la Phase 1 d'INSPIRATION

Les Belges, Luxembourgeois, Danois et Européens affrontent des défis communs pour l'avenir ; pensez seulement au changement climatique, à la garantie de sécurité alimentaire et de sécurité, à un environnement sain, ... L'utilisation du sol et des terres joue souvent un rôle crucial au début d'une transition vers une cohabitation à l'intérieur des frontières de la planète. Du fait des changements dans la démographie et des effets économiques que ceux-ci induisent, la qualité du sol et des terres est soumise à une pression toujours plus forte. Comment nous assurons-nous, en tant que société, que la qualité du sol et des terres soit préservée et que les défis sociétaux soient abordés de manière durable ? Et quelles (nouvelles) connaissances en matière de gestion du sol et d'utilisation des terres sont-elles nécessaires à cette fin ?

Pour trouver une réponse à ces questions, le projet INSPIRATION, un projet de recherche d'une durée de trois ans impliquant 20 partenaires provenant de 16 pays européens, élabore un **agenda stratégique de recherche pour l'utilisation du sol et des terres**, suivant une approche ascendante ('bottom-up'), partant des **besoins des utilisateurs des connaissances et des financiers**. Tant l'acquisition de nouvelles connaissances que la diffusion et l'application de celles-ci sont abordées. Un autre objectif important est la création d'un **réseau** de collaboration et de financement, de manière à ce que l'agenda de recherche soit également effectivement exécuté.

Dans une première phase du projet, les Points Nationaux de Focalisation (PNF) rassemblent, au sein de leur propre pays, les informations nécessaires à l'élaboration de cet agenda de recherche. Ils établissent l'inventaire des Parties prenantes Nationales Clés (PNC), interviewent un certain nombre de ces parties prenantes sur l'état de l'art au sein de la recherche en matière d'utilisation du sol et des terres, effectuent une étude bibliographique et comparent les résultats des interviews et de l'étude bibliographique au cours d'un atelier.



Le présent rapport présente les résultats de la première phase d'INSPIRATION pour la Belgique, avec également des contributions de la part du Luxembourg et du Danemark. OVAM fait office de PNF pour la Belgique. Les interviews ont eu lieu au cours de l'été de 2015 ; l'atelier a été organisé les 29 et 30 octobre à Bruxelles.

Une première constatation est que tant le champ de recherche que le domaine politique sont morcelés en Belgique, en raison de la structure spécifique du pays (un État fédéral composé de 3 communautés (avec leur langue propre) et de 3 régions), certainement sur le plan de la gestion du sol et de l'utilisation des terres. Chaque institution ou administration possède son propre domaine d'expertise ou ses propres compétences, et une vision globale belge sur (la recherche en matière de) l'utilisation du sol et des terres fait défaut. Ce morcellement se fait moins sentir au Luxembourg et au Danemark. Les PNC interrogés s'accordent bien sûr l'importance de l'utilisation du sol et des terres pour affronter les défis futurs : ce rôle est fondamental et est en rapport étroit avec les problèmes sociétaux importants. Une première recommandation est par conséquent d'aborder la recherche en matière d'utilisation du sol et des terres, de manière plus intégrée et plus orientée système et de dépasser ainsi les frontières du champ d'expertise ou du domaine politique propres. Les synergies et compromis entre processus systèmes peuvent être ainsi plus facilement cartographiés et portés en compte. Les connaissances fiables sur les composants séparés d'un ensemble plus vaste restent bien sûr importantes en tant qu'élément du système.

Les besoins actuels et futurs en matière de recherche varient de domaines d'expertise spécifiques, telle l'évaluation des risques pour les sols pollués, à des thèmes plus larges, tels les conflits en matière d'utilisation des terres. Du fait que les thèmes sont liés, un recouvrement, un mélange et une influence entre les sujets interviennent souvent, ce qui complique parfois une description intrinsèque "distincte". En fait, les thèmes, ainsi que les questions de recherche qui leur sont liées, doivent toujours être considérés dans le cadre du système plus large d'utilisation du sol et des terres. La recherche d'une approche intégrée ou de thèmes holistiques, plus horizontaux, est mentionnée comme prioritaire, parce que ceux-ci ne sont pas encore repris, ou de manière limitée, dans l'agenda de recherche actuel et parce que les connaissances nécessaires et l'expertise à ce sujet manquent par conséquent.

La plupart des besoins en matière de recherche sont communs à la Belgique (pour l'ensemble des régions), au Luxembourg et au Danemark, bien que chaque pays/région ait ses propres accents. Ces différences sont commentées dans le rapport, lorsqu'elles sont pertinentes.

Une deuxième recommandation porte sur la collaboration plus intensive entre les intéressés pertinents : tant lors de la formulation des questions de la recherche que lors de l'élaboration de la recherche même, la co-conception entre les intéressés est la clé par excellence pour parvenir à une répartition équilibrée entre questions à court et à long termes, entre la recherche appliquée, orientée vers la pratique, et la recherche fondamentale, théorique, entre les différents niveaux d'échelle (dans le temps et dans l'espace) et entre les différents secteurs et domaines politiques. La co-conception favorise également l'application et la diffusion effectives des connaissances acquises. Ceci vaut également pour le cofinancement de la recherche. Cette approche requiert généralement plus de temps.



Les participants à l'atelier ont également souligné qu'outre le développement de "nouvelles" connaissances, il fallait également attacher une importance suffisante à améliorer le désenclavement, l'interconnexion, la traduction, l'utilisation et la diffusion des connaissances déjà acquises. Les 'knowledge brokers' (ou 'courtiers des connaissances') peuvent jouer un rôle de facilitation et de coordination dans ce processus, ainsi que lors de l'accompagnement des utilisateurs des connaissances. La traduction et la diffusion des connaissances doivent être adaptées aux utilisateurs de celles-ci. Outre les 'knowledge brokers', les plates-formes (numériques) interactives et les réseaux d'apprentissage des intéressés sont également cités comme catalyseurs de l'échange de données, de connaissances et d'expériences.

Pour ce qui concerne le financement de la recherche, les intéressés signalent que les budgets sont souvent morcelés, en raison du morcellement des compétences et des agendas de recherche. La fusion du financement et des fonds est par conséquent recommandée pour une recherche plus vaste, intégrée et à long terme. La recherche en matière d'utilisation du sol et des terres n'est actuellement pas populaire auprès des instances de financement : il est donc important de mettre la plus-value de cette recherche en évidence auprès des décideurs, par exemple, en calculant le coût sociétal de l'absence d'une utilisation durable du sol et des terres, et en en tenant compte lors des décisions politiques, ou en visualisant des solutions gagnant-gagnant inspirantes (avec exemples).

Une évolution des mentalités et le changement d'attitude qui en résulte sont considérés comme le moteur du changement par excellence. Les participants ont plaidé en faveur de l'intégration des sciences sociales dans la recherche en matière d'utilisation du sol et des terres. Celles-ci fournissent des informations sur les raisons et la manière dont ce processus de prise de conscience peut être réalisé. Le fait de dispenser des connaissances sur mesure, dans un style de communication adapté, fait en sorte que la conscience en matière d'utilisation du sol et des terres se développe dans toutes les couches de la société. L'appui aux pionniers favorise une transition plus rapide.

Les participants soulignent enfin qu'une conditionnalité importante doit appuyer le développement, la mise en œuvre et le financement de la recherche en matière d'utilisation du sol et des terres : un cadre légal adapté, un climat politique stable et une régulation du marché (économique).

Dans une phase ultérieure du projet, les informations collectées par pays seront traitées pour parvenir à un agenda de recherche européen commun. La suite du trajet peut être suivie sur <http://www.inspiration-h2020.eu/>.



2.2 Methodology followed

This national report (i.e. INSPIRATION deliverable 2.5) reports the information collated for Belgium, with input from Luxembourg and Denmark (see 1.3.1). The information was collated in accordance with INSPIRATION D2.3 “Template for national information collation”.

In a first phase National Key Stakeholders (NKS) were interviewed and a desk study was executed (see 1.3.2). Based on the information collected during the interviews and the desk study, a national workshop was held in Brussels (see 1.3.3.). Next to the Belgian NKS, also NKS from Luxembourg and Denmark participated to the workshop.

Input from Luxembourg and Denmark

Beside the co-creation with the Belgian NKS, we had also the opportunity to invite some NKS from Luxembourg and Denmark to collaborate on the INSPIRATION goal.

For **Luxembourg**, a representative from the public administration Sustainable Development Ministry (Waste Department, Contaminated Sites Service) and a representative from the Luxembourg Institute for Science and Technology were interviewed and participated to the workshop. All the different topics on soil and land use (cfr INSPIRATION framework) for Luxembourg were represented.

For **Denmark**, a representative from Danish Regions and Danish Soil Partnership was interviewed and participated to the workshop. Danish Regions is the association of the five regions in Denmark. Its overall mission is to safeguard the interests of the regions nationally as well as internationally. The objective of Danish Soil Partnership is to promote development of solutions to contaminated soil and to market these solutions internationally. The regions are solely tasked with soil contamination. All other soil related issues are handled within the municipal planning regime. Only issues related to soil contamination has been dealt with by the Danish NKS.

Interviews and desk study

In Belgium, 11 NKS were interviewed during the summer of 2015. OVAM interviewed also 2 NKS of Luxembourg. 1 NKS from Denmark filled in the questionnaire and sent it back. Details on these NKS are provided in Annex I. To have a better idea of the country specific Luxembourg’ and Danish’ INSPIRATION topics, the reports of the Luxembourg and Danish interviews are provided in Annex Id.

The desk study was based on documents suggested by NKS. These are listed in Annex II.

National workshop

The Belgian workshop, with input from Luxembourg and Denmark, was organized in Brussels (Muntpunt) on 29th and 30th of October 2015.

Based on the information collected during the interviews and desk study, a larger group of NKS focused on deepening, enlarging, structuring and prioritizing the soil and land use related research needs, the science-policy-interface and the funding and (financial) cooperation topics.

The summary of the workshop program is given in the table below. The list of participants is added in Annex V.

THURSDAY 29/10/2015

- 12.00-13.00 Registration and sandwich Lunch
- 13.00-13.30 Welcome and introduction
Aim and scope of INSPIRATION
Summary information from interviews
- 13.30-14.00 Introduction workshops
Introduction stakeholders
- 14.00-14.45 **WS1:** World Café Tour on link between
societal challenges and soil and land use
- 14.45-15.00 Coffee break
- 15.00-15.15 Plenary summary World café
- 15.15-16.15 **WS2:** Knowledge gaps and research needs
- 16.15-16.55 Plenary summary WS2
Priority setting on research needs
- 16.55-17.00 Presentation evening program + next day
- 17.10 Entrance Muntpunt: start city walk on Soil
and Land use in the City of Brussels
- 19.15 Dinner at Restaurant Toukoul,
Lakensestraat 34, Brussels

FRIDAY 30/10/2015

- 9.00-9.30 Welcome to new guests, Summary day 1
Introduction day 2
- 9.30-10.30 **WS3:** Parallel sessions on
- Interface science-policy
- Funding and (financial) cooperation
- 10.30-11.00 Coffee break
- 11.00-12.00 Reporting on WS3
Discussion, suggestions, questions, good
practices, link with INSPIRATION
- 12.00-12.10 Next steps and follow up
- 12.00-13.00 Sandwich lunch



2.3 Research and Innovation (R&I) needs

2.3.1 Societal challenges and needs

We strive toward knowledge, always more knowledge, but must understand that we are, and will remain, surrounded by mystery. (Marcelo Gleiser)

The INSPIRATION strategic research agenda aims to contribute to tackle societal challenges related to soil and land use.

As a first part, the societal challenges and their link to soil and land use are explored.

H2020-challenges listed by the European Commission

Horizon 2020 reflects the policy priorities of the Europe 2020 strategy and addresses major concerns shared by citizens in Europe and elsewhere.

For the INSPIRATION project, the H2020 strategy will focus on the following challenges:

- Contribute to food security and food safety;
- Ensure secure supplies of safe drinking water;
- Secure energy supply and distribution;
- Reduce raw material and resource consumption, Ensure efficient use of natural resources;
- Contribute to climate change mitigation and societal adaptation;
- Contribute to a healthy living environment;
- Ensure secure infrastructure

All interviewees affirmed the challenges listed by the European Commission (EC) for the H2020-program as rather complete and all mentioned challenges as important.

The following challenges were stressed by the interviewees as very important or reported as missing in the list:

- How to **integrate** the different EC-challenges into “**one global long term vision**”?
- It is important to take into account the “**dynamic**” **megatrends and (direct and indirect) drivers** who will influence all challenges (cfr. “*Megatrends*”, John Naisbitt). In the report “*Megatrends, far-reaching, but also out of reach? How do megatrends influence the environment in Flanders?*”, the Environment Report Flanders (MIRA) identifies the six following **global megatrends**:
 - **changing demographic balances**
 - **accelerated technological developments**
 - **growing scarcity of raw materials and other resources**
 - **growing multi-polarity in society**
 - **climate change**
 - **increasing vulnerability of systems**



The megatrends influence our environment mainly through four societal systems: spatial planning, mobility, energy and production and consumption.

- Water (not only drinking water, but also irrigation and production water)!
- Climate adaptation
- Urbanization and growing cities
- Wellbeing and life quality in the city
- Efficient infrastructure
- Reducing fragmentation and dealing with the scarcity of (suitable) land for different land uses
- Protect soil and land as a primary challenge (not only indirectly)
- Protection of ecosystem services
- Safeguarding biodiversity and nature (habitats) for future generations
- Jobs and job creation are not mentioned in the EC-list
- Mobility (as an activity, not only infrastructure) is not mentioned in the EC-list
- Changing demography as an important driver!

Connection between societal challenges and soil and land use issues, mentioned during the World Café Tour in the Workshop in Brussels

During a World Café Tour, workshop participants became acquainted with each other and debated how to link the H2020 societal challenges with aspects of soil and land use (such as agricultural practices, contamination,...).

The fundamental role of soil and land use and the intertwining of all different aspects were stressed.

The following soil and land use issues were named in relation to the listed H2020 societal challenges:

1) Contribute to food security and food safety

Different (political) choices (or combinations of choices) on soil and land use can/have to be made, each with their own impact (which needs to be assessed in order to know the consequences and societal costs; and to make the right decisions), e.g.:

- Globalization (dependency e.g. on world market) versus self-sustaining regions (independency) => soil quality needs to be and stay high enough
- Land market regulation versus protection of commons: this requires political choices => which outcome is best for a healthy soil? How to assess the impact of the chosen land use?
- Land use: share (mixed use) versus spare (mono use): when to apply multi-functionality and when not?



- Agro-industry and intensification (high energy) versus agro-ecology and extensification (less energy)
- Use of agricultural land: bio-fuel versus food
- For low quality agricultural land, it's better to look for alternative land use instead of classic agriculture (with high demands of input), e.g. sheep in combination with energy production.
- Attention for prevention at the land management level is important in order to avoid pollution (soil, groundwater, sediments)
- Taking into account the scarcity of land, it is appropriate to consider the use of urban land for urban related farming and local food production. There is a need to focus also on prevention on food waste.
- Soil health and soil security on the long term are necessary for healthy food.

2) *Ensure secure supply of safe drinking water*

Prevention (e.g. to avoid pollution) is important to ensure supply of safe drinking water and needs to be incorporated in each land management plan:

- Need for clean land use (no use of hazardous chemicals): e.g. nature + extensive agriculture + tourism: cfr. Happy meat (France)
- Need to protect recharge areas for drinking water
- The opportunity for PES (payment for ecosystem services) needs to be taken into account (cfr. water company Vittel pays farmers in the neighborhood to avoid use of harmful products on their fields)
- The agro-industry sector, but also individual behavior of civilians and public authorities, use pesticides, other chemicals, ... which cause problems at the water purification stations.
- Knowledge on contaminants needs to be developed and used:
- Scientifically motivated threshold values – where needed locally adapted
- New chemicals (e.g. TBT, flame retardants) and their sources
- Existing point sources
- Impact over (long) time !! (e.g. for diffuse pollution which is difficult to remediate or to manage)
- Soil sealing and compaction are important issues.



3) Ensure efficient use of natural resources (e.g. green, wood, thermal energy, ore, gravel, ...)

- Sustainable use of soil and land has to take into account soil fertility and soil productivity
- Recycling and re-use of land (e.g. brownfield regeneration)
- Interim (temporary) use: temporary beneficial use of derelict and (low) contaminated land. Preparing for higher quality and sustainable functions.
- For the good understanding of all soil properties and nutrients (biogeochemical processes): a holistic vision is needed !!!
- Laws and legislative framework needs to be adapted to local soil diversity and has to be flexible (adaptable to new knowledge).

4) Secure energy supply and distribution, related to spatial planning

- Food-feed-fuel-fiber: what to choose for land use on arable land? What are tradeoffs? What is sustainable use? What is the policy and knowledge on the different scales (e.g. in Belgium)? What land management is needed?
- Forests can supply wood which implies slow energy production and multifunctional land use
- Solar panels take land for solar energy production which implies fast energy production and monofunctional land use
- Concerning slightly contaminated land (e.g. brownfields, landfills): more pilots and case studies based on applications of the Life Cycle Assessment (LCA) method could be an effective strategy to benchmark environmental synergies and tradeoffs and exploit the opportunity to use phytoremediation or Miscanthus (elephant grass) for energy crops
- It is important to avoid taking good arable land for energy supply and distribution
- Integrated approach and optimization is needed to tackle complex societal challenges: at this moment there is the perception that (EU) leadership for these topics is lacking.
- Look for opportunities in decentralized and local energy supply and storage (biomass (e.g. on landfills), (deep) geothermal energy) in function of soil quality and land use



5) Reduce raw material and resource consumption

- Here again the use of LCA and related methodological infrastructure could be a solution to assess environmental synergies and tradeoffs of different solutions over time
- Look for opportunities to recycle (C2C) excavated sand, clay, gravel,... . This will result in less landfills and more circular economy (e.g. use as building material). Excavating soil and dumping it results in loss of resource.
- Landfill mining
- Be aware for green washing
- Brownfield remediation avoids greenfield take and can be (part of) the solution for land scarcity and speculation on greenfields. However this implicates that (part of) the land management should be in hands of authority? There is need for a policy tool (e.g. “exchange-database”) that helps to easily exchange and trade parcels of land.
- Passive housing and eco-neighborhood promotes and support denser living and energy saving which is more efficient.
- Need to promote and support composting (recycling own biowaste in the garden or in green management) instead of using imported peat soil from Lithuania (which destroys carbon storage in soil)
- Use waste for stabilization of pollutants on site
- Re-use sediments as secondary resource instead of primary resources
- Re-use and recycling of soil nutrients or nutrients from wastewater

6) Ensure secure infrastructure

- Climate change will give birth to sea level rises and salinization of the land and groundwater.
- Landslides due to climate change
- Climate change results in more flooding. More dredging is needed and sediment export to the Netherlands.
- Climate change result in heat effects in cities. Infrastructure should be adapted to reduce the impact of heat stress.
- Radiation effects of power lines.
- Prevent erosion in order to protect residential areas from soil and mud flows.
- There is a clear link between secure infrastructure and spatial planning. Proper land management is the key.
- Regarding underground infrastructure there is a link between soil quality and spatial planning.
- Example of societal challenge related to secure infrastructure: Antwerp Ringland (covering of highway to avoid particulate matter and dust in air of city residential area)



7) Contribute to climate change mitigation and societal adaptation

- C-storage can be provided and fostered by e.g. soil, woods, proper farming practices
- Green corridors and blue-green networks (water) can regulate temperature and heat stress in cities
- Smart spatial planning and smart distribution of human activities (e.g. smart mobility) gives birth to less CO₂.
- Proper farming practices (e.g. no tillage) keep C and nutrients high enough and keep drainage high enough.
- The sea level rising due to climate change has effects on hydrology (e.g. more flooding).

8) Contribute to healthy living environment

- Recent research confirm the strong link between mental health and “green” land use (green area, nature, water)
- Compact cities can result in less polluting mobility.
- Less polluted soils and less waste contribute to a healthy living environment.
- Organic farming contributes to healthy food.
- Good working and healthy ecosystem services (e.g. filtration of water, purification of air, ...) contribute to a healthy living environment
- Green corridors could act as buffer to land use conflicts.
- Buffering capacity of soil

9) Protection of nature, ecosystems and biodiversity

- There is a clear link between soil diversity and soil history on the one hand and biodiversity on the other hand.
- Taking into account the value of (soil) ecosystem services can raise awareness and evidence the external benefits to society
- Land and soil should be considered as a valuable common
- Soil legislation
- Integrate policies and spatial planning

During the World Café Tour, it became clear that soil and land use are fundamentally related to all societal challenges. This intertwining shows and reveals the need to connect and to transcend the different scientific disciplines and to merge soil and land use related research topics into a system focused approach.

It was also stressed that it is very important to take into account the different scales (in time and space) of soil and land use: on each scale other processes, other legal frameworks, other stakeholders, ... could be of importance.



2.3.2 Topics / research needs to include in the SRA

In the next step Belgian, Luxembourgish and Danish NKS listed the topics and research needs/questions that are to be included in the SRA.

Research topics and research questions should be as good as possible ordered or connected to the four integrative themes of the INSPIRATION conceptual model (see chapter 1). This proposed ordering of the research questions will be given in the text below, indicated in italic.

Demand related topics and questions will be indicated in **red**, **natural capital** in **green**, **land management** in **blue** and **impacts of land management** in **purple**. If the topic or question is related to all four integrative themes, it will also be indicated.

In the text below, all research topics and research questions, related to soil and land use, that were mentioned during the interviews or workshop, are described using a small narrative. In the narrative, we try to introduce the “**why**” and the “**what**” of each topic, followed by more detailed research questions.

BE-1: Long term monitoring of the soil (or soil-sediment-water) system (as an important part of natural capital)

Long term monitoring and data collection of the soil-sediment-water-system (SSW), including the related SSW-system mechanisms and processes, is needed, e.g. to monitor the natural state of the SSW-system and the impact of climate change, land management practices, land use changes, ... on the SSW-system in order to take the appropriate (policy) decisions, measures and the evaluation of these measures. This monitoring includes:

- chemical, physical, biological soil parameters (e.g. organic carbon, pH, CEC, nutrients, moisture content, biodiversity, C-storage, ..)
- contamination parameters (e.g. heavy metals, emerging contaminants, ...)
- large scale and long term
- using a harmonized and optimal methodology
- guaranteeing good quality data
- within all of Europe

Research questions:

*The following research questions on monitoring are **relevant to all four integrative themes**: the monitoring can (depending on the topic) give necessary information about the **demand** – **the natural capital** – **the land management** and **impact of land management**.*

Data mining: Which data are necessary and/or useful? How to collect them (cfr representativity, taking into account heterogeneity and variability)? How to interpret the collected data and draw conclusions resulting in measures?

Which are proper target values or threshold values for each of the parameters measured (for the different soil types and for the different land use and vegetation types, e.g. for habitat restoration)?

New reliable, validated, efficient, cheap and quick screening and detection methods for all monitoring parameters (e.g. using field test kits) need to be developed. How to set priorities?



BE-2: Further research on the survey and risk evaluation of contaminated soil, land, groundwater, sediment

A lot of knowledge related to the survey and risk evaluation of contaminated land is already available, but should be continuously updated, fine-tuned and disseminated in order to keep the implementation (including policymaking) appropriate, cost-effective and capable to tackle possible risks for human health and environment due to contamination.

Research questions:

*The following research questions are relevant for either **natural capital** (cfr. historical contamination), **land management** (cfr. prevention of contamination) and **impact of land management** (cfr. contamination due to ongoing land management practices).*

New (cheap, efficient, quick, validated and reliable) innovative screening methods for sampling and analysis (additional to the “classic” methods) need to be developed. How to integrate the different detection methods to have a proper and “combined” view of the contamination? How to use statistics to determine the proper number and location of samples and analysis (cfr representativity, taking into account heterogeneity and variability)? Which methods for “passive” sampling (taking into account bioavailability)?

How to fingerprint (e.g. determination of age) sources of contamination in mixed plumes?

Sampling and analysis methods for detection of “new” contamination parameters, e.g. for tar, dioxins, other “new” emerging contaminants, ... need to be developed.

Updated and harmonized models for human and ecotoxicological risk evaluation for contaminated land, sediment need to be developed: including updated and refined toxicological and dispersion parameters (e.g. on bioavailability, vapor intrusion due to changed building regulations (cfr. fresh air tube in Luxembourg), natural attenuation, flux groundwater-surface water), updated exposure models, new chemicals,

How to deal with uncertainties related to risk assessment?

Should methods and models for risk evaluation be harmonized within Europe? How?

Should threshold values be harmonized within Europe? How?

How to take into account combination toxicity (mixed contamination parameters)?

How to eliminate risks due to vapor intrusion into building with sensitive use?

How to refine the modeling of interaction (e.g. chemical erosion) and dispersion in the groundwater-sediment-surface water interface? How to define the spreading and “in situ” risks and need for remediation?

How to raise awareness for the possible risks due to soil contamination (e.g. in vegetable gardens)?

How to survey (and remediate) groundwater contamination (e.g. VOC, pesticides) in limestone aquifers?



BE-3: Research on diffuse contamination (i.e. contamination not directly linked to a known source, e.g. dioxins, nitrates, pesticides and its metabolites)

Diffuse inputs of contamination parameters to soil, sediment and groundwater can be of various nature and is in most cases not directly linked to a known source. Typical (both historical and actual) inputs resulting in diffuse SSW contamination are:

- Agricultural practices; i.e. direct input of nutrients (fertilizers) and pesticides, application of sewage sludge and manure.
- (Historical) Atmospheric deposition of exhaust gases and particles from vehicles and industry.
- Sedimentation of diffuse particles from waste water discharges in surface waters
- Very local sources (use of material (e.g. ashes), uncontrolled excavations and refillment (e.g. using excavated soil and sediments), (carelessly) use of harmful products by citizens, professionals (e.g. pesticides, cosmetics, pharmaceuticals, ...)

Major impacts of (both historical and actual) diffuse inputs to soil, sediment and groundwater could be:

- Decrease of soil quality and possible risks for humans and environment
- Decrease of groundwater quality due to leaching processes of nutrients, organic matter, pesticides and other pollutants
- Decrease of sediment quality due to deterioration of water quality and import of polluted material
- Eutrophication of surface waters due to sedimentation processes⁵.
- Diffuse contamination forms a major threat to the drinking water availability on the long term.

Research questions:

*The following research questions are relevant for either **natural capital** (cfr. historical diffuse contamination), **land management** (cfr. prevention of diffuse contamination) and **impact of land management** (cfr. diffuse contamination due to ongoing land management practices).*

How to prevent, map and monitor, evaluate risks, remediate or manage diffuse contamination in soil, groundwater and sediments?

How to set priorities in research and monitoring?

How to balance intense land use and agriculture, and drinking water production?

How to set up a plan of action to tackle diffuse pollution of soil, sediment and groundwater on the local, on catchment areas (for drinking water) and regional scale?

⁵ EUGRIS portal site



BE-4: “New”, non-common measured or “Emerging Contaminants” in soil, groundwater, sediment

Definition of Emerging contaminants by the United States Geological Survey: “Any synthetic or naturally occurring chemical that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and(or) human health effects”.

The major sources of environmentally relevant emerging contaminants are primarily wastewater treatment plants effluents, and secondarily terrestrial run-offs (roofs, pavement, roads, agricultural land) including atmospheric deposition. Characteristic of some contaminants is that they do not need to be persistent in the environment to cause negative effects since their high transformation/removal rates is compensated by their continuous introduction into the environment. For most of the occurring emerging contaminants, risk assessment and ecotoxicological data are not available and therefore it is difficult to predict which health effects they may have on humans, terrestrial and aquatic organisms, and ecosystems. Also the budgets (sources, entry routes, and fate) for environmental pollutants would be of importance⁶.

When migrated to surface and groundwater, new or emerging contaminants form a threat to the drinking water production on the long term.

Research questions:

*The following research questions are relevant for either **natural capital** (cf. historical contamination due to emerging contaminants), **land management** (cf. prevention of contamination due to emerging contaminants) and **impact of land management** (cf. contamination due to emerging contaminants in relation to ongoing land management practices).*

Knowledge on physicochemical properties and risks of “new” (emerging) contaminants (e.g. cosmetics, pharmaceuticals, pesticides, ...) is often not available and is needed: (eco)toxicology, bioavailability, combination toxicology, behavior, sources, pathways, impact, remediation technology, ...

Sampling methods and suitable analytical methods (low detection limit) are often not available and are needed

Collection monitoring data (in soil, groundwater, sediment) is needed to check the evidence in the real environment.

How to set priorities in the research and monitoring for the most critical parameters?

How to set “threshold values” (if necessary)?

How to remediate these “new” (often persistent and mobile) parameters?

How to prevent and remediate contaminated soils, groundwater, sediments?

How to raise awareness at the producers and consumers (of the products containing emerging contaminants) (e.g. appropriate use of products, ...)?

How to estimate the risks of new or emerging pollutants for drinking water production?

⁶ EUGRIS portal site



BE-5: Remediation technology for contaminated soil, groundwater, sediment

A lot of knowledge related to remediation technology of contaminated land is already available, but should be continuously updated, fine-tuned and disseminated in order to keep the implementation (including policymaking) sustainable, cost-effective and capable to tackle possible risks due to contamination.

Research questions:

Demand

The combination of soil and sediment remediation with other activities (e.g. energy production) could give a positive imago to remediation actions which are usually only considered as a “cost”. It can also inspire and convince “less experienced” countries/regions/enterprises to start with remediation. What kind of research is needed to develop and test the win-win-situations and disseminate the knowledge and inspiring examples?

Land Management

How to optimize existing and innovative remediation technology for contaminated soil, groundwater, sediment (e.g. for big urban VOC-plumes, e.g. for low permeable geology, e.g. cleaning soil contaminated with multiple parameters,...)?

How could phytoremediation/mycoremediation/bioremediation be used to remediate or manage contaminated soil, groundwater, sediment (long term management)? How could naturebased solutions (inspired by nature e.g. enhancing/using soil biodiversity) be useful and how can they be incorporated in the remediation process (long term remediation, management or restoration)?

Impact of land management

How to make remediation of contaminated soil, groundwater, sediment more sustainable and cost-effective (e.g. lower energy consumption, cleaning of soil, ...)?



BE-6: Integrated approach remediation - spatial planning (e.g. brownfield development, landfill mining)

Land is a limited natural resource. An integrated approach of the remediation of contaminated land can help create sustainable solutions (elaborated in co-creation with all stakeholders) by ensuring that economic, social and environmental issues are tackled through integrated strategies for renewal, regeneration and development in both urban and rural areas, e.g. brownfield development which can help protect the conservation of greenfields, urban forestry, Landfill sites can be considered as a specific kind of brownfields and should by consequence be addressed in a more specific way, namely as a resource of materials, energy and land.

Research questions:

Demand

How to integrate and optimize the remediation of contaminated land in spatial planning processes? How could spatial planning take the contamination of the site into consideration, thus allowing for more optimal redevelopment?

How to set up a landfill management plan that provides optimal use and protection during the period of non-mining. Cost-effective interim measures as alternative to high containment costs.

Land Management

What kind of knowledge is needed to stimulate the reactivation of brownfields (e.g. for urban forestry) rather than developing green field sites. How can we stimulate the protection of greenfields? How to implement and apply existing knowledge on brownfield redevelopment? How to develop flexible instruments?

How can we involve all stakeholders (e.g. municipalities, real estate, ...)?

Could we grow “usable and sustainable” energy crops on contaminated land? How?

BE-7: Integrated approach spatial planning in relation to soil and subsurface

Facing a denser population and a more complex society, more and more activities will take place in the subsurface (e.g. infrastructure facilities, water supply, electricity, sewer system, ...). A sustainable use of the soil (and subsurface) contributing to tackle societal challenges without losing soil quality and the natural soil services is needed.

Research questions:

Land Management

How to integrate and optimize subsurface activities (e.g. remediation, infrastructure facilities, subsurface buildings, sewer system, ...)?



BE-8: Innovative funding systems for remediation / restoration / brownfield development / landfill mining...

In some cases the costs for the remediation or restoration of contaminated or degraded land or sediments are too high for a private owner or for public agents. This results in land or soil and sediments that is not remediated or not restored, even if this remediation or restoration would be very valuable for society.

Research questions:

Land Management

Can we develop an innovative funding system allowing support for those remediation or restoration projects for which the costs are exuberant or exceed the initial expectations? Or for those projects where “economic” value is not the main driver (e.g. remediation or restoration in small nature areas)?

BE-9: Excavated soil/sediment

Excavated soil or sediment can be used as building material instead of primary raw materials. On the other hand can the unsafe reuse of contaminated excavated soil and sediment give birth to diffuse contamination.

Research questions:

Demand

How to use excavated soil/sediment as secondary raw material?

Land management

How to guarantee and monitor a safe reuse (regarding the current lack of traceability of excavated soil/sediments)?

BE-10: Organic carbon (OC) in soil

Soil organic carbon plays an important role in soil fertility and soil health; and plays also a key role in the carbon cycle, and thus it is important in global climate models.

Research questions:

Natural capital

Models calculate the C-evolution in soil. How should the model results be monitored in the field allowing an evaluation of these models?

How can soil help to reduce the impact of climate change?

LULUCF: mapping Land use, Land use Change and Forestry on European level:

- Data on land use and on land use change
- Data on the evolution of C in soil
- How to process and analyse these data? How to conclude on measures needed?

The C-storage capacity of specific soils needs to be quantified.



Land management

What kind of measures do we need to, on the one hand keep organic carbon high enough (to preserve the soil health) and on the other reduce the impact on climate change? And this taking into account the different kinds of organic carbon and its different roles (storage C, soil fertility, ...).

Impacts of land management

What is the impact of land use changes on (changes in) of OC (and on soil fertility, erosion)?

What is the impact of the manure policies and legislation (limitation of manure use on land) on OC?

A large quantity of biomass is used for the generation of "green" energy but due to that, biomass is not returning to soil, resulting in an impoverishment of the soil. In regard to the potential conflict between food supply and energy need, impact of the loss of biomass needs to be assessed. Which quantity of biomass can be exploited keeping the soil quality? Which practices to choose?

BE-11: Conservation soil fertility

Soil fertility refers to the ability of a soil to sustain plant growth, i.e. to provide plant habitat and result in lasting constant yields of high quality. In lands used for agriculture and other human activities, soil fertility typically arises from the use of soil conservation practices and their impact on the long term.

Research questions:

Land management

How to conserve the fertility of soil in the long term?

BE-12: Erosion

Due to erosion in Flanders, a lot of fertile soil is lost resulting in less fertile arable land on the longer term. The washed away soil and mud enters in the sewer systems and the residential areas resulting in high clean-up costs.

Research questions:

Land management

A lot of erosion research has already been done or is ongoing:

- How to restore degraded soils? What are the actual knowledge gaps?
- How is the knowledge on measures to reduce erosion implemented (or not)? Which measures could be implemented by farmers or by other stakeholders?

How can research and research findings be translated into layman's terms in order to foster the implementation of results and suggestions for action? How can we stimulate its implementation?

BE-13: Soil sealing (covering of the ground by an impermeable material)

The increased sealing of (former) fertile soil, especially in cities, causes a degradation of soil fertility and thus impedes food production. The ecological soil functions are severely impaired or even prevented (e.g. soil working as a buffer and filter system or as a carbon sink). In addition, surrounding soils may be influenced by change in water flow patterns or the fragmentation of habitats. Current studies suggest that soil sealing is nearly irreversible.

Research questions:

Land management

How can we develop a policy to prevent soil sealing? How can we integrate these policies in spatial planning processes?

Does a technological solution exist?

Impacts of land management

How can we raise awareness around soil sealing issues?

BE-14: Soil compaction

Soil compaction is a form of physical degradation resulting in densification and distortion of the soil where biological activity, porosity and permeability are reduced, strength is increased and soil structure partly destroyed. Compaction can reduce water infiltration capacity and increase erosion risk by accelerating run-off. The compaction process can be initiated by wheels, tracks, rollers or by the passage of animals.

Research questions:

Land management

How can we develop a policy to prevent soil compaction or to restore soils after compaction?
How can we integrate these policies in spatial planning processes or land management practices?

Can we think of innovative ways to cultivate the land without having to use heavy machinery (e.g. the use of drones,...)

Impacts of land management

In order to change the behavior of farmers, foresters and policy developers we need to raise awareness on the issue of soil compaction. How can we do this efficiently and effectively?



BE-15: Water retention capacity of soil

Soil water retention is a major soil hydraulic property that governs soil functioning in ecosystems and greatly affects soil management. Soil moisture forms a major buffer against flooding, and water capacity in subsoil is a major steering factor for plant growth. The effects of changes in soil water retention depend on the proportions of the textural components and the amount of organic carbon present in the soil. Maintaining or even enhancing the water retention capacity of soils can play a positive role in mitigating the impacts of more extreme rainfall intensity and more frequent and severe droughts, e.g. due to climate change.

Research questions:

Land management

How to safeguard the sponge function of the soil?

How to foster/upgrade the water retention and water infiltration capacity of soil?

BE-16: Soil and sediment ecosystem services

Soil and sediment as an important part of our natural capital are providing a lot of ecosystem services to society. These ecosystem services are relevant to grand challenge areas: e.g. climate change adaptation and mitigation, food and energy security, water protection, biodiversity and genetic pool for human health, ecological sustainability, cultural heritage. It is necessary to increase the awareness on the importance of the soil (and sediment) ecosystem and their services, showing their value for society, the need for protecting (and restoring) this values and make a more sustainable and efficient use of it, as part of the natural capital for the actual and future generations.

There should be made a clear link to the existing initiatives on MAES and TEEB, which are addressed both through national efforts of each Member States and the European Commission, via also some ongoing H2020 projects. New knowledge should be built upon existing knowledge...): <http://biodiversity.europa.eu/topics/ecosystem-services>; etc.

Research questions:

Natural capital

How to raise awareness on the importance of soil, sediment and their (ecosystem) services?
How can we highlight its/their positive and fundamental role in order to protect (and restore) them?

How to map and assess soil ecosystem services?

How to value soil ecosystem services?

All stakeholders (including policymakers) need to take into account the value of the different soil ecosystem services in their processes and projects: how to do that?

BE-17: Recycling of soil nutrients

Plant nutrients are chemical elements that are mostly absorbed by plant roots as inorganic chemicals dissolved in water. At the same time, plant nutrients are used by other forms of life and go through many biological transformations that determine when and how plants take them up. Biological materials like manure are major nutrient sources on many "conventional" farms, as well as organic farms, while inorganic minerals (chemical materials) like rock phosphate and lime are acceptable fertility amendments for certified organic production. Understanding soil nutrient recycling processes helps identify practical options that fit different farming systems. Understanding nutrient cycles helps all types of farmers maintain the fertility of their soils, while at the same time protecting our water resources.

In Flanders most soil nutrient recycling challenges are focused on manure.

Research questions:

Land management

How to process manure to recycle nitrogen (N) and phosphorus (P)? Which techniques and methods can be used to remove P (and N) from manure?

Impacts of land management

What is the impact of the manure policies and legislation (limitation of manure use on land) on N and P?

What is the relation between soil nutrients and the health value of food?

Phosphorus saturation

Sandy soils in Flanders have a high content in phosphorus.

Demand and Natural capital

What are the optimal P-levels in different soil types and for different land uses?

What is the behavior of P in sandy, loamy and clayey soils? What is the effect of the saturation in the long term? We need more data about this topic.

Which analyses and extraction methods/protocols should be used to map the P-concentrations in soil in a harmonized and proper way, and this in function of pH and soil texture?

Land management

In other regions in Europe or on a mondial scale, there is a deficit in P. How can the P in Flemish soils be recycled? Which "remediation technology" is the most suitable to reduce the amount of P in soil?

Nitrogen saturation

Natural capital

What is the link between N-deposition and biodiversity? What are possible effects in both the short and long term? We need more data .



BE-18: Soil biology and soil biodiversity

Soil biodiversity is the driving force behind the regulation of soil ecosystem services. Many of the functions performed by soil organisms can provide essential services to human society. Most of these services are supporting services, or services that are not directly used by humans but which underlie the provisioning of all other services. These include nutrient cycling, soil formation and primary production. In addition, soil biodiversity influences all the main regulatory services, namely the regulation of atmospheric composition and climate, water quantity and quality, pest and disease incidence in agricultural and natural ecosystems, and human diseases. Soil organisms may also control, or reduce environmental pollution (bioremediation). Finally, soil organisms also contribute to provisioning services that directly benefit people, for example the genetic resources of soil microorganisms can be used for developing novel pharmaceuticals.

Soil biodiversity is threatened due to soil degradation, land use management, climate change, pollution by chemicals and GMO's and invasive species. This decline leads to high societal costs. For instance, the consequences of soil biodiversity mismanagement have been estimated to be in excess of 1 trillion dollars per year worldwide.

Research questions:

Demand

What is the potential of soil biodiversity for the development of new pharmaceuticals?

What kind of soil biodiversity is important for the farmer?

Natural capital

How to sample, analyse and evaluate (the status of) soil biodiversity? How to extrapolate field data?

How can we visualize and communicate the role of soil biodiversity to stakeholders in the agricultural sector in order to make its importance easily understood?

Land management

How to protect/restore soil biodiversity?

Impacts of land management

What is the role (and impact) of soil biodiversity on agricultural processes? And vice versa?

What is the impact of agricultural practices on soil biodiversity?

Is the bioavailability of soil nutrients (e.g. P) influenced by soil life / soil biodiversity? And vice versa. How is this different in manure or chemical fertilizers?



BE-19: Remediation of “agricultural” contamination (phosphorus, nitrogen, pesticides)

Agricultural land with too high concentrations on N, P or other parameters should be remediated or managed in order to reduce risks and restore a good soil quality.

Research questions:

Land management

How to avoid too high N-levels in soil through N-deposition and manuring. How to remediate contamination linked to agricultural activities (P, pesticides, ...)?

Could naturebased solutions be used to remediate agricultural contamination?

BE-20: Integrated pest management – Use of pesticides, herbicides, ...

Integrated pest management, or IPM, is a process that can be used to solve pest problems while minimizing risks to people and the environment. IPM can be used to manage all kinds of pests in urban, agricultural, and wild land or natural areas.

Research questions:

Land management

How to grow crops – vegetables making use of integrated pest management and reducing the use of harmful pesticides, herbicides? Especially for specific less cultivated crops (some vegetables, fruits, ...).

How to raise awareness and lower the use of herbicides, pesticides at the citizen, allotment and public services level?

Impacts of land management

How to link integrated pest management to the effects on the structure and function of the soil food web.

BE-21: Pressure on land and spatial planning, fragmentation of land, scarcity of land

Land is a limited resource. The countryside is urbanizing (urban sprawl). Farmers need more land to upscale their production. Land prices are rising and access to land is getting more difficult for some parties (e.g. “new” farmers).

Research questions:

Demand

Which land is best/not suited for which agricultural use? A lot of knowledge is available, but is not disseminated or implemented to the relevant stakeholders. How to disseminate? How to exchange knowledge and data?

Land management

How to reduce the pressure on land? How do we deal with the available area of land/soil, to what use will we give priority and which not? How to link spatial planning with environmental concerns and raise awareness? How to keep the resilience on and resistance to the use of land, which is e.g. important for climate change? Which policy tools are needed?

What (and how) could prevent society from losing its good agricultural soils (by combining science, laws, social sciences, economy, ...)?

How to make efficient and effective use of the available land? E.g. making use of roofs for greenhouse farming? Which technologies are needed?

How to stop fragmentation of land?

Land prices (e.g. for public nature, agriculture or public recreation areas) are rising due to private landowners buying big parcels of land. What is the impact of this process on private plots of natural land (private landowners)? Can we assess and calculate this impact?

BE-22: Conflicts on land use

An increasing demand on land causes conflicts in land use resulting in pressure on land (use) in Belgium, with possible impact outside Belgium.

Research questions:

Impacts of land management

How to avoid land conflicts and to provide righteous access to land? How to find an equilibrium between the different land use types? Need for sociological research (e.g. role of difference in cultures, role of wellbeing, relation green/wellbeing/area for recreation/criminality/hospitals, ...). What kind of sociological research is needed?

How should we assess the environmental impact (e.g. on water and soil quality) of the different kinds of land use in terms of costs on society (cost/benefit analysis), (e.g. costs to purify contaminated drinking water)? How to take into account the results of these assessments?

Should we distribute certain high impact economical activities (e.g. cattle breeding) over Europe? If yes, how should this be done?



Can we think of decision making tools that allow us to determine which land should be used for specific functions, e.g. biomass production, food production,...? What are advantages and trade offs of the different choices in land use? How can we take into account the impact of a certain land use beyond the regional boundaries? How to make balanced decisions and how to set priorities? Should former farmhouses that are no longer active in the agricultural field be redeveloped (and house new functions, e.g. recreation, care (for the elderly),...) or do we pull them down?

BE-23: Agricultural practices and land management

Land management systems and agricultural practices should take into account the actual situation of the soil and the impact of the practices or management systems on the soil and the environment (also on the long term). Knowledge is available but not always satisfactorily distributed and applied.

Research questions:

Land management

Can we integrate the existing knowledge in the educational practice of e.g. (urban) planners, agricultural sciences, etc...? How can this knowledge be translated into laymen terms that make them more accessible to the agriculture sector?

How to realize sustainable intensification in agriculture?

How to process manure in such a way that it is better absorbed by the soil with less "leaching"?

How to process compost or the recycling of bio waste in the most suitable, practical and cost effective way?

How to make horticulture (vegetables) more sustainable (e.g. less soil compaction due to intensive farming, less use of pesticides, less erosion)?

How to make irrigation and drainage more effective and sustainable (e.g. less impact on soil biodiversity, less leaching of nutrients)?

Impacts of land management

How should we assess the environmental impact (e.g. on water and soil quality) of the different kinds of land management practices in terms of costs on society, e.g. the cost to society on loss of soil fertility, soil biodiversity or food health by some unsustainable or harmful agricultural practices? How to take into account the results of these assessments?



BE-24: Spatial planning

Flanders (and Brussels) is characterized by intensive soil sealing and fragmentation. Spatial policy in Flanders is facing a number of societal challenges. The population is expected to grow from 6 to 7 million, so the pressure on the space will not be reduced. It is necessary to think how a high-quality open space, good mobility and space for renewable energy production can be provided. How can we prevent floods, protect food production and offer investors and businesses the space that's needed to keep the Flemish (and other) region competitive?

Research questions:

Demand and Natural capital

How to integrate the “dynamic” societal flows (e.g. temporary and/or multiple use of space or land, mobility, energy flows, waste flows, ...) into the more “static” natural system of soil and land use?:

- How to collect dynamic data on multiple and flexible land use, temporary land use (e.g. pop up activities in cities, temporary nature)?
- How to collect dynamic and accurate data on “flows” and “logistic networks”: e.g. energy, transportation and mobility (people, goods), circular economy, resources, waste, ...? How to develop a dynamic model that visualizes and monitors changes? Based on this model policymakers can make better decisions.

These dynamic data are necessary to develop and follow up a good policy about spatial planning and land use.

Land management

Can we translate the fundamental knowledge about land use and land use planning into practical knowledge that can be easily and readily applied? What kind of tools can be used by stakeholders on different levels (e.g. policymakers, cities, ...)?

How to develop decision supporting tools to optimize land use and spatial planning, taking into account different societal needs at system level (e.g. mobility, water management, agriculture, residential areas, industry, nature, recreation, ...)?

Impacts of land management

How to coach and support policymakers on different levels to be able to calculate/see the impact of their policy decisions on spatial planning? The research demands of those who need the support and coaching should be central.



BE-25: High tech monitoring and data collection

The need for technological development, e.g. in agriculture to achieve "sustainable intensification", is on the agenda of governments and international bodies. Innovation is also at the centre of the EU2020 strategy. New technologies and their adoption by e.g. EU farmers are considered as key drivers in maintaining European agriculture competitive in a global world. While the potential of technological development for sustainability is acknowledged, there is a global trend towards increased regulation of new technologies, be it for concerns about their safety or ethical and societal concerns. The conception and development of policies governing technology needs strong scientific support.

Research questions:

Land management en Impacts of land management

The development and use of high tech monitoring and data collection in relation to soil and land use: e.g. real time monitoring using satellites, precision farming, remote sensing and (geo-tele)detection, use of drones, ...=> what are its possibilities, what are priorities, what are unintended effects?

BE-26: Holistic approach

Complex societal challenges, like (research on) land use and soil management, should be approached in an integrated and holistic view in which the interactive nature and interdependence of external and internal factors is stressed. In an integrated approach complex systems are viewed as a whole, with its own dynamics, and the individual components should "collaborate" to fulfill the main objective. This results in an integration of many different disparting functions and different disciplinary fields for a collective optimum performance at minimum cost to the objective in a sustainable manner and also result in long term benefit to the environment. Strong emergence of collective behavior of complex system should be the cornerstone of an integrated approach.

E.g. There is a strong need to engage the whole product/process chain and sector, using a complete life cycle oriented approach: "Life Cycle Thinking".

Research questions:

*Process related item and **relevant to all four integrative themes.***

How to promote an integrated approach and system thinking (e.g. life cycle thinking)?

How to set up an holistic and systemic approach in soil and land use (research), taking into account indirect and unexpected events? How to find the equilibrium between the 2 extremities: fragmentation of knowledge and the postmodern "talking about the whole without acting"?

How can system dynamical modeling help to understand the complexity so that new needed knowledge and/or measures can be developed (e.g. try to connect the C-N-P-cycles in one holistic model)?

How to take into account the different scales (in time and space) in soil and land use (e.g. parcel, region, landscape, country, ...), needing all a different framework, within the holistic and integrated approach?



BE-27: Integrated risk/impact assessment on industrial sites (and for other activities/practices)

Industrial activities (and other land management practices) could have impact on different environmental compartments (e.g. air, water, soil, sediments, ...). Policymakers need to use a more integrated risk evaluation for all impacted compartments, ensuring that the suggested measures to reduce the environmental impact are not conflictual, e.g. excavation of contaminated soil gives birth to landfills. These landfill sites cannot be used for other developments. It is imperative to keep track of the whole and to understand the mutual impact of decisions made. Priorities need to be set and supporting actions taken. This can be a win-win for the industry and society.

Research questions:

Impacts of land management

How can we make such integrated assessments? What kind of research is needed to provide knowledge to make optimal choices?

How can we integrate soil and land use aspects in the existing environmental impact assessment?

BE-28: Ecosystem approach

Ecosystem services can contribute to economic development and research on the ecosystem approach can help to grow awareness. Economic models should take more into account certain ecosystem related parameters like e.g. soil fertility or the pollination of crops.

Research questions:

Overlap of all four integrative themes

What kind of research is needed on the interface between biodiversity, ecosystem services, nature on the one hand and economic development on the other hand?

Impacts of land management

How to map the “trade off” between money or economic growth and ecosystem in a better way?



BE-29: Mind shift and change in behavior

Having the “right” knowledge and practices is not enough to challenge the needed change. A mind shift and change in behavior -at the level of all stakeholders- are required.

Social sciences should unveil the triggers needed to provoke change. This, however, demands technical knowledge of the soil and land use system in the bigger framework to be fully comprehensible. You must know the process in order to know how things must be changed. The relevant information/knowledge should be disseminated to the stakeholders in order that they know why a change in mind and behavior is appropriate or needed. The added value of change for all stakeholders and society needs to be clarified and clearly and visually communicated.

The importance of pioneers (actors who seek to own initiative for alternatives) is very clear and should not be ignored here. Based on their own new ideas or vision, they take new (in the beginning) individual initiatives and could be new “leaders” who can share their ideas to colleagues.

Research questions:

*Process related item and **relevant to all four integrative themes.***

How can we encourage the citizens/farmers/politicians/... to change/adjust his/their mindset and behavior so that something can change? For example: how to change the conventional agricultural methods into alternative methods (e.g. no tillage) ? E.g. by helping to change farmers’ perception on soil => soil is a partner that the farmer should treat as such.

How to support pioneers in transition behavior or mind shift?

Applied Agent Based Modeling: how can farmers make the right choices? Therefore they need the right information. How to model the farmers’ behavior in relation to different constraints (e.g. market prices, ...) and the different related scenarios and costs?



2.3.3 Prioritization of research topics

After the discussion in workshop 2 on the research topics and the research needs, each workshop participant had 5 votes to give to the research topics which need to most research efforts (and budget) at this moment and in the future, to tackle the societal challenges. The list of the topics is the same list as described in this report.

The results of the voting (reported from high to low scores) are summarized in the table below.

RESEARCH TOPICS	score
1 LONG TERM MONITORING SSW-SYSTEM (INCLUDING FRAMEWORK!	10
22 CONFLICTS ON LAND USE	10
27 INTEGRATED IMPACT ASSESSMENT SOIL AND LAND USE	10
6 INTEGRATED APPROACH REMEDIATION - LAND USE/SPATIAL PLANNING	9
7 INTEGRATED APPROACH SPATIAL PLANNING, SOIL AND SUBSURFACE	8
26 HOLISTIC APPROACH	8
29 MIND SHIFT AND CHANGE IN BEHAVIOR	8
16 SOIL ECOSYSTEM SERVICES	6
21 PRESSURE ON LAND, FRAGMENTATION, SCARCITY OF LAND	6
2 SURVEY AND RISK EVALUATION CONTAMINATED SOIL, GROUNDWATER, SEDIMENT	4
5 REMEDIATION TECHNOLOGY CONTAMINATED SOIL, GROUNDWATER, SEDIMENT	4
23 AGRICULTURAL PRACTICES AND LAND MANAGEMENT	4
8 INNOVATIVE FUNDING SYSTEMS FOR REMEDIATION / BROWNFIELD DEVELOPMENT	3
10 ORGANIC CARBON IN SOIL	3
18 SOIL BIOLOGY AND SOIL BIODIVERSITY	3
24 SPATIAL PLANNING	3
extra METHODS TO APPLY EXISTING KNOWLEDGE	3
4 NEW OR EMERGING CONTAMINANTS IN SOIL, GROUNDWATER, SEDIMENT	2
28 ECOSYSTEM APPROACH	2
3 DIFFUSE CONTAMINATION	1
9 EXCAVATED SOIL/SEDIMENT	1
13 SOIL SEALING (COVERING)	1
17 RECYCLING OF SOIL NUTRIENTS (e.g. P, N)	1
19 REMEDIATION "AGRICULTURAL" CONTAMINATION (P, N, pesticides)	1
20 INTEGRATED PEST MANAGEMENT - USE PESTICIDES, HERBICIDES,	1
..	
25 HIGH TECH MONITORING AND DATA COLLECTION	1
11 CONSERVATION SOIL FERTILITY	0
12 EROSION	0
14 SOIL COMPACTION	0
15 WATER RETENTION CAPACITY OF SOIL	0



What strikes is the high scores for the **more horizontal oriented, trans disciplinary, system focused** and **integrating** themes; and the **process related** topics to the prejudice of the more “specialized” fragmented topics.

In the discussion after the voting, workshop participants stressed that these “fragmented” topics were not considered as “less important”, but that the perception lives that these topics are already on the research agenda. Whereas it was felt that the **more horizontal oriented, integrated and process related topics** really need a focus on the research agenda, because **knowledge, implementation and funding on this topics is lacking**. These topics integrate all the fragmented specialized knowledge (which is also needed!) and try to connect and translate these knowledge into applicable knowledge.

2.3.4 Existing knowledge agendas

Not all interviewees made use of an **existing knowledge agenda**.

Some of the interviewees mentioned existing research agendas: e.g.

- Each Flemish administration has its own (limited) research agenda
- Witboek voor Landbouwonderzoek
- Onderzoeksagenda Ruimte Vlaanderen
- TWOL
- IWT (little attention for soil and land use)
- FWO (only linked with people, not topics)
- Innoviris (Brussels)
- Danish Soil Partnership (see Annex VI)



2.4 Experiences regarding connecting science to policy/practice

The following information and opinions were given by the interviewees answering the INSPIRATION questionnaire.

2.4.1 Use of knowledge

Scientific knowledge can be defined in various ways and can have various shapes (e.g. fundamental, applied, practical, ... scientific knowledge). An unequivocal answer to this question is not present. One example of a given answer by a stakeholder: “Scientific knowledge is information about the nature of a cause-effect, delivered with a high degree of certainty.”

Most knowledge end users **need to use up-to-date scientific knowledge in their jobs**, e.g. for solving practical or policy problems (e.g. monitoring, impact assessments, modeling, ...) in an appropriate way (with more certainty (e.g. about the impact of measures), more efficiency, more effectiveness, more sustainability, more cost efficiency, ...).

Dissemination and exchange of scientific knowledge happens mostly through the **classic pathways**: internet, papers and reports, Google Scholar, networks via projects, informal and personal contacts, conferences, newsletters, Policymakers have often more knowledge exchange with **consultants** than with universities or research institutes.

The “soil knowledge world” (experts, policymakers, different stakeholders) is a **small world** and knowledge is exchanged in an easy, mostly informal, way.

One of the met difficulties using and disseminating “scientific knowledge” is that scientists produce “**black-white, objective**” **knowledge**, whereas policymakers need also to consider the “**grey, mixed, subjective**” **opinion** of different stakeholders.

“Commercially or privately” collected data on soil quality and on soil contamination are often private and most of the time not available. However they could provide good and useful information.

The interviewees indicated that is not in detail known to what extend has been made use of the **state-of-the-art in scientific research for the formulation of existing policies**. In general existing scientific information (provided by scientists) is/was used as a basis for policy decision, however, (now more and more) civilians (society) and/or other stakeholders (like lobby groups) also want to participate in policymaking and give their “non-scientific” input. This is a difficult equilibrium to manage. Policymakers should take their role in this process and steer/advise.



2.4.2 Possibilities to set the agenda

Possibilities to influence national or regional research agendas are for most knowledge end users **very limited**. Most priorities are determined at a (higher) political level or at academic level. Regional public administrations include innovation or new research in their own (limited) research agenda.

At **academic** level there is a high degree of academic freedom: scientific researchers develop their own research agendas. Universities can also provide research or consultancy on demand (e.g. for policymakers, industry, ...). **Structural consultation** (e.g. in periodic workshops, conferences, networks, platforms,...) about research needs with policymakers or industry or between universities is not a common practice, but could be very useful and fruitful. End users learn to know which scientist could help them and scientists learn about the end users research needs.

Policymakers and scientists should be keeping and watching their **independence** regarding the development of research agendas. But on the other hand they also should **“synchronize”** on needed “new” research, respecting their mutual objectives.

Policymaking used to be funded on knowledge provided by scientists, whereas now, citizens or other stakeholders also want to participate in policymaking and give their “non-scientific” input. This is a difficult equilibrium to manage. Policymakers should take their role in this process and steer/advise.

Policymakers should be more involved in setting the research agendas from e.g. IWT (Agentschap voor Innovatie door Wetenschap en Technologie: *Government agency for Innovation by Science and Technology*), FWO (Fonds Wetenschappelijk Onderzoek: *The Research Foundation*),

2.4.3 Science – policy – practice

Most knowledge end users indicate that they are sometimes **involved in the formulation of scientific research questions, scientific research or the synthesizing of scientific knowledge** in function of their jobs. The translation of research needs into scientific research questions is not always easy because the knowledge end users aren't scientific institutes. Sometimes they need external partners to help them with the translation. **Good communication** between the knowledge end users and scientists is essential to define proper research questions and obtain proper research results, but this process takes often a lot of time. When the research questions are very applied, targeted and/or practical, it is easier to translate the research questions.

How to **improve to science-policy-practice**? Some **suggestions** or **questions** to answer, formulated by the interviewees:

- Scientists want to deepen research topics and develop “new” knowledge ⇔ knowledge users (e.g. policymakers, industry, farmers) want to broaden and link topics and want more practical and robust knowledge to solve their problems. Policymakers should try to **connect** both parties to ensure more policy relevant research. Providing relevant knowledge for immediate application gives scientists opportunities to use/produce knowledge in a creative and innovative way.



- Also the dissemination of not successful research results could be helpful and can be very valuable as “**lessons learned**”
- **Stakeholder coaching** (not only involve sociological experts who are again academic experts, but really the coaching of the process) during the process of knowledge development could foster the formulation of more “demand driven” research needs and the implementation of the developed knowledge.
- Working **transnational** could offer scale opportunities, e.g. developing new technology that could be used in different countries whereas on the national level the field is too small to define a well-functioning market.
- There is need for a **common European vision** on soil and a framework to provide focus on common goals and targets. This will foster the collaboration in research related to soil and land use.
- The collaboration between scientists (working often on more fundamental research) and consultants (applying the knowledge) is not always easy. Policymakers could help to find a **mutual understanding and foster collaboration**. This process takes time.
- **Structural consultation** (e.g. in the form of a platform or network, periodic meetings, a framework contract with research institutes, ...) between knowledge end users and the different research institutes is very useful and can offer an added value because of the broad and transdisciplinair discussions, but is not easy e.g. taking into account intellectual rights. Collaboration in an informal or bilateral way is sometimes more easy.
- In **European projects** a large body of **knowledge and tools** are developed, but **not (optimally) used**. The projects should be **demand driven** according to the need of the end users so that developed knowledge and tools are effectively used.
- Disseminating high quality scientific information via “**open source**” is important.
- Stimulating innovation by **adapting rules for procurement** (e.g. more attention for sustainability and long term effects as selection criteria in proposals) is necessary to give a boost to the development and implementation of innovative solutions. Considering a broader range of issues when choosing contract award criteria should include setting standards for documentation, assessment and methodology
- A lot of knowledge is available but is **locked and not distributed to the end users** (cfr. The EPA⁷-website gives good scientific and policy information). **Key-people** can help with the distribution of knowledge: who is who within Europe in the different research domains? An **inventory of knowledge and public/shared databases** (e.g. on toxicological parameters, monitoring data, ...) could also be very useful. **Existing research results** should be used in further research and knowledge developments.

⁷ EPA: US Environmental Protection Agency



- Fundamental knowledge should be **translated** into applied practical knowledge resulting in suitable tools and concrete measures, tailor-made for the relevant end users (e.g. for municipalities, ...).
- **Raising awareness** and **tailor-made communication** (resulting in a mind shift and change in behavior) is as/more important than developing extra “new” knowledge. This will result in the effective implementation of the “appropriate” knowledge by the relevant stakeholders.
- How to take into account all aspects of soil and land use on a **systemic level** (can we see the **whole picture**)?
- How to find an **equilibrium** between academic freedom and independence and the synchronizing of developing “societal relevant” knowledge?
- Make challenges and topics as concrete and “**recognizable**” as possible and explain the “**why**” of the needed research and its implementation. Make it **visual, inspiring and attractive**.
- **Scale** (in time and space) is very determinative to take measures: need for knowledge that is adaptable to the scales on which it will be deployed, data, measures (e.g. parcel, community, city, region, country)
- **Trans-disciplinarity** is important: e.g. involving social sciences who can e.g. link scientific land use information with sociocultural aspects

In most cases the **impact** of research is not explicitly monitored/checked, but is guaranteed as much as possible through the involvement and consultation of all the stakeholders before, during and after the process and by checking the quality of the work done. The quality of IWT (a Flemish funder) funded research, e.g. the impact of the research on society (who is reached, long term effects, ...), is monitored using indicators.

No national SPI documents are mentioned.

Some mentioned SPI initiatives in different sectors are added in Annex III.



2.4.4 Science – policy – practice: workshop positions and discussion

During the workshop several positions were used to start a discussion about the actual and future SPI process in Belgium, Luxembourg and Denmark.

Both knowledge producers and knowledge users discussed, in a critical fashion, the role of scientific research and the interface between science and policy. Inspiring cases were shared and possibilities for trans-disciplinary and cross-boundary collaboration (and funding: see next chapter) were explored.

Position 1: During the interviews, stakeholders stressed that a lot of knowledge is available.

How can we inventory, translate, disseminate and tailor-made communicate this knowledge to the relevant end users?

Actual SPI

process What goes well? (Success stories, good practices)
 What goes wrong? (Lessons learned)

Future SPI How to improve? Which actions should be set up? For each scale separately
process or jointly?

 For each sector separately or jointly?
 Who has to execute these actions?
 Where to start? What are priorities? Time schedules?

Position 2: To tackle societal challenges, new knowledge and research is needed to fill existing knowledge gaps.

How could the end users let know their needs to the knowledge developers?

Actual SPI

process What goes well? (Success stories, good practices)
 What goes wrong? (Lessons learned)

Future SPI How to improve? Which actions should be set up? For each scale separately
process or jointly?

 For each sector separately or jointly?
 Who has to execute these actions?
 Where to start? What are priorities? Time schedules?

Topics in the discussion:

A lot (enough?) scientific data and knowledge are available => There is a need to **talk and share** them:

- Need for exchange of data and knowledge using interactive **platforms** (e.g. INSPIRE, ANAE, EUGRIS-portal, IAP, ...): scientists and other stakeholders can communicate and share their data, in exchange for **acknowledgment** for their work
- What about the **quality** of existing knowledge and data? How to guarantee them?



- How to tackle “academic competition” issues in order to promote “open source knowledge and data sharing” and shift to “academic sharing”? (*Remark NFP: This is not only an issue on academic level, but on every level?*)

Need for **more coordination** on:

- Research topics: the same topics are treated in different research institutes, regions, countries (risk for overlap): scientists need to talk more to each other, using the same language
- Data gathering and exchange is sometimes difficult because of different collection methodologies

Need for highly ranked **journals for holistic studies** (integrated projects, system thinking, multi-actor-projects, co-creation, ...) to publish articles and studies on these topics and to disseminate experiences, lessons learned (also mistakes,...) and knowledge on integrated approaches. Need for the **funding** of these journals.

Need for **knowledge brokers** and need for **funding** for the translation by knowledge brokers. Knowledge brokers should coordinate and facilitate the translation from existing “fundamental” knowledge/science into applicable knowledge/science/tools/policy and disseminate the applied knowledge/science/tools/policy to all relevant stakeholders. The knowledge brokers can also coordinate and facilitate the translation of specific end user questions into research questions or assignments (cfr. German specialized companies). The role of knowledge broker could be taken up by institutions like e.g. INBO, ILVO, CRA, OVAM, Funding for knowledge brokers could be collected based on certification or labeling: e.g. for products fabricated on soil that is sustainably managed.

Innovation is not only developing “new” knowledge, but also making “**new links**” between existing knowledge topics.

Need for sustainable and long term thematic joined stakeholder **networks** (e.g. soil platform in Luxembourg) and **co-creation** (i.e. “real” collaboration between knowledge developers and knowledge users from the beginning and not only dissemination to the end users at the end) to tackle societal challenges using scientific knowledge.

Engage the **whole product/process chain and sector**, using a complete **life cycle oriented approach**: **Life Cycle Thinking** can help identify opportunities and lead to decisions that help improve environmental and social performance and image associated with supply chains, end-of-life waste management, as well as when using products, helping to reduce associated risks and improve economic benefits (see for more information: <http://eplca.jrc.ec.europa.eu/>). Monitoring the sustainability performance of life cycle activities related to soil and land management can support the development of effective **policy assessment and implementation**. (According to the latest recommendations from the European Platform on Life Cycle Assessment for those working in the field of policy development, Life Cycle Thinking and Assessment are beneficial for a number of reasons:

- Gathering baseline information on social, environmental, and economic considerations for market-orientated policies and the promotion of innovative product design
- Accounting for trade-offs between options



- Understanding trends in product supply chains and where it may be best to influence the chain
- Developing resource strategies, such as optimal waste management
- Better informing consumers through the use of labelling schemes and the use of Green Public Procurement (GPP).)

“Science needs **freedom**”: The gap between end users and fundamental research is not necessarily negative: end users tend to think short term and when they influence fundamental research institutions too much, these last ones could be dragged away from their core activities (namely fundamental research, long term)

Need for “**senior**” (**permanent**) **scientists at academic level**: scientists with long term experience are necessary to **integrate** all scientific expertise and see the whole process and system; and to **stabilize** the existing knowledge

Sometimes scientific knowledge is **neglected or not taken up by policy makers** (e.g. climate debate, agricultural research project on functional agro-biodiversity)

Not only science is fragmented, also **policy making can be fragmented** and decisions made in one department can be contra-productive for another department

The role of **civil society** is getting more important (e.g Ringland in Antwerp): citizens and citizen movements are becoming a more important partner in collaboration. They push and ask questions (multi-polarity). Citizens and scientists could work together as activists. However this is not always easy.

Promote **long term funding** instead of short term applications. This is very important to protect (and restore) the environment on the long term.

Social and anthropological research (and the translation of this knowledge into tailor-made communication) is needed to foster change in human behavior. E.g. the **link between consumers and producers** needs to be restored if we want that consumers understand that a farmer needs a good price for his products in order to produce healthy food in a sustainable way (i.e. with attention to sustainable soil and land use). Consumers and producers also need information and awareness on the **impact on society and the costs to society** if e.g. product prices are too low.

Need for **impact analysis** of the different **policies and legislations** related to soil and land use: e.g. search for conflicting laws, conflicting subsidies, ...

Need for **long term integrated research programs, focusing on different targets and different gaps**. Need for “new” type of consortium or partner collaboration: **spider web construction**: small core group (2 or 3 partners) which focuses on the targeted questions and deepens the subjects. They ask for cooperation on a wider group of “specialized” partners who make the translation of the topics into specific applications. Implementation of the new knowledge in pilots or demonstration projects is an important part of the global integrated research framework. Dissemination and ask actively for feedback from end users is also important, as well as monitoring the long term impact and evaluation/adaptation based on the monitoring results.

Need for long term and small scale experiments



Stimulating research on **integrated approach** is also difficult and fragmented on **policy level**, e.g. different ministers and administrations are responsible for different topics which should be treated in an integrated way. The government should act as a whole. Working together between or within administrations could be difficult because of the fear that jobs or budgets will be lost. It is important to clearly show the added value of cooperation.

Need for **“true” partnerships** between policymakers-scientists-private companies for research

Need for **“flexible” partnerships and approaches** for research (e.g. in IT-sector: intermittent develop – evaluate – develop – evaluate - ...): this approach needs a specific kind of contracts

Not only the agricultural sector or industrial sector are important knowledge end users, also **citizens** (e.g. use of pesticides, promotion of ecological gardening, promotion of green): how to reach and convince them?

Holistic and integrated thinking and problem solving should be part of the **education** and taught to students

Different **stakeholders** are **influencing** the research agenda for “new” knowledge: what is their role and interaction: e.g.

- Scientists: try to convince policy makers of the importance of a topic
- The European Commission influences decision-making in a strong way
- Industrial enterprises that developed technology are lobbying for return on investment (e.g. on satellites)

One of the problems with translating end user needs into research questions is that **end users** (e.g. farmers) tend to have **little interest in participating in the preliminary phases** of research projects (definition of the research questions). Communicating with sector representatives is a possible solution, but doesn't necessarily mean the gathered information reflects the real end user (e.g. the farmer on the field) needs. How should they be convinced to participate?

Privately ordered knowledge development (e.g. by industrial stakeholders) often stays locked and is not shared, although the knowledge could also be interesting for other stakeholders

How to foster or **reward policy relevant research** at academic level? Now there is a focus on rewards by publication. How can we change that?



2.5 National and transnational funding schemes

2.5.1 Funding schemes and possibilities for research funding

The following information and opinions were given by the interviewees answering the INSPIRATION questionnaire.

Regional, national, European and international funding schemes

Belgium is a complex federal state where the communities and regions are responsible for scientific research, although the federal government still has some smaller competencies on this matter as well. This leads to fragmentation of the budget. Most of the research funding comes from the regional and European level. A comprehensive listing of identified regional, national, European and international funding schemes is added in Appendix IV.

Policy research directly commissioned by regional authorities, is usually funded with their own financial resources. Regional government institutions are fully or partially financed by a grant from the regional government. Some interviewees indicated that the funding of policy research should be supervised or distributed by a single public body as much as possible. Obviously, this currently is not the case yet and leads to fragmentation because different institutions prefer to manage their own research budget. The Agency for Innovation by Science and Technology (IWT) or the Department of Economy, Science and Innovation (EWI) could take up such a central role in Flanders, and manage and distribute all regional funds for policy research.

Knowledge institutions have the impression that research on the environment in general, and soil or land use in particular is not high on the priority list of the IWT. Proposals submitted to the IWT are always formulated by scientists or research institutions, and are therefore largely influenced by the self-interest of the scientist. Integrating the needs of end users, industry or government could make the funded research more relevant, concrete and applied. Consultation of stakeholders prior to formulating research needs can allow for a more objective and independent formulation of the research questions.

Participating in and applying for European projects is very suitable to build an international network and to develop and exchange knowledge. On the other hand, the complex procedures and low success rates often discourage organisations to participate and submit a proposal. The whole of European funding opportunities is a complicated maze that urgently needs to become more accessible and transparent. In European funding programs and more specifically in Horizon 2020, little attention is paid to soil and land use related research. Moreover, Horizon 2020 is susceptible for lobbying by the scientific community, which leads to wrong priority setting. There is a lot of attention for temporary fashion trends that are of little scientific relevance.



More (financial) cooperation is necessary

Between public and private sector

Some public authorities or research institutions sign cooperation agreements with other national or international partners in order to share the cost of joint research efforts, or even carry out consultancy assignments for other authorities or companies and to generate additional funding on top of their grants.

There is general consensus that more financial cooperation between public authorities and private partners (PPP) can significantly increase the added value of research on soil and land use. Because of public budget cuts, less money is available for research funding. PPP will thus become increasingly important as an alternative. Moreover, the involvement of private partners could provide the guarantee that the research results will be relevant and effectively applied. Private partners pursue return on investment and can be a driving force. Other new financing models like crowdfunding will gain in importance in the future.

By using innovative procurement methods (e.g. pre-commercial procurement) the public sector can develop innovative solutions to respond to societal challenges together with private partners. This improves the international competitiveness of enterprises and increases the engagement of the private sector in the research. Early involvement of businesses and stakeholders will also increase the impact and relevance of the research. However, strict legislation on public procurement can sometimes impede the establishment of privileged partnerships between public organisations and research institutions, because the entire market must be consulted first.

Initiating and funding research is not an exclusive responsibility of the public sector. The industry should fulfil its duty of care under all circumstances and proactively initiate research to guarantee that their products and services are not harmful to human health.

A more extensive collaboration between public and private sector should be fostered and stimulated by the European funding programs. This could be explicitly mentioned in the call for projects.

Between public organisations

Belgium needs more horizontal cooperation and coordination between the various governments that fund environmental research. Because of the unique federal state structure there are a lot of governments and public agencies in Belgium, which leads to fragmentation of research. Conflicting interests or hidden political agendas often hamper cooperation between these public bodies. The creation of a new central coordinating body or the centralization of research funds with an existing organization could reduce fragmentation and avoid duplication of research. It would also increase the quality of the research and guarantee consistency with a vision in the long term. Specifically for research on soil and land use, a new expert counsel at national level in analogy to the Technical Committee on Soil Protection in the Netherlands, might prove beneficial.

The establishment of networks for knowledge exchange between policy makers like the Common Forum on Contaminated Land in Europe can also contribute to more intensive transnational collaboration between government institutions.



Between knowledge providers

Belgian research institutions often have similar specializations but different priorities. Cooperation between universities or between different scientific disciplines can be improved. There is still rivalry between research institutions or departments. Maybe an additional structure that operates on a supra level is needed to coordinate all interdisciplinary efforts. Finding a common language and a way of communicating between scientists is key in this process. Physical meetings, discussion and network events could also help.

Most knowledge institutions are fully or partly financed by government grants. Public authorities should use their influence to organize the research at the universities more efficiently. Certain disciplines, specializations or departments of various universities could cooperate more and some research topics could be merged so that the research institutions evolve more towards the (extreme) model of the university of Wageningen where almost all agricultural research in the Netherlands is concentrated in one university.

Both at national and international level, repetition or duplication of research is a major issue. To avoid this, scientists should be required to first inventory and evaluate existing knowledge, before starting on new research. Accessibility and dissemination of research results and scientific reports is key.



2.5.2 Gaps in financial resources for research

Because of its scale and the large budgets available for research, Europe should make additional efforts to promote large-scale, cross-border, integrated projects on the long run. E.g., setting up a very costly large-scale harmonized European monitoring network for certain soil parameters is currently not possible because there is no budget available. The collection of data for soil-related research purposes, is very time consuming because there is no harmonized European data set with soil parameters available. A European soil database fed by measurements of different member states should be the ultimate goal. In addition to public authorities and knowledge institutions, certain private companies might also dispose of valuable data, but they often ask financial compensation for the use of it. Besides supporting the establishment of a European soil database, the European Union should also promote and coordinate the harmonization of the different standard and detection methods and risk assessments for soil contamination.

In Belgium and by extension in Europe, there is a lack of thorough interdisciplinary and holistic research. Researchers often operate in the narrow confines of their own specialisms. Scientific articles with a more holistic approach, often don't get published in peer-reviewed journals. That is why there is little scientific substantiation for a more holistic or integrated approach. In Belgium there is no university that has a discipline or department on system thinking. The University of Antwerp does offer a course on 'methods and techniques for interdisciplinary research'.

It is important that researchers take economic, social, legal and psychological aspects into account. Open communication with stakeholders and proper disclosure of the results and underlying data sets is absolutely necessary. Regional as well as national or European authorities need to stimulate holistic, trans-disciplinary, integrated approaches.

Society and politicians still don't fully recognize the importance of a healthy soil and sensible, thoughtful land use. Continuous communication and raising awareness could reverse this attitude and give a boost to the research on this subject.

In addition to a mind shift, a European Soil Framework Directive with (binding) quantitative targets (possible for other environmental compartments such as water and air, so why not for soil) will give a boost to research on soil and land use. In that case, the Joint Research Centre of the European Commission in cooperation with the EEA should first study the consequences of the legally binding document and then deduce the most urgent research needs from it (knowledge needed to achieve the targets) so that those needs can be integrated into the calls of the European funding programs.



2.5.3 Funding and (financial) collaboration: workshop positions and discussion

During the workshop several positions were used to start a discussion about the actual and future funding and (financial) collaboration.

Inspiring cases were shared and possibilities for trans-disciplinary and cross-boundary collaboration and funding were explored.

Position 1: The budget for research related to soil and land use in Belgium is fragmented.

How can funding be more efficiently used to create added value (leverage) in new research on soil and land use?

Existing funds

Actual funding What goes well? (Success stories, good practices)
 What goes wrong? (Lessons learned)

Future funding How to improve? Which actions should be set up? For each scale separately or jointly?
 For each sector separately or jointly?
 Who has to execute these actions?
 Where to start? What are priorities? Time schedules?

Position 2: The budget for research related to soil and land use is getting smaller (all over Europe)

How can (alternative) funding or smart cooperation (e.g. integrated approach) tackle the smaller budgets?

Alternative funding (e.g. co-design and co-funding,; green deal, PPS, Framework partnership agreement, Innovation fund of European investment bank , natural capital financing capacity, crowdfunding

Smart cooperation: inter-, intra-, transdisciplinair? Transsectoral? Transnational?

Actual alternatives or cooperation What goes well? (Success stories, good practices)
 What goes wrong? (Lessons learned)

Future alternatives or cooperation How to improve? Which actions should be set up? For each scale separately or jointly?
 For each sector separately or jointly?
 Who has to execute these actions?
 Where to start? What are priorities? Time schedules?

Topics in the discussion:

The budget for research related to soil and land use is definitely fragmented in **Belgium**:

- 3 different languages
- 3 different regions
- Funding on different levels (federal, regional and sub-regional)
- Lack of communication on funding and on research-themes worked on
- Every regional level has a multitude of (research providing) parties and end-users involved without structural communication between parties

Situation for **Denmark**:

- Not as fragmented as in Belgium
- Thematically subdivided
 - Land use
 - Soil contamination and remediation
 - Agriculture
- Integration is not always possible/desirable; soil is a “common denominator” between several themes and not everything can be integrated in the same research package

Situation for **Luxembourg**

- Little fragmentation as Luxembourg is a small country, but
 - some fragmentation due to different research themes being stressed
 - communication/exchange between themes can be improved
- Major funding source: Fonds Nationale de la Recherche (FNR)
 - Goal: stimulating “excelling research”
 - Basically for fundamental research
 - Different topics / macro-areas covered:
 - Societal challenges
 - IT-challenges
 - Natural resources management
 - Urban area management
- Funding for applied research mostly by
 - Public authorities
 - Private companies

Belgium, Denmark, Luxembourg,... all are rather small countries and –consequently- have smaller research budgets available.



Collaboration between (smaller) countries could be a solution for this problem. There are already some partnerships between funding agencies on European level (e.g. “ERA”) so smaller countries can benefit from the scale-up. To make collaboration on a (sub-)European scale possible, there is need to identify common research needs/research agendas.

Collaboration is often being retained by **cultural determinations**: every country (region) wants to “re-invent” its own regulation, wants to work with own partners,... and as long as a **common (European) regulation/legislation** remains absent, this problem will subsist.

Products/solutions developed by a “consortium” of parties (to serve the needs of all of these parties) can benefit from both the economy of scale and the fact they’re “custom-made”.

Collaboration is not always possible as mostly countries can’t start from scratch, there is always one or another method or approach that has already been installed. This existing situation has to be taken into account.

Fragmentation of funding can also be positive as some problems ask for a very local or even site-specific (tailor-made) approach and/or solution.

Thematic fragmentation is also problem that cannot be denied on the Belgian level. Soil is being approached from different points of view (forest soils, natural soils, agricultural soils, contaminated soils) without there being a “general approach”. Every thematic group is looking for funding for its own theme but should work together with the other groups to create a “common level” and find funding for this “common level”. The current situation is that there is collaboration but on a thematical (cross-regional) basis. A different approach (= redefining of the themes starting from a common basis) could benefit collaboration and knowledge exchange between different stakeholders.

A (European) legislation could be the answer to this problem. From the moment on things are being regulated by legislation, funding will follow as the member states will have to follow the European Directives.

Political concerns have to be taken into account too. The legislative level wants to know what the cost of a certain legislation will be before implementing it.

Remark: bringing all funding into one general funding mechanism isn’t always beneficial (e.g. The Netherlands where they experience significant problems after centralizing all soil related funding).

Soil is not a sexy topic. It is difficult to have soil and land use related research financed: the importance of soil and land use should be made clear to politicians and land owners.

It is also difficult to have co-creation projects financed, because they take more time.

“Science will not change itself, but finders will”

“How to change the funders?”

Direct research funding by policy makers is becoming more important than funding by scientific funding channels. This leads to fragmented budgets.

The ESPON 2020 Cooperation Programme is an example where funds are brought together.



VITO has developed a model on land use funded by different public administrations. Coordination. The integration and coordination of such projects should be done by the government and not by the research institute.

A soil protection law could force interaction on research, e.g. by member states or citizens.

Crowdfunding has a strong symbolic value: everyone who contributes has an interest.

There are **European funding frameworks** (e.g. LIFE) that can be very useful for smaller countries and very specific problems, but have the disadvantage that funding is limited to a smaller part of the total cost (50-60%). Other frameworks fund a higher percentage of the total cost (up to 100%) but have a higher level of competition.

The general feeling is that European budgets are not getting smaller, but that there is a lower success-rate of the proposals, and as time spent to apply to a call is higher, there's a lower return on investment (what makes parties decide not to apply for certain funding systems).

There is also the idea that global research budgets aren't declining, but there is a certain "**budget shift**" noticeable towards the "fashionable" themes Europe is putting more stress on (e.g. remote sensing, biodiversity).

Three **major problems** related to European funding frameworks are listed:

- competition is getting harder
- administrative burden for European projects is getting more and more demanding
- co-funding is not always possible as potential partners cannot always provide 50% of the funding. Plus: private companies don't tend to be interested to co-fund as the profit-margins in the sector are too low

The co-funding problem can be tackled at national level: when the project is accepted, the country provides the other part of the funding.

Evaluators of European projects have a crucial responsibility and are now mostly scientists. Why not involve citizens, pressure groups, policymakers, ... ?

It also stands to reason to show and measure the impact of the proposed research. This is however not always easy to measure.

It is **difficult to find co-funding** for research projects **for (small) civil organizations** (e.g. small NGO, non-profit organization, ...), **and for society as end user, in general**. Integrated LIFE-projects give sometimes opportunities (e.g. cooperation between public administration and NGO).

Municipalities are willing to co-fund for soil and land use related projects, e.g. on erosion projects

In the past, most European Directives were implemented to solve an existing problem and research was funded to find a solution for that problem. When **anticipating** to possible future problems, research budgets could be used more efficiently.



2.6 Other remarks made by interviewees

Looking for “new” needed knowledge and relevant research questions is one thing, but a lot of **good knowledge already** exists and is not effectively used: to improve the use of existing knowledge is also very important, perhaps more important.

Very important **boundary conditions** to support/ensure the development and implementation of the research agenda are:

- A good **juridical framework** for all relevant topics is necessary to offer “legal certainty” for all stakeholders.
- **Political climate and stability**
- **Market** regulation

Mind shift and change in behavior are the key drivers for change. Importance of **raising awareness** to, **co-creation** with and tailor-made **communication** to all related stakeholders.



2.7 Annexes

Annex Ia: NKS interviews in Belgium

	Stakeholder organisation			Profile INSPIRATION													
	Name of the entity	Country	Contact person	fund er	end user	know ledge provider	natio nal-regio nal-	unive rsity/resea rch	SME /cons ultant	busin ess and indus	NGO	netw ork	other	soil	sediment	wate r	land use-mana geme
13/08/2015	Société publique d'aide à la qualité de l'environnement (SPAQuE)	Wa	Marie Jailler Pierre Dengis Claudia Neculau	1		1		1						1		1	
29/06/2015	Katholieke Universiteit Leuven	VI	Erik Smolders			1		1						1	1	1	1
7/07/2015	Vlaamse Instelling voor Technologisch onderzoek (VITO)	VI	Guy Engelen			1		1	1					1	1	1	1
15/07/2015	Service Public de Wallonie (SPW)	Wa	Ester Goidts	1	1		1							1	1	1	1
9/07/2015	Leefmilieu Brussel	Br	Saïd El Fadili	1	1		1							1	1	1	1
1/09/2015	Vlaamse LandMaatschappij (VLM)	VI	Carole Ampe	1	1		1										1
3/07/2015	Departement Leefmilieu, Natuur en Energie - Afdeling Land en Bodembescherming, Ondergrond, Natuurlijke Rijkdommen	VI	Joost Salomez	1	1		1							1		1	1
2/07/2015	Departement Landbouw en visserij	VI	Ellen Maertens	1	1		1										1
15/06/2015	OPENBARE VLAAMSE	VI	Johan Ceenaeme	1	1	1	1							1	1	1	
13/07/2015	AFVALSTOFFENMAATSCHAPPIJ (OVAM) - Afdeling bodembeheer		Griet Van Gestel														
11/08/2015	Umicore (netwerk NICOLE)	VI	Lucia Buvé		1				1		1			1	1	1	
5/10/2015	Ruimte Vlaanderen	VI	Peter Willems	1	1	1	1										
10/08/2015	Ministère du Développement durable et des Infrastructures de	Lux	Sophie Capus	1	1		1							1		1	1
10/08/2015	Luxembourg Institute of Science and Technology (LIST)	Lux	Benoît Othoniel			1		1						1			1
3/09/2015	Danish regions	DK	Christian Andersen		1		1							1			

Annex Ib: NKS questionnaire template

See Chapter1, Annex I

Annex Ic: NKS hand-out: INSPIRATION interview at a glance

See Chapter1, Annex II



Annex Id: Reports interviews Luxembourg and Denmark

Luxembourg

Title:	Report of the interview with Sophie Capus and Benoit Othoniel
Department / division / team:	Soil Management, Soil Investigation and Remediation West, Policy Support
Author / contact:	Bavo Peeters

1 Interview information

Date of the interview:	August 10, 2015
Country:	Luxembourg
INSPIRATION interviewer:	Nele Bal
Report:	Bavo Peeters
Interviewees:	Sophie Capus (EAL) & Benoit Othoniel (LIST)
Function:	Engineer at the Service des Sites Contaminés, Environment Agency of Luxembourg & Ph.D. student ecological economy at the Luxembourg Institute for Science and Technology (LIST)
Expertise:	Soil, water, land management & ecosystem services, life cycle assessment, economic modeling
Type & role:	The Agency doesn't fund research in a structural way, but there is a contract with the LIST for ad hoc policy support and research.

2 Societal challenges

- Due to the limited surface of Luxembourg, land resources are very scarce. Spatial planning is becoming more and more of a problem, because almost all land is already zoned and planned. This leads to increasing competition between different land uses and to trade offs with externalities, e.g. land used to cultivate bio fuels cannot serve for food production anymore.
- The list of challenges developed by the Commission is pretty complete. Loss of biodiversity is missing but is closely connected with the other societal challenges.



3 Research topics

- Most knowledge on contaminated land management is available, but not always used or implemented, so maybe a kind of **knowledge inventory** is needed.
- Should we grow **energy crops on contaminated land**? What are the positive and negative effects?
- There is still a lot of research needed on the **crossroad/interface between biodiversity, ecosystem services, nature** on the one hand **and economic development** on the other hand. The trade off between money or economic growth and ecosystem services needs to be mapped in a better way. Economic models should take more into account certain ecological parameters like e.g. soil fertility or the pollination of crops. Ecosystem services can contribute to economic development and this kind of research can help to grow awareness.
- More **monitoring and data collection on the state of natural capital** is needed, as well as the development of more efficient **monitoring techniques**. Because a lack of data, often theoretic assumptions are made without sufficient confirmation or validation.
- Luxembourg is a very small country but as member of the EU it nevertheless has to implement European legislation and directives on this limited scale. This is not always efficient. Can a **minimum scale** be determined under which decision making or implementing certain measures is inefficient?
- **Soil biodiversity and the link with entire ecosystems** needs more attention in sciences (modeling as well as monitoring), e.g. we need more knowledge about the nature and number of micro-organisms.
- How to go from an impact assessment or an **evaluation of ecosystem services to concrete measures** to promote biodiversity? How to make this knowledge tangible and applicable?
- Instead of a lot of extra knowledge, more **consciousness/awareness and communication** is needed, and this on the different decision making levels. We need a shift in people's minds.

4 Existing research agenda

There is a Luxembourg research program on environmental issues but not on the specific topics soil or land-use.



5 Interface between science and policy

The Environment Agency needs scientific results and information in their daily practice mainly for monitoring, impact assessments or modeling. For policy makers it is not always easy to define research questions, because they know the result they want, but not the way to reach it. Therefore **good communication** between science and policy is necessary. There is a **collaboration with the LIST** so that their researchers can provide support when things get to complex or scientific. There is little cooperation between the government and the university.

Conferences and scientific papers are an important source of knowledge, but they tend to go too much in detail to be able to fulfill the needs of a policy maker.

Every department of the Environment Agency defines its research needs once in a three year time period. There is a contract with research institutions to execute this research but there often isn't enough budget available to meet all demands. INSPIRATION could be complementary to this contract.

Luxembourg is too small to capture all knowledge needs and to do research in all scientific domains. LIST's research is more applied while the university' research is rather fundamental. Except for its control by funding or grants, there is no direct steering of the government (impact on research domains rather than specific research topics).

The impact of research is not measured explicitly, but can be guaranteed as much as possible by the involvement and consultation of all the stakeholders.

The administration is currently developing new legislation to tackle contamination, which will go to parlement in October. Hopefully it will be adopted before the end of the international year of soil.



6 Financing

FNR (Fonds National de la Recherche de Luxembourg) finances Benoit's research.

Soil should get higher on the agenda and receive more attention on an international research level. INSPIRATION can contribute and promote this.

The Environment Agency does not participate a lot to European projects because the application procedures are too complex and the administration requirements are too heavy. Nevertheless European projects can establish international contacts or networks.

Some research mainly in economic sciences is financed by a PPP, e.g. research financed by banks or other financial institutions.

A large scale **monitoring of soil indicators** (e.g. to assess ecosystem functionality) or **agricultural parameters** will require considerable financial resources and a pooling of money.

Organizing collaboration between different government administrations is difficult. But also in the scientific world there should be more interdisciplinarity between the different specialisms to be able to tackle big societal challenges. There still is too much rivalry between research institutions or departments. Maybe an extra structure which operates on a supra level is needed to coordinate all interdisciplinary efforts. Finding a common language and a way of communicating between scientists is key in this process, but it takes time and this phase of the process often is seen as not productive. Maybe a European consortium could/should work on an integrated language. Physical meetings, discussion and network events could help as well. LIST is currently setting up a project with interdisciplinary research on ecosystem services assessment with researchers from all corners of science.

7 Other

- benoit.othoniel@list.lu
- Benoit's supervisor is Bendetto Rugani.

Denmark

A. Interview information	
Country:	Denmark
Name of INSPIRATION Researcher:	Christian Andersen
Date of Interview:	3 rd September 2015
How does the NKS wish to be referred to:	Danish Soil Partnership
B. Introductions	
<i>Description INSPIRATION-project in annexe</i>	
C. Background information on the interviewee	
1. Name of NKS interviewed:	Christian Andersen
2. Institution:	Danish Soil Partnership/ Danish Regions
3. Role:	secretary of Danish Soil Partnership
4. Are you a (multiple answers possible):	<ul style="list-style-type: none"> <input checked="" type="radio"/> (x) National-regional-local authority <input type="radio"/> University/research institute <input type="radio"/> Small or Medium sized Enterprise (SME, i.e. < 500 employees) / consultant <input type="radio"/> Business and industry <input type="radio"/> Non-Governmental Organisation (NGO) <input checked="" type="radio"/> (x) Network representative / leader <input type="radio"/> Other, specify: ...
5. Fields of expertise (multiple answers possible): <i>[Ask to specify background regarding the selected item(s) in order to understand expertise background of interviewee]</i>	<ul style="list-style-type: none"> <input checked="" type="radio"/> (x)Soil <input checked="" type="radio"/> (x)Water <input type="radio"/> Sediment <input type="radio"/> Urban / spatial planning <input type="radio"/> Landscape design <input type="radio"/> Land management <input type="radio"/> Other, specify:
6. Does your organisation provide external research funding?	<ul style="list-style-type: none"> <input type="radio"/> Yes. To a very limited extend, usually the work we order is consulting service and we mostly offer facilitation services. The regions are themselves financing

innovation as part of their investigation and remediation activities.

D. SRA

7. Which societal challenges do you regard as important?

The following is based on the challenges of the regions in relation to their legal responsibilities. It should not be taken as representative for the broader theme of soil in Denmark as a whole.

[If needed, you can use the European Commissions (EC) list of societal challenges here. These EC themes are:]

- Contribute to food security and food safety;
- (x) Ensure secure supplies of safe drinking water;
- Secure energy supply and distribution;
- (x) Reduce raw material and resource consumption, Ensure efficient use of natural resources;
- (x) Contribute to climate change mitigation and societal adaptation;
- (x) Contribute to a healthy living environment;
- Ensure secure infrastructure

a. If applicable, what additional, other or alternative challenges would you suggest/prefer?

- securing drinking water –specifically groundwater clean at the source
- healthy living environment – specifically indoor air quality affected by vapour intrusion
- Securing the ecosystem as affected by flux from contaminated groundwater reaching surface water bodies

8. Starting with your own experience: which specific topics (research needs) should be included in the SRA?

8.1 Vapour intrusion from contaminated soil or groundwater into buildings with sensitive area use such as dwellings or institutions for child care

a)

- *Who will be affected?:* the people living in the houses or users of the institutions are affected by the vapour intrusion of gaseous phase contaminants in particular

chlorinated solvents.

- *Who is responsible?:* In case of orphan site contaminations – mostly the case - the regional authority is responsible for securing the indoor climate from the effect of contaminated soil and groundwater.
- *Is it a topic of concern of your organisation / department?:* Yes
- *Is it only a national topic, or a shared topic by multiple countries?:* We presume this is a general issue, but of course it depends on the national definition of responsibility and guideline values – but also perception of acceptable risk relative to other sources of contamination of indoor air.
- *Where are we now, where do we want to be in x years (point on the horizon)?* It is difficult to isolate the effect on indoor air by vapour intrusion from other sources. It is desired to fix the issue using a safe, maintenance free solution, where by monitoring and operation is not required. A ventilation solution might be build in to the HVAC system of the house, so to combine several solutions. It is a challenge identifying pathways. It is a challenge to break the pathway perpetually. Membranes are destroyed by age or reconstruction. Horizontal barriers may be considered. Multiple tracers can be used to identify pathways. Or an outwards pressure gradient could be secured. Insitu solutions not affecting the house would be ideal, but they are often costly and rather invasive.
- *How can the newly gained knowledge be effectively used?:* The knowledge should be able to secure sensitive area use cheap, once and for all, and without monitoring or operational requirements.

b)

This is a high priority.

c)

- The funders should be a consortium of problem owners and solutions providers matched with the appropriate fund – national or EU – depending on the nature of the specifically involved parties. We also include import/ export as an objective in the list below, as we consider the combined target of environmental benefit and development of green business.
 - o *Assessment of land resources*
 - o *Potential productivity of land and soils*
 - o *(x) Demand for soil/land resources, imports and exports*
 - o *Competition between land uses (land-use conflicts)*
 - o *(x) Concepts to identify and quantify relevant impacts*
 - o *(x) Instruments to avoid / minimise impacts (feedback to decision-making process)*



- *Opportunities of innovative land-use technologies*
- *Resource-oriented land management systems]*
- *Soil regeneration*
- *(x) Soil and groundwater remediation*

8.2 Pesticide contamination of groundwater

a. Explain – elaborate the topic

- *Who will be affected?* : Traditionally the guideline values of pesticides are set at 0.1 µg/l, which used to be the detection limit. This is not a toxicology based value, but a political choice. Denmark is basing its water abstraction on naturally pure groundwater, which is not supposed to undergo chemical treatment before distribution, which incidentally is also costly. The people affected by pesticide contaminations of the groundwater resource are the water consumers.
- *Who is responsible?*: In Denmark, the soil act distinguishes between a point source contamination, which is included in the act, and contamination related to general agricultural use of pesticides, which is not subject to the soil act. As this was also the setup in the proposal for the Soil Framework Directive, we believe this is general to the EU legal model. If it is an old (before 2000) point source pollution, it is the responsibility of the regions. If it is a new point source pollution it is a polluter pays case, which is handled by the municipality. The same goes for contamination resulting from regular pesticide use.
- *Is it a topic of concern of your organisation / department:* Yes.
- *Is it only a national topic, or a shared topic by multiple countries?:* Two factors combine to make this a priority issue in Denmark: the intensity and historical ubiquity of agriculture and the exclusive reliability on groundwater as supply. Other areas of Europe may face a similar combination, such as northern Germany, Netherland and Flanders. But if it is seen as an issue or not also has to do with the willingness of the population to either allow low concentrations of pesticides in their drinking water or clean it after abstraction.
- *Where are we now, where do we want to be in x years (point on the horizon)?:* Methods are needed for remediating pesticides, which is something, we have done little of before. Especially pesticides in the plume is a challenge, because of its wide dispersion and the low concentrations. As we cannot legally do something about diffuse pesticide contamination resulting from regular use, we need improved tools for distinguishing point sources from diffuse sources. We need tools to screen cheaply, because of the immense amount of potential point sources, the classical approach of historical due diligence cannot be applied indiscriminately. The effect of combining various



low concentrations of various pesticides is unknown.

- *How can the newly gained knowledge be effectively used?:* The field of pesticides in soil contamination is new. The challenge needs to be defined as a more specific level, so that the scope of a pesticide project is limited and specific. We should only develop something, which there is a market for, otherwise it will not be implemented.

-

b. Priority:

This is a high priority in Denmark.

c. Who wants to/should fund this kind of research?

[As 8.1](#)

8.3 Remediation in low permeable geology

a. Explain – elaborate the topic

- *Who will be affected?:* Low permeable geology is mostly a challenge where excavation is not considered an option. This may be because of buildings occupying the site or the depth of the hot spot. The people affected are the inhabitants affected by vapour intrusion from the contamination or the threat of downstream water abstraction.
- *Who is responsible?:* In case of orphan contaminations - mostly the case - the regional authority is responsible for securing a pure groundwater resource. Where a developer is responsible he will mostly use excavation due to speed and the need for documentation.
- *Is it a topic of concern of your organisation / department :* Yes
- *Is it only a national topic, or a shared topic by multiple countries?:* This will depend very much on the geology of the specific region of a country.
- *Where are we now, where do we want to be in x years (point on the horizon)?:* Energy use in thermal methods are costly. Achieving geotechnical stability after thermal remediation or soil mixing is a challenge. It is difficult to ensure contact between reactants and contaminants, it is hard for the reactants not to react prior to reaching their target. Horizontal distribution is a problem. There is a need for long lasting (75 year +) reactants. In situ methods are often not competitive because of the time needed, so faster methods are needed.
- *How can the newly gained knowledge be effectively used?:* If techniques developed are integrated in commercial technology and acknowledged by the problem owners, the knowledge will be used.

-

b. Priority:



This issue has not been ranked yet

c. Who wants to/should fund this kind of research?

As 8.1

8.4 Investigation methods

a. Explain – elaborate the topic

- *Who will be affected?* : The public or private owner of the investigation
- *Who is responsible?*: consultants and entrepreneurs
- *Is it a topic of concern of your organisation / department :*
- *Is it only a national topic, or a shared topic by multiple countries?:*
- *Where are we now, where do we want to be in x years (point on the horizon)?:*
Inhomogeneous geology poses a challenge for representative sampling. It would be desirable to be able to connect a contamination with a specific source or with multiple sources. This would help prioritising the remediation target as well as the responsible party. This could be done using fingerprinting of a contamination. A methodology determining the age of a contamination could give a similar indication, and it could also be used to identify responsibility, which in most MS is based on the when the contamination took place. Especially early phase investigations leave us with a high degree of uncertainty, because the price of drilling and sampling only permits for very few samples to be taken. So screenings tools, cheaper and faster methods are desired. In clay and low permeable strata it can be hard to analyse for substances in the aqueous phase. Passive samplers could be the answer. At times it can be hard to take samples underneath existing buildings, so more compact, controlled direction equipment is needed. Higher resolution of geophysical tools – usually developed for larger scale and deeper geology could be useful. There is a great need for a 3D vision of the subsurface including the extent of the contamination. Possibly this could be approached by integrating several geophysical tools with geochemical or optical sensors and other tools. Auto-processing of massive data amounts would also be needed. There is a need for cheaper on- site analysis of concentrations in various media. Methods are needed to estimate the concentration of free phase. Possibly we need to look at total screening of estranged compounds on site rather than analysing for specific compounds. If a “human toxicology screening” was possible, it would be preferable. This brings down the risk, that we have to revisit sites in the future – as for instance with PFOS. All original data must be saved including the chromatogram, for future readings, based on new knowledge. We need to collect data real time, making sure it goes directly from the sensors, the probe and the observer in the field to the database, and not necessarily via a laboratory. An auto sampler could go



directly to a measuring device. Remote controlled automated drilling could lower the price of drilling. If probes could be made cheaper and mass produced, they could be left in the well for continuous measurements. This would also allow for a much faster risk assessment.

- *How can the newly gained knowledge be effectively used?:* Especially in this theme, it is essential that an entrepreneur is taking the lead in a project consortia. It is essential that the individual development objective of a project is limited and precise. Legal demands on accreditation and use of specific methods are blocking the application of new techniques.

b. Priority:

This is a high priority mostly because of the commercial potential in combination with the possibility of specific development objectives, which can lead to solutions imminently implementable.

c. Who wants to/should fund this kind of research?

As 8.1

8.5 Groundwater contamination i Limestone aquifers

a. Explain – elaborate the topic

- *Who will be affected?:* The water consumers
- *Who is responsible?:* the regions
- *Is it a topic of concern of your organisation / department :* Yes
- *Is it only a national topic, or a shared topic by multiple countries?:* Depends on geology. The dominating aquifer of eastern Denmark is limestone and chlorinated solvents and pesticides are of particular concern.
- *Where are we now, where do we want to be in x years (point on the horizon)?:* Delineating deep plumes is a challenge. The fracture and dispersion pattern in a limestone aquifer differs from sediments, and the chemical properties are different. Our experience on sedimentary aquifers has to be tested on limestone.
- *How can the newly gained knowledge be effectively used?:* Pilot and full scale studies and models.

b. Priority:

This issue has not been ranked yet

c. Who wants to/should fund this kind of research?

Such projects are mostly driven by authorities & research institutions. As 8.1

8.6 Risk assessment modelling considering flux and natural attenuation

a. Explain – elaborate the topic

- *Who will be affected?* : The ecosystem as well as human health and groundwater resources
- *Who is responsible?*: The Nature Protection Agency, the regions and partly the municipalities
- *Is it a topic of concern of your organisation / department* : Yes
- *Is it only a national topic, or a shared topic by multiple countries?*: Many countries have risk assessment systems as well as politically based criteria and accept of risk. We are uncertain what other countries are doing especially in relation to flux from contaminated groundwater in to surface water.
- *Where are we now, where do we want to be in x years (point on the horizon)?*: We are uncertain about the extent of attenuation on the ground-surface water interface and about the relation between chemical concentrations and biological status. We are uncertain about natural attenuation vertically and how this may be included and documented in a risk model.
- *How can the newly gained knowledge be effectively used?*: Comparison of risk models and risk assumptions before implementation in the national models.

b. Priority:

This issue has not been ranked yet

c. Who wants to/should fund this kind of research?

This is mostly an administrative issue which can be solved in cooperation with research institutions – preferable transnational. Otherwise as 8.1

8.7 Alternatives to or optimisation of pump and treat

a. Explain – elaborate the topic

- *Who will be affected?* : The owners of the P&T units.
- *Who is responsible?*: Generally the regions are the problem owners, but some water works are also operating pump & treat facilities to fixate a groundwater contamination.
- *Is it a topic of concern of your organisation / department* : Yes
- *Is it only a national topic, or a shared topic by multiple countries?*:
Supposedly. It depends on how wide spread the use of P& T is. A determining factor is also what tax is levied on discharging waste water to a public sewer. If the discharging entity does not pay anything, no treatment of cause is needed. We have had the experience, that operation and maintenance has taken an increasing part of our budget.
- *Where are we now, where do we want to be in x years (point on the horizon)?*:
P&T units are costly to build and to operate. In particular carbon filters

constantly needs replacement, and pumping is energy consuming especially over as the operating period can be decades. Alternatives or supplement to carbon filters are sought. Self-cleaning pumps or plumps not clogging are sought. Back diffusion is time consuming. Approaches eliminating the need for P&T entirely are also sought. A higher degree of automation may make operation cheaper. Much water contains a high concentration of TOC, if we could remove it we could make existing units more effective.

- *How can the newly gained knowledge be effectively used?:* The business case must be proven in comparison to traditional setups. Many incremental solutions are possible making concrete products and results very achievable.

b. Priority:

This issue has not been ranked yet

c. Who wants to/should fund this kind of research?

As 8.1

8.8 Sustainable alternatives to dig and dump

a. Explain – elaborate the topic

- *Who will be affected?:* neighbours, entrepreneurs, global climate
- *Who is responsible?:* Private developers and public authorities regarding orphans sites
- *Is it a topic of concern of your organisation / department :* Yes
- *Is it only a national topic, or a shared topic by multiple countries?:* The price consideration for dig and dump compared to on-site remediation is highly influenced by the population density and hence the availability of clean soil and nearby areas available for deposition. Even considering the transport cost of large soil volumes, it is hard for an on-site remediation to compete with a landfill. So the issue is also influenced by regulation of landfill taxes.
- *Where are we now, where do we want to be in x years (point on the horizon)?:* Mobile cleaning units have been around for decades, but have largely been too energy consuming, too slow or too burdensome for neighbours – either because of noise, exhaustion or size. These are the challenges having to be dealt with in a mobile clean up unit.
- *How can the newly gained knowledge be effectively used?:* The challenge here, is to implement alternatives to dig and dump with private entrepreneurs. To do this, alternative technology must be price competitive. Another regulatory option is to make deposition relatively more costly. A public authority may on its own account choose an on-site solution, but to justify this it must at least be able to prove the environmental benefit of this – relative to



price – using a life cycle analysis.

b. Priority:

This issue has not been ranked yet

c. Who wants to/should fund this kind of research?

As 8.1, but the driving force here should be an entrepreneur.

9. Linked to topics mentioned by the NKS:

a. What are the important / relevant documents, research agendas, research programmes underpinning these topics? (state-of-the-art)

Danish Soil Partnership is running a process identifying the key physical challenges faced in the five regions regarding soil contamination. It is the intention to initiate a number of innovation projects aimed at these challenges through the period January 2016 to December 2018.

GEOCON – Advancing GEOlogical, geophysical and CONtaminant monitoring technologies for contaminated site investigation. GEOCON includes the following partners: DTU, AU, GEUS, University of Bonn, Lund University, Kansas University, Orbicon, The Region of Southern Denmark, Central Denmark Region. The program has been running since October 2014.

<http://www.geocon.env.dtu.dk/>

b. Related to these agendas and programmes: what are timelines of programming and windows-of-opportunities to influence agendas / programmes?

The mapping process of key technical challenges in Denmark will have a first draft ready 1st October 2015. From this point a more detailed problem formulation will be elaborated within chosen categories based on the priority of the regions and interest third parties such as solution providers and universities.

E. Science-Policy-Interfacing (SPI)

10. How would you define ‘scientific knowledge’?

Information about the nature of a cause-effect – delivered with a high degree of certainty as supported by empirical evidence

11. For what do you use scientific knowledge in your job?

We apply it for applying solutions from the lab – or from other sectors – within our field to investigate and remediate better, cheaper and with a higher degree of certainty.



12. Which sources of (scientific) knowledge do you use for doing your job?

[Open question and you can mention some of the sources underneath as examples]

- scientific paper
- (x) consultants
- (x) reports
- (x) colleagues
- (x) experiences /examples within my own country
- experiences /examples abroad
- newspapers
- television
- (x) conferences Involvement in research projects
- data (bases)
- websites, such as:
- other, specify:

13. To what extend do you use most recent/new scientific knowledge (i.e. state-of-the-art scientific insights/findings) for doing your job?

In the regional authorities, we use scientific knowledge indirectly, as we depend mostly on consultants having access to this information. Some projects are done in cooperation with universities.

14. To what extend are you able to influence (and how) the setting of scientific research policies/agendas in our country?

Very limited. But we include universities in our own development projects.

15. To which extend do our national policies/agendas reflect your specific needs and priorities?

Very limited, as soil contamination is a small field. We include innovation in our own problem solution.

16. To what extend has been made use of the state-of-the art in scientific research for the formulation of existing policies in our country?

Don't know.

[Questions only for NKS from the non-science sector (business and policy):]

17. Have you ever been involved in:

- a. the formulation of scientific research questions?: Yes
- b. doing scientific research (i.e. knowledge co-creation)?: Yes
- c. synthesizing/wrapping-up of scientific knowledge, e.g. to feed into policy making or to increase business opportunities?: yes



[When yes: Follow-up questions]

- How successful/satisfying was this, on a scale of 1-5?
 1. *Very successful/satisfying*
 2. *(x)Successful /satisfying*
 3. *Neutral*
 4. *Unsuccessful/unsatisfying*
 5. *Very unsuccessful/unsatisfying*
- *What went well:* disseminating the conclusions and the knowledge of a finding
- What could be improved?: the willingness of makers of policy, law and public bidders in considering a broader range of issues when choosing contract award criteria, setting standards for documentation, assessment and methodology. The secondary policy objectives of creating jobs, business opportunities, sustainability, innovation etc. often falls prey to securing the stated objective of a certain legal act.
- What to avoid/not to do?: do not develop a solution without a marked
- Additional remarks?: we need to consider this in a trans-national perspective. This field is too small to define a well-functioning market – at least in a country like Denmark.

[Question only to NKS who are likely to have insights here (e.g. research funders)]

18. (How) is the societal impact of scientific research related to the scope of INSPIRATION being assessed in our country?

We would like to see projects developing into concrete products. For this reason we will typically select rather mature research topics for development as opposed to basic research. Often innovation will be preferable to research: applying a well know technique from another area to a new field.

[If they know: Follow-up questions:]

- How successful/satisfying is this, on a scale of 1-5?
 1. *Very successful/satisfying*
 2. *Successful/satisfying*
 3. *Neutral*
 4. *Unsuccessful/unsatisfying*
 5. *Very unsuccessful/unsatisfying*
- What indicators are used?
- What goes well?



- What can be improved?
- What to avoid/not to do?
- Additional remarks?

19. Which national Science-Policy-Interface documents do you know of / can you recommend?

Don't know

F. Funding

20. Which experiences and expectations in funding schemes (public / private) do you have in your own field that could offer opportunities for future research on land-use and -management and related impacts to Soil-/Sediment-/Water-systems:

- *Sub-nationally /regionally?* Regional Growth Fora.
- *Nationally?* The DEPA environmental technology fund (TUP), DEPA's Environmental development and demonstration fund (MUDP), Innovationsfonden, InnoMT bubble projects, The Market Development Fund
- *European?* Interreg, H2020, LIFE+,
- *International?* We have no experience with international funds.

21. How to increase the added value of different financial resources (i.e. achieve a multiplier) for doing research that contributes to EU and national demands, in particular to the R&I demands on Land and the SSW-system?
[CONSTRUCTIONS that (could) work. PP, PPI, etc. Just ask for, as open as possible for suggestions, ideas, experiences, good examples]

It should be possible to fund projects from more than one fund with especially larger projects, where the budget perhaps cannot be met using only one co-financing source. There is a fine balance between adding more co-financing partners and economics of descale. In a EU fund application context it can be an advantage in an application to add useless partners to a project just to ensure regional representation. Participation should be based on merit, not geography. The EU Public Procurement Directive can have undesired effect on innovative procurement, because a solution provider is discouraged to disclose an idea in a co-creation process without a guarantee to be included in the downstream bid. The effect of the latest directive amendment is unknown in DK, where it has still not been implemented. For this reason a legal adviser is often needed, and we have found some help in developing standard agreements and models for PPP and PPI.



22. Are there areas of research and innovation (R&I) that you are aware of that are not (yet) covered by current funding mechanisms and which would need new/different funding schemes / infrastructures? To our knowledge it is generally difficult to get funding for late-stage innovation, where a prototype is in place, but there is still not created a market access.

23. Integrated approaches (necessary for addressing particular societal challenges related to the use and management of land and related impacts to SSW systems) are usually difficult to fund / get recognised by the research funding communities. What would be necessary to improve this?

We suppose this has to do with the categories and the objective defined in the funds.

24. Based on previous learning experiences that you are aware of: how to best set up / govern funding option(s), so that societal demands will be fulfilled, knowledge resulting from execution of the SRA will be taken up and used; and funders experience that their invested, national Euros are indeed multiplied?

It has to do with defining the larger project as an integrator of existing identified needs with in the participating organisation – not as something additional. A good project either has offspring projects as a result – or a change in practice and behaviour. The outcome/ effect of a project should be measured in how the results are integrated in to the organisations driving the project. The project must have a driver, the most suitable is often the entrepreneur.

[if they know: Follow-up questions]

- How successful/satisfying was this, on a scale of 1-5?
 1. *Very successful/satisfying*
 2. *Successful/satisfying*
 3. *Neutral*
 4. *(x)Unsuccessful/unsatisfying*
 5. *Very unsuccessful/unsatisfying*
- What went well
- What could be improved? The business case should be improved. Curiosity is not a market. The problem owners have to be committed, but it is difficult, because they cannot be legally bound to actually purchase the product they have been co-developing.
- What to avoid/not to do? Compromise to secure happiness of all partners. It is better to lose some.



- Additional remarks?

G. Other (remarks, suggestions, examples):

The above inputs are delivered by Danish Soil Partnership based on the outcome of five work shops held in the five regions of Denmark. As the task of the regions only include the issue of contaminated sites – other issues regarding broader soil issues such as erosion, spatial planning etc. has been neglected in this questionnaire.

A synthesis of the most acute challenge faced by the regions within the area of managing contaminated is currently being produced. The objective is to identify problem owners in other European Countries capable and willing of co-investment and co-development up against the identified priority issues.

The Danish Soil Partnership is an initiative taken by the regions in order to promote business and innovation in the field of contaminated soil and groundwater. The secretariat is hosted by the organisation Danish Regions.

H. Ending the interview

Thank you for taking the time to participate in this interview:

- Would you like us to keep you updated about INSPIRATION progress?
- Would you suggest anyone else who we should be interviewed by us?
- Do you have further questions arising from this interview, or would you like to add anything else?
- What information are you interested in, and willing to give feedback on?

[Discuss the feedback mechanism and if they have expressed their opinions as a person or as a representative of their organisation/network. Checklist:]

a. Information to exchange / willingness to give feedback on:

- (complete interview, not recommended)
- summary of main conclusions
- national report, national contribution to D2.4
- complete D2.4, all countries

b. Preferred level of feedback:

- no feedback
- informal feedback
- formal feedback (e.g. on behalf of represented organisation)



[Check: have you discussed consent form / how to refer to interviewee]



Annex II: Documents used for the desk study

Witboek Landbouwonderzoek - Departement Landbouw en Visserij

Afdeling Monitoring en Studie, *Van Gijseghem Dirk, Piessens Inge, Vuylsteke Anne, Maertens Ellen, Vandenbroeck Philippe, Goossens Jo*, downloadbaar in pdf-formaat op www.vlaanderen.be/landbouw

<http://www.ruimtelijkeordering.be/NL/Diensten/Onderzoek/Onderzoeksagenda>

Onderzoeksagenda Platteland - uitgebreide versie - Platform voor plattelandsonderzoek, opgemaakt door VLM – februari 2014

Onderzoeksprogramma ter ondersteuning van het Vlaamse milieubeleid - Opgemaakt door het Departement Leefmilieu, Natuur en Energie i.s.m. de Vlaamse Landmaatschappij, de Vlaamse Milieumaatschappij en de Openbare Vlaamse Afvalstoffenmaatschappij, mei 2015



Annex III: Mentioned SPI initiatives around soil and land use in Belgium

SPI in the Agricultural sector (some mentioned initiatives)

Agriculture Practice Centers translate results of fundamental research into applied practices

The Agriculture Education service brings policy measures to farmers, communicates with the practice centers and the farmers organisations, organizes seminars for farmers and captures the questions and worries of the farmers

The Platform Agrolink brings together the research institutes on agriculture research.

Policymakers try to foster cooperation between research institutes, farmers and authorities through the Platform for Agricultural Research (Flanders)

Platform on European level: Standing Committee on Agricultural Research (SCAR)

Vulgarization of the scientific research findings for farmers: via VILT and the “Countryside”-TV channel

The best way to convince people is to have personal contact and to show empathy.

SPI in Industrial sector (some mentioned initiatives)

NICOLE network: European network of industry and service providers on contaminated land

SPI in policy sector (some mentioned initiatives)

Common Forum: European network of policymakers on contaminated land

SPI in spatial planning sector (some mentioned initiatives)

Steunpunt “Ruimte” and “Ruimte en Wonen” brings together all stakeholders on these topics and discusses e.g. on research needs

Annex IV: List of regional, national, European and international funding schemes

	Name*	Research and Innovation funder**	What and/or whom do they fund?***	More info****
Regional				
1	Prevention and Remediation Fund for Environment and Nature (MINA)	Flemish government	The MINA-fund is both fed by the Flemish revenues from environmental taxes, fines and fees (polluter pays principle) and by a grant from the Flemish government. A lot of research commissioned by the Flemish government within the environmental domain is financed through this fund.	ebl.vlaanderen.be/publications/documents/77056
2	Applied Scientific Research Program on Environment (TWOL)	Flemish government	This public research program is prepared annually by the Department of Environment, Nature and Energy of the Flemish government and includes all planned and strategically important policy studies on environmental issues. The TWOL program is approved by the Flemish Minister for Environment and funded by the various environmental agencies.	ebl.vlaanderen.be/publications/documents/74536
3	Innoviris	Brussels government	Innoviris is the Brussels institute for the encouragement of scientific research and innovation. The institute supports and stimulates research, development and innovation through the funding of innovative projects by companies, research organisations and the non-commercial sector.	www.innoviris.be
4	Flemish Program for Rural Development (PDPO)	Flemish government / EU	The 3rd PDPO for the period 2014-2020 focuses on young farmers, the future of farming, innovation, education, resilience and sustainability in the agricultural sector, and improving the viability of rural areas.	lv.vlaanderen.be/nl/landbouwbeleid/plattelandsontwikkeling

5	Agency for Innovation by Science and Technology (IWT)	Flemish government	IWT stimulates knowledge development in companies, research institutions and government agencies by providing financial support, advice and coordination. The agency annually distributes 300 million euro in grants, partly through its own funding programs, partly as intermediary of the Flemish government to which it provides support, monitoring and financial management.	www.iwt.be
6	Special Research Fund (BOF)	Flemish government	The BOF is funded through a grant from the Flemish government and supports basic and strategic research conducted at Flemish universities and colleges. The distribution of the funds over the different research institutions depends on a formula that includes the number of master degrees, doctoral degrees, publications and citations. Every knowledge institution has to co-finance research funded by BOF with own resources.	www.ewi-vlaanderen.be/wat-doet-ewi/excellerend-onderzoek/financiering-van-onderzoek/bijzondere-onderzoeksfondsen
National				
1	Research Fund – Flanders (FWO), Fund for Scientific Research (FRS-FNRS)	Flemish, Walloon and Federal government, National Lottery, donations.	Both federal research funds finance fundamental scientific research mainly by supporting individual researchers through fellowships. The FWO operates in Flanders, the FRS-FNRS in the Wallonia-Brussels Federation.	www.fwo.be
2	Belgian Science Policy Office (BELSPO)	Federal government	BELSPO is the federal coordinating office for the Belgian science policy. By managing some major research programmes it provides the Belgian government reliable, validated data, allowing it to take decisions with full knowledge of the facts in areas such as sustainable development, climate change, biodiversity, energy, health, mobility and	www.belspo.be



			the information society.	
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3	VLIR-UOS	Federal government	VLIR-UOS is financed by a grant from the Belgian development aid budget. It supports cooperation projects between professors, researchers and teachers. VLIR-UOS also awards scholarships to students and professionals in Flanders and the South. The fund also helps to strengthen higher education in the South and the globalisation of higher education in Flanders.	www.vliruos.be
4	Luxembourg National Research Fund (FNR)	Luxembourg government	The Luxembourg National Research Fund (FNR) is the main funder of research activities in Luxembourg. The FNR invests public funds and private donations in research projects in various branches of science, with an emphasis on selected core strategic areas. Furthermore, the FNR supports and coordinates activities to strengthen the link between science and society and to raise awareness for research. It also advises the Luxembourg government on research policy and strategy.	www.fnr.lu
European				
1	Interreg	EU	Interreg is a program for European regional development and promotes cross-border, transnational and interregional cooperation. The program aims to strengthen economic and social cohesion across the EU.	ec.europa.eu/regional_policy/nl/policy/cooperation/european-territorial/



2	European Regional Development Fund (ERDF)	EU	The ERDF is a structural fund that stimulates economic, social and territorial cohesion within the European Union. Funding priorities include modernising economic structures, creating sustainable jobs and economic growth, research and innovation, environmental protection and risk prevention. Investment in infrastructure also retains an important role, especially in the least-developed regions. All actions should contribute to the objectives of the Europe 2020 strategy for smart, sustainable and inclusive growth.	ec.europa.eu/regional_policy/en/funding/erdf/
3	Joint Programming Initiatives (JPI)	EU	The objective of these JPI's is to increase the value of relevant national and EU R&D funding by concerted and joint planning, implementation and evaluation of national research programmes. There are JPI's on themes like agriculture, food security, urban development, climate change or water.	ec.europa.eu/research/era/joint-programming-initiatives_en.html
4	Rural Development Programs (RDP)	EU	The aim of the Rural Development Programme (RDP) which is financed by the European Agricultural Fund for Rural Development (EAFRD) and national or regional authorities, is to improve the quality of life in rural areas and to encourage diversification of the rural economy.	ec.europa.eu/agriculture/rural-development-2014-2020/index_en.htm
5	European Innovation Partnership (EIP)	EU	The EIP's are a new approach to EU research and innovation. By bringing together actors from the entire research and innovation value chain they aim at streamlining efforts and accelerating market take-up of innovations that address key challenges for Europe on themes like water, raw materials or agricultural sustainability and productivity.	ec.europa.eu/research/innovation-union/index_en.cfm?pg=eip

6	European Research Council (ERC)	EU	The ERC's mission is to encourage the highest quality research in Europe through competitive funding and to support investigator-driven frontier research on the basis of scientific excellence. The ERC complements other funding activities in Europe such as those of the national research funding agencies, and is a flagship component of Horizon 2020.	erc.europa.eu
7	European Science Foundation (ESF)	EU	ESF helps its member organisations collaborate internationally on research programmes that it coordinates in almost every scientific domain. ESF provides services to the science community, including peer review, evaluation and conferences, as well as support career tracking.	www.esf.org
8	Marie Skłodowska-Curie Actions (MSCA)	EU	MSCA support research training and scientific career development focused on innovation skills. The programme encourages transnational, intersectoral and interdisciplinary mobility. The MSCA is the main EU programme for doctoral training and finances 25.000 PhDs.	ec.europa.eu/research/mariecurieactions/
9	SNOWMAN	OVAM, DLNE, ADEME, MEDDE, Naturvårdsverket	SNOWMAN is a European network of research funding organisations that has launched four calls and funded 17 projects related to soil and land management.	snowmannetwork.com
10	LIFE+	EU	LIFE+ is the EU's funding instrument for the environment and climate action. The general objective of LIFE+ is to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value.	ec.europa.eu/environment/life/



1 1	ERA-net	EU	The ERA-net instrument under Horizon 2020 is designed to support public-public partnerships in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as topping up of single joint calls and of actions of a transnational nature.	ec.europa.eu/research/era/era-net_en.html
1 2	European Observation Network Territorial Development and Cohesion (ESPON)	Mainly EU	The ESPON 2020 Programme aims at promoting and fostering a European territorial dimension in development and cooperation by providing evidence, knowledge transfer and policy learning to public authorities and other policy actors at all levels. ESPON 2020 has a total budget of 48,7 million EUR of which 41,4 is contributed by the EU.	www.espon.eu
International				
1	Bill & Melinda Gates Foundation (BMGF)	Bill Gates & other donators	With financial resources up to 42 billion dollar, the BMGF is the largest private foundation in the world. The foundation funds and promotes research on improving health and global development, and also has divisions dedicated to education and equal rights in the US, and global advocacy.	www.gatesfoundation.org
2	Organisation for Economic Co-operation and Development (OECD)	Member countries	The OECD has a Co-operative Research Programme (CRP) for the funding of research fellowships and international conferences (workshops and symposia). The CRP supports work on the sustainable use of natural resources in agriculture, fisheries, food production, forestry, and research into new technologies in these areas.	www.oecd.org

Annex V: Participant list workshop

Name of the entity	Contact person
SPAQUE	Claudia Neculau
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KU Leuven	Anton Van Rompay
VEB vzw	Karen Van Geert Pieter Schrooten
VITO	Guy Engelen
Service Public de Wallonie	Ester Goidts
ISSEP	Simon Garzaniti Robin Lambotte
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Universiteit Hasselt: Centrum voor Milieukunde	Bernard Van Heusden
Université Liège/Gembloux	Jean-Thomas Cornélis
Vlaamse LandMaatschappij	Carole Ampe
Vlaamse LandMaatschappij	Frank Stubbe
LNE-ALBON	Joost Salomez
Bioforum	An Jamart
Instituut voor Natuur- en Bosonderzoek	Bruno Devos
OVAM	Johan Ceenaeme
OVAM	Eddy Wille
CIW WG bagger- en ruimingspecie (SEDNET)	Astrid Vosselen
Umicore (NICOLE)	Lucia Buvé
De Watergroep	Simon Six
Haven van Antwerpen	Agnes Heylen
Univ UCL: Terre et climat	Bas Van Wesemael
Union des Villes et Communes de Wallonie	Gwenael Delaite
Espace environnement	Nicolas Rochet
Solvay (NICOLE)	Roger Jacquet
Ministère du Développement durable et des Infrastructures de Luxembourg	Sophie Capus
Luxembourg Institute of Science and Technology	Benedetto RUGANI
Danish regions	Christian Andersen
Ruimte Vlaanderen	Peter Willems

Annex VI: Programme Danish Soil Partnership



Report publicly available at:

http://miljoeogressourcer.dk/filer/lix/4660/Challenges_concerning_contaminated_sites_common_to_the_five_danish_regions.pdf

Or see:

Danish Soil Partnership (DSP): <http://danishsoil.org/index.php>

Publications: <http://danishsoil.org/pages/publications.php>

HORIZON2020 CSA INSPIRATION

Deliverable D2.5 –
National reports with a review and syntheses
of the collated information





inspiration

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