



**EmConSoil**

**CHALLENGES FOR EMERGING SOIL  
CONTAMINANT GOVERNANCE & POLICY**



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# EmConSoil

# CHALLENGES FOR EMERGING SOIL CONTAMINANT GOVERNANCE & POLICY

Creating a multi-stakeholder network



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Johan Ceenaeme - OVAM  
Bruno Billiaert - OVAM  
Griet Van Gestel - OVAM  
Kris Van Looy - OVAM  
Nele Bal - OVAM  
Dirk Dedecker - OVAM  
Ellen Luyten - OVAM
- 9 *Authors:*  
Griet Van Gestel  
Kris Van Looy  
Johan Ceenaeme
- 10 *Contact persons:*  
[emconsoil@ovam.be](mailto:emconsoil@ovam.be)  
Griet Van Gestel  
Nele Bal
- 11 *Other publications about the same subject:* not applicable

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## Foreword

With this white paper OVAM wants to initiate the creation of a network for international collaboration on the governance and policy of emerging soil contaminants. Started off with an international workshop (ENSO<sub>r</sub>) in November 2018, the aim of the paper is to follow-up on that initiative and to enlist and engage with stakeholders and ask for their participation.

The paper describes the challenges that stakeholders face when dealing with the legacy of soil contamination with emerging contaminants, and proposes activities and possible actions to work on in the EmConSoil network.

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## Summary

In the last few decades, an increasing number of harmful chemicals have found their way into the environment. Many of these emerging contaminants are found in soils, groundwater and sediments, and are a threat to human health and ecosystems. Especially, the large number of substances and their omnipresence in soils are a matter of great concern, and strengthen the sense of urgency for action.

The legacy of soil contamination with chemicals of emerging concern needs to be properly managed and remediated, in order to prevent risks and further spreading and to preserve healthy soils for the future. This is a major challenge posed to policy and practice of soil and land management.

It is clear that the problem cannot be solved by the regulatory authorities alone. Concerted actions and initiatives are urgently needed. Therefore, the Flemish agency responsible for sustainable management of materials and soils, OVAM, wants to initiate an international multi-stakeholder network, EmConSoil, *'Challenges for emerging soil contaminant governance & policy'*.

The network will have the ambition to develop new policies and adequate management strategies for soil pollution with emerging contaminants, by bringing together actors from industry, research centres, consultancies, national and regional authorities, and society. The aims are to exchange knowledge, to develop strategies and policies through co-creation, to raise awareness and intensify cross-sectorial collaboration. In the short term, practicable approaches and policies will be developed, but we envisage as well the integration of actions aiming at soil stewardship and care for soil health, as part of a transition towards sustainability.

In this white paper we present the current challenges that policy makers, problem owners and other stakeholders face when dealing with emerging soil contaminants. We show these challenges can be met by developing a multi-stakeholder approach and network. Next, we propose an agenda of possible activities and topics to be dealt with by the network. We end with the invitation of actors and interested parties to join the EmConSoil network.

In this way, progress can be made towards effective and sustainable solutions for the problem of emerging soil contaminants. This will help to protect our soils and, by extension, all life on earth.

## INTRODUCTION

Contaminants of emerging concern can be defined as substances that have been detected in the environment, but are currently not included in routine monitoring programs and/or whose fate, behaviour and (eco)toxicological effects are not well understood. Most of these contaminants are not yet covered by existing legislative activities of product control and standardisation, but gradually measures are being taken to restrict and eventually phase out the use of these chemicals.

At the same time, there is a need for management and remediation of these new substances already present in soils, sediments and groundwater, in order to prevent risks and further spreading. This legacy of environmental pollution is not adequately dealt with by current legal and practical approaches. Examples of emerging contaminants with potential relevance for soil, sediment and groundwater are: perfluoroalkyl substances (PFAS), nanoparticles, human and veterinary pharmaceuticals, pesticides, flame retardants, plasticizers, cosmetics and detergents.

From a policy perspective, emerging contaminants are candidates for future regulation at different levels, depending on research on their ecotoxicity, potential health effects and public perception, and on monitoring data. A stakeholder network can initiate and support this policy developments. It can also ensure harmonization between regions and nations, and guarantee that the approaches towards legacy substances in soils are practicable and economically feasible.

This white paper provides an overview of the issues facing decision makers, including the range of sources and risks, the complexity of preventing and restoring the caused contaminations, as well as policy and management response options. The paper includes an invitation to participate in an international multi-stakeholder network, EmConSoil, initiated by OVAM.



*The network's first workshop invitation was inspired by James Ensor's painting Le Marais, mingling colours in air, water, land and the human figure, since it symbolizes the omnipresence and pervasiveness of the emerging contaminants and the need for holistic approaches.*

# 1 THE SENSE OF URGENCY FOR EMERGING SOIL CONTAMINANTS

Two topical examples to set the scene. The fluorinated, brominated and chlorinated organic chemical compounds with their strongly persistent character in the environment and broad application (additives in tyres, textiles, plastics,...) in recent times, makes it a widely spread pollution posing strong environmental and human health risks. For most of these persistent organic pollutants it remains difficult to define critical loads and set norms, especially since regulation would be highly impacting land and soil management practices. These days there is strong emphasis and concern about perfluoroalkylated substances (PFAS). Recent cases have shown that these substances spread far from the source of contamination, and are found in all environmental compartments: surface water, groundwater, soils, sediments, food products, ... Background or ambient concentrations of PFOS and PFOA have been reported<sup>1</sup>. The extent of the problem is emphasized by the recent proposal of the European Food Safety Authority to lower drastically the tolerable intake of PFOS and PFOA (EFSA, 2018)<sup>2</sup>.

Another example is the health risk of micro- and nano-plastics that only recently come to be light. Nowadays the marine plastic threat to our marine environment and economy has finally hit the headlines. But only 10% of mismanaged plastic waste reaches the sea<sup>3</sup>. It is highly likely that a large proportion of the rest ends up in soils<sup>4</sup>. Micro-plastics have been documented now to accumulate through the food chain from earthworms into chickens, eggs and humans<sup>5</sup>. There are no analytical methods for nano-plastics in soils, and therefore their presence and effects have remained largely unknown until now.

## LEGACY OF EMERGING CONTAMINANTS IN SOILS

These are only two examples of a multitude of increasingly diverse substances that are used in industrial activities, agriculture, in our homes and in health care services. Other examples are pesticides and their metabolites, plasticizers, personal care products, pharmaceuticals, flame retardants, detergents, .... Many substances of this ever-growing list end up in soils, sediments and groundwater, and contribute to the legacy of pollution, which has been present since the beginning of industrialization. Causes of contamination are point sources such as industries and other risk activities, and diffuse inputs, e.g. atmospheric deposition, agricultural activities, floods, ... As more knowledge on presence, toxicity and persistence of emerging contaminants becomes available, concerns are on the increase.

On the one hand, stronger legal mechanisms to rule out hazardous chemicals from the product design phase are needed. Initiatives like REACH<sup>6</sup> and other European Chemicals Agency (ECHA) activities are indispensable for a preventive approach. On the other hand, the legacy of pollution with emerging contaminants in soil and groundwater demands an **active** and **curative** approach. In order to limit exposure risks and to prevent further

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<sup>1</sup> Vedagiri UK, Anderson RH, Loso HM, Schwach CM. Ambient levels of PFOS and PFOA in multiple environmental media. *Remediation*. 2018; 28: 9– 51.

<sup>2</sup> EFSA Panel on Contaminants in Food Chain (CONTAM). Risk to human health related to the presence of perfluorooctane sulfonic acid and perfluorooctanoic acid in food. *EFSA Journal* 2018; 16(12): 5194.

<sup>3</sup> Jambeck, JR, Geyer R, Wilcox C, Siegler TR, Perryman M, Andrady A, Narayan R, Lavender Law K. Plastic waste inputs from land into the ocean. *Science* 2015; 347, 768–771.

<sup>4</sup> Horton AA, Walton A, Spurgeon PJ, Lahive E, Svendsen C. Microplastics in fresh water and terrestrial environments - evaluating the current understanding to identify the knowledge gaps and future research priorities. *Science of the Total Environment* 2017 May 15; 586: 127-141.

<sup>5</sup> SAPEA, Science Advice for Policy by European Academies. 2019. *A Scientific Perspective on Microplastics in Nature and Society*. Berlin: SAPEA.

<sup>6</sup> Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) is a European Union regulation dating from 18 December 2006. REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment.

spreading in the environment, soil and groundwater contamination with emerging contaminants should be adequately managed and remediated. And therefore challenges posed to current soil policies should be met.

Until now little emphasis has been given to this side of the story, and only a few international joint initiatives have been taken on this topic. The focus of this white paper is therefore on the management of the legacy of emerging contaminants in the environment, and more specifically in soils.

## EFFECTS ON HUMAN HEALTH AND THE ENVIRONMENT

Harmful substances in soils cause human health risks by different routes of exposure, such as ingestion of soil and dust particles, uptake in food crops, inhalation, leaching to groundwater that is used for drinking water, ... In this way, emerging contaminants can cause health risks in the short and in the long term. Even when phased out, restricted or banned, persistent contaminants will still be present in the environment and be harmful for a very long time. Persistent and mobile contaminants are a serious and long-term threat for the quality of groundwater resources and are impacting drinking water provision.

For some groups of pollutants, e.g. polychlorinated dibenzodioxins and furans, polychlorobiphenyls and other persistent organic pollutants (POPs), human health risks are well established and acknowledged. For many other emerging contaminants, knowledge on health effects and fate is still lacking<sup>7</sup>. The lack of knowledge on the effects on ecosystems is even larger, so that consequences are even more difficult to predict. Furthermore, the occurrence of some contaminants is ubiquitous, often in combination with other substances. However, very little is known about the combined effects.

The unknown effects on soil ecosystems call for more caution, especially considering the important role soils can have for measures to combat climate change, and the role of soil biota therein. Healthy soils can be a major sink for carbon.

## CHALLENGES FOR SOIL AND LAND MANAGEMENT PRACTICES AND POLICIES

Although a lot of work (e.g. by the NORMAN Network Europe<sup>8</sup>) has been done to collect and exchange available scientific data on emerging contaminants, a large gap remains between the knowledge and the practice of soil protection and remediation. Unlike other environmental compartments, there has been no common European legislation for soil protection until now. Each member state is responsible for the implementation of measures to address new substances in their current national and regional soil policies. Emerging contaminants are posing new challenges to the existing environmental governance frames and soil remediation strategies.

For these contaminants we are currently lacking adequate **guidelines** on monitoring, analysis and risk assessment. Also practicable norms and threshold values for soil, groundwater, surface water and sediment

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<sup>7</sup> Gavrilescu M, Demnerová K, Aamand J, Agathos S, Fava F. Emerging pollutants in the environment: present and future challenges in biomonitoring, ecological risks and bioremediation. *New Biotechnology* 2015 Jan 25; 32(1): 147-56.

<sup>8</sup> NORMAN Network: <http://www.norman-network.net>. The NORMAN network is a permanent self-sustaining network (EU) of reference laboratories, research centres and related organisations for the monitoring and biomonitoring of emerging environmental substances. It enhances the exchange of information on emerging environmental substances, and encourages the validation and harmonisation of common measurement methods and monitoring tools so that the requirements of risk assessors and risk managers can be better met.

are missing. Furthermore, the technical knowledge and expertise on remediation and the treatment of contaminated groundwater, sediments and soils still needs to be developed. As a consequence, contamination in soils, sediments and groundwater with these new substances is usually not properly treated. Often owners and users of land are not aware of the problems related to soil and groundwater contamination with emerging substances.

The lack of guidance is felt most urgently when dealing with **excavated soil**. Construction works and other projects involving excavation of contaminated soil and sediments are in urgent need of clear regulations. Large differences in threshold values between neighbouring regions and countries are causing undesirable cross-boundary transports of excavated soil. This is neither sustainable nor economically viable.

Ongoing and finished soil remediation projects may need to be re-opened and adjusted to account for concerns related to new substances, giving rise to **legal uncertainty** for problem owners.

Furthermore, there are major problems related to **liability**. Legislation on soil contamination is usually based on the 'polluter pays'-principle, meaning that the polluter is responsible for the costs for survey and remediation. However, regarding the widespread use and occurrence of emerging contaminants in consumer products used in daily life, the question can be raised whether this is fair and reasonable.

Finally, most current approaches and strategies to deal with soil contamination are source-oriented, designed for tackling pollution caused by well-known point sources. However, contamination with emerging contaminants is often caused by dispersed sources that are difficult to identify and to locate. Current strategies and policies are often not suitable do deal with this **diffuse soil contamination**. New approaches need to be developed.

## ACTIONS ARE URGENTLY NEEDED

It is clear that actions are urgently needed to tackle the threats and challenges posed by emerging contaminants in soils. Further postponement will lead to increased costs in the future. From the recent past we have learned how the sense of urgency regarding mercury in soils can result in strong policy (e.g. brownfield rehabilitation) and global initiatives, such as the Minamata Convention. Yet, the extent of the emerging contaminants' risks to environmental and human health poses an even much larger threat.

In addition, it is also clear that there are many different stakeholders who have issues with emerging soil contaminants, but who can also play an active role in developing comprehensive and adequate solutions for this complex problem.



*In the Italian Veneto region pollution with PFAS gave way to a strong public awareness and sense of urgency, resulting in a 'holistic multi-stakeholder collaboration' between regional authorities, knowledge institutions, agriculture and drinking water sector to find solutions (Life PHOENIX project).*

## 2 NEED FOR AN INTERNATIONAL MULTI-STAKEHOLDER APPROACH

Intensive cooperation between stakeholders from different sectors (industry, science, policy, civil society), scales (European, regional, local) and involvement is essential to work out balanced approaches for the posed challenges on emerging contaminants in soils. Different stakeholders may have similar or overlapping questions and research needs, but their concerns and interests can vary. Including all stakeholders, such as non-governmental organizations representing environmental, health and consumer priorities, as well as trade unions and representatives of industry, is crucial to the success and sustainability of the approach for these challenges.

Due to the lack of a common European soil policy, EU-members need to develop their own soil policies and regulations, including methodologies for analysis and risk assessment, implementation of thresholds, soil remediation options and preventive actions. Developing the necessary guidelines is complex and costly. Moreover, there is also a need for harmonization of methods and threshold values to ensure a level playing field and a concerted approach. Intensified collaboration across European member states will reduce these costs, and will also help to reach a common vision and agreement on different aspects. A specific EU policy on soil contamination and remediation would be a major step forward (see German position paper on EU soil policy<sup>9</sup>).

In this perspective we propose the creation of an **international multi-stakeholder network** for emerging soil contaminants.

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<sup>9</sup> Ginzky H, Grimski D, Frauenstein J, Glante F, Ehlers K, Marx K. The need for soil protection at EU level. December 2018, Umweltbundesamt, Germany

## AIMS OF THE NETWORK

By setting up this network we want to ensure that soil pollution with emerging contaminants is adequately managed and remediated, and prevented in the future. The aims of the network are:

- intensifying the **exchange and dissemination** of knowledge, data, technical and juridical expertise;
- developing strategies and policies through **co-creation**<sup>10</sup> to remediate and manage the legacy of emerging contaminants in soil and groundwater, and to reduce risks for human health and ecosystems;
- **raising awareness** among stakeholders to strengthen the support for proposed actions and policies;
- enabling inter-sectorial and international **collaboration** towards holistic and sustainable solutions.

## WHO ARE THE STAKEHOLDERS, AND WHAT IS THEIR ROLE?

The stakeholders can be divided into four main groups.

First, there are industry and **business** partners that may be represented by sector organizations. Often, they are problem owners who have to deal with soil contamination with new substances. This group also includes the consultancy sector and the contractors specialized in soil remediation works.

A second group are the **research** institutions, both public and private, including education and training centres, and their networks. They will contribute with new insights, knowledge and scientific data on all relevant aspects, including juridical and social points of view.

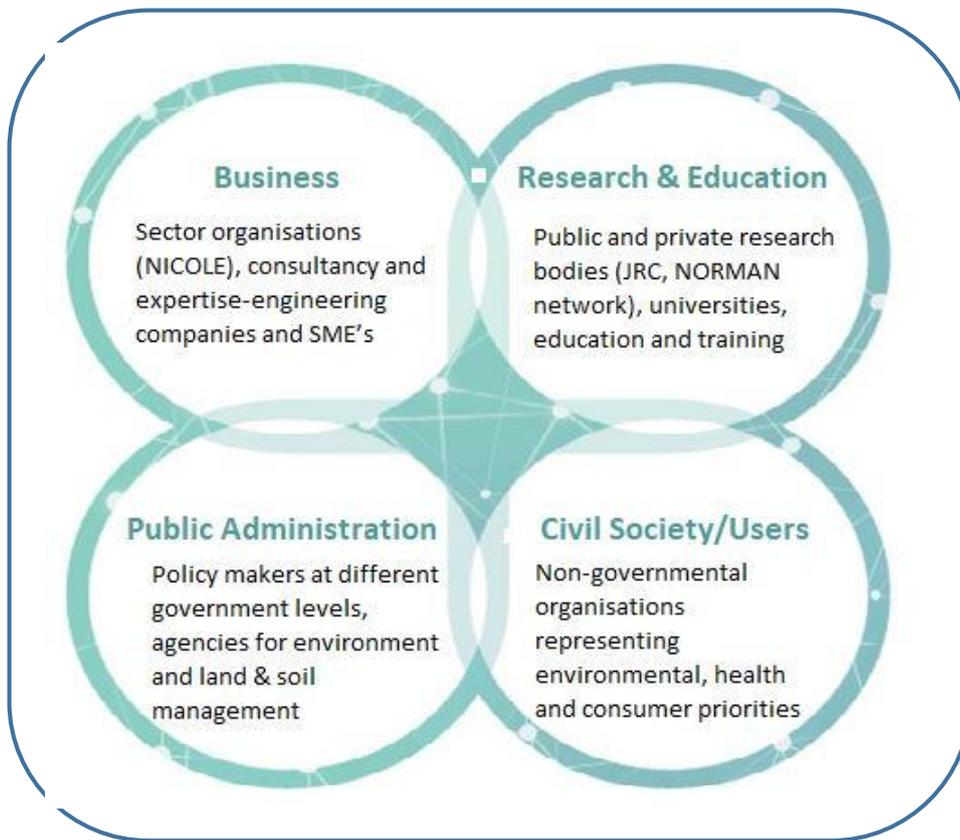
Then, there are the **policy makers** at the different governmental levels, from local, regional, to national and international, who are responsible for the legislation on soil and land protection.

And lastly, the **citizens**, represented by non-governmental organizations and trade unions. They are involved as users of land, as consumers of all kind of products.

All stakeholders together will shape the strategic direction of the network activities. This transparent and participatory approach will ensure that the network generates results that address genuine societal concerns, and that proposed approaches and policies are feasible and effective.

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<sup>10</sup> Co-creation needs a permanent dialogue between stakeholders so that consensus is built on factors related to institutional mission and agendas, sector interests, development models, strategies and prioritization. For the complexity of the policy challenge, co-creation with the multi-sectorial stakeholder group can offer the necessary multilevel governance model. Effective governance relates to proper alignment of policy, institutions, programs and their implementation in line of the contextual factors (stakeholders and their needs/aspirations).



*The quadruple helix setting of the multistakeholder network will promote exchange and pooling of efforts.*

## STARTING OFF: THE FIRST ENSOR MEETING

As a first step to launch this initiative for an international stakeholder network, a workshop was organized on 19-20 November 2018 in Brussels. At this ENSOr meeting, as it was named after ‘emerging policy challenges on new soil contaminants’, an international group of experts and stakeholders came together to exchange knowledge and experiences. Thanks to involved sector organisations such as NICOLE<sup>11</sup>, and public agencies such as the Common Forum for Contaminated land in Europe, the participants represented a broad stakeholder community. In this first phase we tried to formulate answers to the following questions: Is the sense of urgency of emerging soil contaminants sufficiently assessed and perceived? Do we have to re-define liability of producer, user and regulator with respect to these contaminants? Are existing legislative and juridical frameworks appropriate to deal with these “new” liabilities related to contaminants of emerging concern? How to proceed in policy making for soil protection regarding emerging contaminants?

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<sup>11</sup> NICOLE Network for Industrially Co-ordinated Sustainable Land Management in Europe, is a leading forum of industrial partners in land management and brownfield remediation in Europe.

### Linking initiatives to UN Sustainable Development Goals

Bringing together actors, users, practitioners and governors of land and soil, will allow to propose the appropriate necessary mix of policy instruments at different levels from local to global, from biosphere to society and economy, and from education to legislation. This collaboration can be linked to a concerted action to achieve the UN Sustainable Development Goals: SDG 17 Partnerships for the goals.



## 3 PROPOSED ACTIVITIES AND POTENTIAL TOPICS

To tackle the complex problem of emerging contaminants in soils, we need to work along two action lines. New substances should be included in existing policies on soil protection and remediation, and at the same time we have to invent new management and governance concepts to ensure adequate prevention and management of all soil contamination with emerging contaminants in the future. Until now, soil remediation policies have mainly focussed on point sources and risk-entailing activities, and are not well suited to deal with diffuse soil contamination. However, many emerging contaminants are present as diffuse soil contamination, and therefore new policy frameworks are urgently needed.

In addition, these new strategies and approaches need to be interwoven and connected with those aiming for soil stewardship and care for healthy soils, and should be part of new socio-economic models, such as circular economy, foundational economy, ... in order to protect our planet for future generations.

With this white paper we want to propose a framework for activities and possible topics to work on. The list below is open for discussion and extension. Core actions focus on (1) knowledge generation and technological innovation, (2) policies, regulations and new governance models, and (3) awareness raising, communication, behavioural and societal changes. Topics and actions are interconnected and often have the same basis or a similar goal.

### **1 Knowledge generation and technological innovation**

- Identifying important knowledge gaps and research questions in relation to policy making (sources, behaviour, toxicity, monitoring data, risk assessment (human health & ecotox), impact on receptors, uncertainty assessment, ...).
- Inventory and monitoring (adhering to and extending LUCAS<sup>12</sup> and NORMAN<sup>13</sup> aims and ambitions, in relation to (ground)water, air and biota);
- Long and short term effects on soil ecosystems (monitoring to initiate preventive actions);
- Innovative technologies for soil and groundwater remediation, for detection and monitoring, and for data processing and accessibility.

### **2 Policies, regulations and new governance models**

- Defining background levels and threshold values (human health & ecotox based), including methods to deal with combined effects, for risk-based approaches;
- Guidelines on analyses, monitoring, risk assessment, remediation options and technologies;
- Assigning obligations and liabilities, and enforcement (with possible adjustment of existing rules);
- Management systems for excavated soils that take into account emerging contaminants;
- Instruments to finance operations (taking into account reasonableness and fairness);
- Development of novel governance approaches, strategies and policy framework, based on the precautionary principle and sustainability considerations, such as area-oriented solutions (connected with spatial planning), and other holistic solutions.

### **3 Awareness raising, communication, behavioural and societal changes**

- Communication to citizens about risks, measures to reduce risks and prevention;
- Showing externalities and costs related to harmful effects;
- Instruments oriented at behavioural change through education, knowledge sharing and participatory decision making;
- Finding support for social mind-set change and the stewardship principle.

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<sup>12</sup> LUCAS periodic Land Use/Land Cover Area Frame Survey (*LUCAS-ESDAC European Soil Data Center, European Commission*) to sample and analyze the properties of topsoil in Member States of the European Union.

<sup>13</sup> NORMAN Network (Network of reference laboratories, research centers and related organizations for monitoring of emerging environmental substances)

### Human biomonitoring: a tool for integrated risk assessment

To properly assess effects on human health of emerging contaminants, it is important to determine internal concentrations in the human body. Human biomonitoring techniques measure levels of substances in body fluids and tissue, and can be used as forecast tool in support of risk analysis and management (cfr. HBM4EU project<sup>14</sup> and Life PHOENIX project<sup>15</sup>). Such projects aiming at coordinating and advancing human biomonitoring in Europe, provide better evidence of the actual exposure of citizens to chemicals. In addition, they can be combined with assessment of levels of contaminants in environmental compartments citizens are exposed to: air, (home-grown) food, drinking water, house dust, soils, ..., allowing to estimate the relative importance of different exposure routes. Such data are extremely helpful to determine what measures are most effective to reduce the risk of exposure.

## 4 WHAT WILL THE NETWORK LOOK LIKE?

EmConSoil wants to be an open network (without commitment or charge) for stakeholders from the identified concerned societal groups, from all over Europe (not excluding the rest of the world, but for our policy objectives we have to restrict our ambitions). It could evolve into a network of national stakeholder platforms, or even into an international platform alongside existing ones like NORMAN and Common Forum. With information sharing through a website, and activities like symposia, workshops and perhaps sharing policy briefs, petitions, etc. it can engage in the formulated goals.

### COLLABORATION WITH OTHER INITIATIVES

The network will work in collaboration with other initiatives, such as NORMAN, Common Forum, NICOLE, SedNet<sup>16</sup>, Water JPI ... for sharing information, knowledge and strategy.

### WHY PARTICIPATE?

By joining and participating in the EmConSoil you will:

- learn and inspire others;
- meet experts from different disciplines and backgrounds;
- have early access to new data and experiences;
- be able to set research priorities that address societal needs;
- ensure that proposed actions and approaches are practicable and legitimate;
- implement efficiently procedures that are transparent and accountable.

<sup>14</sup> Human Biomonitoring for Europe. A joint effort of 28 countries, the European Environment Agency and the European Commission, co-funded under Horizon 2020.

<sup>15</sup> Perfluorinated compounds Holistic Environmental Interinstitutional Experience. LIVE 16 ENV/IT/000488.

<sup>16</sup> European Sediment Network

## 5 CONCLUSION

Pollution with emerging contaminants is a systemic phenomenon occurring in all parts of the world. It is an urgent priority in order to protect the environment and ecosystem services that are vital to all life on Earth. Emerging contaminants are found in all environmental compartments: air, water, soils, sediments. Persistent and immobile substances tend to accumulate in soils and sediments, and remain there for a very long time. They are a potential risk for future generations and can hinder the proper functioning of soil ecosystems.

Therefore, concerted actions and initiatives to deal with this legacy of emerging contaminants in soils are urgently needed. Risks and further spreading should be prevented by adequate management and/or remediation. The sense of urgency of the problem is further aggravated by the omnipresence of emerging contaminants, and the important role of soil health for measures to combat climate change.

The solutions to the problem are not just in the hand of regulating authorities, but can be developed in a participatory network such as presented here, with representatives of industry, policy, knowledge centres and NGO's. The aims of the network are to exchange knowledge, to develop strategies and policies through co-creation, to raise awareness and intensify collaboration between all stakeholders. Core activities focus on practicable approaches in the short term, as well as on actions that consist of and are part of a holistic societal transformation to sustainability.

With this white paper we want to bring the issue of emerging contaminants in soils to the attention of all stakeholders, including European institutions. And we want to invite all interested parties to participate in the EmConSoil network.

## CALL TO ACTION

Do you want to join EmConSoil?

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