

Emerging pollutants in the EU – 10 years of NORMAN in support of environmental policies and regulations

The 10th anniversary workshop of the NORMAN Association took place on the 26th October at the Representation of the State of Saxony-Anhalt to the European Union, Centre for the Regions, in Brussels. The workshop attracted about 90 participants, with representatives from 60 organisations, including the European Commission, ECHA and EEA, national authorities, research centres, academia, industry and international stakeholder organisations (cf. Programme and List of participants below).

Jutta Klasen, Chemical Safety Division, Federal Environment Agency, Germany and Raymond Cointe, General Director of INERIS, France opened the workshop with a welcome speech.

The work and achievements of NORMAN's 70+ member organisations were recalled in the introductory talk by Valeria Dulio, coordinator and Executive Secretary of the NORMAN network since its launch as an EU-funded project, whereas Kevin Thomas, a senior scientist at NIVA (Norway) and member of the NORMAN Steering Committee, presented the vision of the NORMAN network in the afternoon session. After each of these two overview presentations, the floor was given to national and European agencies, the European Commission and relevant stakeholders who were invited to present their experience with the work done by the network so far and give their recommendations about NORMAN's future roadmap, with a view to improving Europe-wide collaboration on emerging pollutants and policy-making. The workshop included two panel discussions:

1st Panel discussion (morning session): Where are we now? - monitoring data for risk assessment of contaminants of emerging concern. Participants: J. R. Romero (EC DG ENV); P. Korytar (EC DG ENV); P.F. Staub (ONEMA); X. Trier (EEA); Moderator: Jaroslav Slobodnik, Environmental Institute.

2nd Panel discussion (afternoon session): NORMAN's way forward - what are the pollutants of the future and how can they be assessed and regulated in an anticipatory manner? Participants: S. Schaan (EC DG ENV); I. Liska (ICPDR); G. Hanke (EC DG JRC); M. Depledge (University of Exeter); H. Piha (ECHA); Moderator: Jan Koschorreck, UBA.

Main conclusions of the workshop from presentations and panel discussions

1. After ten years of activities NORMAN has become an essential network in support of EU policies. NORMAN integrates EU-wide activities on chemicals of emerging concern and facilitates the transfer of state-of-the-art scientific knowledge to policy-makers and regulatory bodies.
2. Chemicals of emerging concern are clearly on the EU water policy agenda, e.g. the Water Framework Directive, and they are also an important issue of chemicals policy, e.g. the legislation for marketing of plant protection products, biocides and pharmaceuticals. Prioritising chemicals in the environment for regulation is an increasingly important issue.
3. Progress in analytical chemistry and increasing monitoring activities reveal the occurrence of a growing number of chemical substances in the environment. It is therefore necessary to complement the traditional approach for risk assessment with new tools.

4. NORMAN encourages the development of collaborative R&D strategies with a view to their integration into policy. But new techniques and new monitoring approaches need to prove that they can be used in regulatory routine programmes and that they are cost-efficient. As a collaborative and multidisciplinary platform, NORMAN fosters the exchange of information, validation and harmonisation work and helps consensus to be achieved within the wider international community in view of implementation of the research results into policy.
5. The environmental and human exposure to chemicals of emerging concern needs to be assessed in a comprehensive way, taking into account all environmental compartments and the impact on human health.

Summary of the workshop - presentations and panel discussions

Valeria Dulio (NORMAN Executive Secretary) summarised the history of the NORMAN network and its main achievements so far. It came into existence following a call by the EU Commission (DG Research) in 2004 to create “a network of reference laboratories and related organisations dealing with emerging environmental pollutants”. Its main missions – on which it has worked actively over the past ten years – are to improve the exchange of information on emerging substances and to foster harmonisation of protocols and improvement of data quality. It started as a consortium of 17 partners in 2005 and is today a self-sustaining organisation of more than 70 members.

As regards data quality, one major achievement has been the development of a common framework for validation of chemical and biological monitoring methods – a protocol now adopted as a CEN technical specification. Besides that, NORMAN has organised, and continues to organise, interlaboratory studies on substances of priority interest in research and, more recently, collaborative trials for passive sampling, bioassays and non-target screening – necessary to support the development of innovative sampling and monitoring tools and the need to prepare the ground for their validation and harmonisation before possible future implementation in regulations.

NORMAN is very active in the field of prioritisation; it has developed an innovative approach for EU prioritisation of emerging substances. The NORMAN scheme is already applied in various European countries (France, Slovakia) and is currently being tested in the Netherlands.

The development of databases and improvement of data exchange has been NORMAN’s core business since the start of the project. NORMAN EMPODAT is today the largest database on emerging substances worldwide, with more than nine million data records. Besides that, the ECOTOX module, a platform for systematic collection and evaluation of ecotoxicity studies for harmonised derivation of environmental quality standards, is now part of the priority tasks of the NORMAN network. Finally, it is worth mentioning the NORMAN Massbank database, an open-access database of mass spectra for more than 1,000 environmental contaminants, which is an essential tool for laboratories working with non-target screening techniques to support the identification of “unknowns”.

Because of its strong scientific expertise, NORMAN anticipates at an early stage the need for new tools, and thanks to this multidisciplinary platform it is possible to organise the activities in these new fields in a constructive way (an example was given for the non-target analysis activities).

NORMAN publishes a bulletin on emerging substances. More than 30 international events have been organised by NORMAN since 2006 and position papers have been published on various relevant topics by NORMAN experts, such as passive sampling, effect-directed analysis, and more recently a paper by W. Brack et al. with 10 recommendations for the review of the WFD, developed by NORMAN in collaboration with the SOLUTIONS project.

NORMAN interacts as efficiently as possible with all research projects dealing with emerging contaminants (national and international initiatives), thereby increasing visibility of the results and faster implementation in policies.

In conclusion, NORMAN has built a strong infrastructure and has developed tools to connect science and policy. NORMAN is a good platform to reach consensus among experts for harmonisation of practices.

Session 1: Emerging substances monitoring data and chemicals management in Europe

An EU Commission view on the NORMAN Network

P. Quevauviller (DG HOME and former DG Research) highlighted the fact that NORMAN kept up with its initial ambitions and objectives over the years. In the large and highly variegated community of users of information there is a need for “interface platforms” to establish communication between the providers of information / data and the different users: NORMAN has managed to establish one such platform – the platform for emerging substances.

P. Quevauviller suggested a possible extension of the scope of NORMAN activities in the future. NORMAN’s focus is currently on environmental protection from emerging substances (i.e. ‘safety’ objective), but if we look at ‘emerging substances’ from a wider perspective, the term includes also ‘emerging threats’ associated with intentional contamination (i.e. ‘security’ stress). The measurement techniques are actually similar but current regulations do not mesh with each other. We should promote better interaction between the safety and security regulatory frameworks; and the scope of NORMAN could be extended in the future to cover security aspects, too.

J. Romero (DG ENV) stated that the tools developed by NORMAN are useful to the Commission services and to the Member States. Today, NORMAN EMPODAT hosts the largest database on emerging substances worldwide, with more than nine million data records. NORMAN has contributed significantly to the European prioritisation process of the WFD with unique datasets (15% of the monitoring data used in the on-going review process for the EU Priority Substances have been retrieved from NORMAN EMPODAT database). However, challenges still remain for representative monitoring data of sufficient quality and for more holistic monitoring approaches.

J. Romero (DG ENV) highlighted as the main challenges:

- 1) Deficiencies in the WFD implementation process: for example, as regards river basin-specific pollutants (RBSP), the reports of the Member States clearly show that there are huge differences between countries and that there is a need for improved and more comparable approaches, both in terms of identification and monitoring of RBSP.
- 2) Also, there are limitations in the current prioritisation system: prioritisation relies largely on sound and comprehensive monitoring data. It is widely recognised that the lack of data is the primary cause of the lack of regulation of chemicals of emerging concern, as a result of the vicious circle where: “no monitoring means no data, and no data means no regulations”. The Commission action to break this vicious circle was the introduction of the EU Watch List for a short list of selected compounds. In addition, the Commission introduced IPCHEM to collate monitoring data from the environment and human populations and to make these data accessible for regulation, research and the public.
- 3) Although monitoring data for regulated substances and emerging contaminants will increase and will be more accessible in future the question remains whether we are addressing chemical pollution in the environment in a sustainable and efficient manner. We have the impression that we are always running behind the problems, as we do not have yet a mechanism to anticipate the challenges of the future. Effect-based tools, non-target screening techniques, passive sampling, effects directed analysis, etc. are new and promising options for routine use in chemicals and water management.
- 4) However, we need to ensure that these novel tools for identifying and prioritising relevant priority contaminants are appropriate for regulatory programmes. The extra benefit of novel tools needs to be demonstrated and common harmonised practices need to be agreed upon by environment agencies before these new tools can enter into the regulations. NORMAN has a clear role here in facilitating the transfer from science to policy. NORMAN can play an important role in the CIS of the WFD, in particular in improving future strategies for water quality monitoring.

Member State views on the NORMAN Network

As an example of the view of the Member States (national agencies), **P.F. Staub (ONEMA, France)** and **Eva Dressler** (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany) presented their experience with 10 years of NORMAN in France and in Germany.

The feedback from ONEMA in France is that NORMAN helps water managers. The added value of NORMAN for national activities is that NORMAN draws together expertise from across the EU and beyond, and promotes synergies across research teams: this adds significant value to the Common Implementation Strategy in support of the Water Framework Directive. Furthermore, NORMAN's strategic focus and its ability to help expertise and data-sharing stimulate the development of complementary national R&D strategies.

P.F. Staub stressed that in France national authorities adopted NORMAN products to develop the national strategies for water management. The mechanism currently used in France for the national review of the list of river basin-specific pollutants and the launch of regular screening studies on emerging substances is based on the principles of the NORMAN prioritisation scheme. In this context, a dedicated “prospective” surveillance network is now going to be established, which will also involve innovative tools (non-target screening, bioassays and passive sampling), building upon the results of the NORMAN interlaboratory studies, recommendation papers, etc. The French case study is a demonstration of how EU member states and/or the EU can benefit from NORMAN activities with regard to science-to-policy links.

NORMAN goes beyond networking scientists and research institutes. It also involves regulatory agencies and industry. Thanks to this tripartite nature, the NORMAN community is aware of the requirements and challenges faced by water managers in the implementation of the current legislation and the necessary steps for the implementation of innovative tools.

Eva Dressler (Federal Ministry of Environment, Germany) addressed the need for more environmental occurrence data to improve the legislation for safe marketing of biocides. Monitoring data can tell us whether there are shortcomings in the authorisation procedure, and whether risk mitigation measures are designed in a reasonable manner. They can also serve as a means to better focus surveillance and control measures.

As yet, far less data for biocides in the environment are available in comparison to plant protection products and pharmaceuticals. New data can create pressure on policy-makers for a level playing field in e.g. regulating biocides and plant protection products with equivalent protection goals. The Directive on the “sustainable use of pesticides” adopts an overarching approach to reduce the overall risks and impacts of pesticides on environment and health. New monitoring data for biocides can help to achieve a protection level comparable to the sustainable use law for plant protection products.

Eva Dressler announced upcoming monitoring initiatives in Germany to build a comprehensive picture of biocides, including new projects on monitoring the environment and human health. This involves a monitoring programme in 2017 in Germany which will cover 20 WWTP (sampling), and a screening study for 20 active substances. More proof of the burden associated with the use of biocides may trigger more protective policy actions in future, perhaps including a law on sustainable use of biocides along the lines of the one that applies to plant protection products.

1st Panel discussion (morning session): Where are we now? - monitoring data for risk assessment of contaminants of emerging concern.

*Participants: J. R. Romero (EC DG ENV); P. Korytar (EC DG ENV); P.F. Staub (ONEMA); X. Trier (EEA);
Moderator: Jaroslav Slobodnik, Environmental Institute*

- There was a consensus that monitoring data are important indicators in water and chemical management. Monitoring data are used to check the effectiveness of environmental policy and

trigger new regulatory actions. In view of the upcoming Commission's 2018 strategy for a non-toxic environment, there is a need for an early warning system to tackle emerging chemicals threats.

- For many substances there are no – or insufficient – monitoring data (biocides are a typical example of such substances). There is a need to promote the generation of monitoring data to have a clear picture of their level of occurrence in the environment. Furthermore, some of the data that have been generated (e.g. produced by research studies) are kept in databases with restricted access so that they cannot be used for assessment of occurrence levels.
- Although the amount of data produced has increased in recent years many of these data are not satisfactory in terms of data quality and metadata. One outstanding challenge is that the limits of quantification (LOQ) used by the analytical laboratories do not meet the requirements of the environmental quality standards (EQS), i.e. the concentration level above which a chemical substance is expected to have an effect on ecosystems or on human health. The EU Watch List initiative should lead to improvement of data quality in the medium-to-long term (thereby allowing a higher level of exploitation of the acquired data for prioritisation purposes).
- For data produced with public funds there should be a mechanism to make them available to the public authorities and institutional bodies by default. Following this line it is important in the near future to establish the connection between IPCHEM and NORMAN databases.
- DG ENV stated that traditional approaches for chemical assessment need to be complemented by new tools in policy: input from science is welcome. EEA's view is that both biomonitoring data (data from bioassays) and environmental data (chemical concentrations) should be used and better connected. Bioassays are useful to catch all substances having the same "effects".
- New techniques and new approaches for characterising chemicals in aquatic environments are under development and need to be tested, validated and harmonised. Activities organised by NORMAN, such as the collaborative trials (e.g. for the preparation of harmonised workflows for non-target screening techniques), the EDA (Effect-Directed Analysis) guidance document, the recent publication of recommendations for the review of the WFD, etc. lay the ground for the implementation of new techniques into policy. NORMAN is seen as a platform for innovative bottom-up initiatives for new monitoring approaches.
- Close collaboration with ECHA is important in order to ensure the link with information on registered substances and the reliable identification of industrial chemicals in environmental media. The example of per- and polyfluorinated alkyl substances (PFAS) indicates the need to look beyond the list of registered substances: only 5% of PFAS have a CAS number and several PFAS are not high production-volume compounds. We therefore need to use techniques such as non-target screening and bioassays to catch these compounds.
- An approach of 'grouping chemicals' for future regulation has been suggested, as the 'individual substance' regulation is not sufficiently protective.
- It was mentioned by representatives of drinking water companies that there is also a need to improve consistency between the Drinking Water Directive (DWD) and the WFD, in particular as regards the application of Art. 7 of the WFD, which refers to the improvement of groundwater protection in order to reduce the purification efforts required in the production of drinking water. The present process of ranking and selection of priority substances and setting of EQSs

does not allow persistent and mobile compounds (PMOC) – which can pass both wastewater and drinking water treatment steps and for which a greater drinking water purification effort (DWPE) is required – to be given appropriate consideration. In other words, PMOC might not be bioaccumulative, but they are persistent or toxic and they are continuously emitted and might end up in drinking water, where – because of the precautionary principle and public concern – they are not wanted. They should therefore be given a higher score in the Priority Substances selection process in order to be consistent with Art. 7 protection objectives.

- It was thought that assistance should be given to the establishment of a more unified approach for assessing risks to human health that is transparent and can be applied across different matrices (e.g., drinking water, fish). There was also a call to end the common assumption that substances are 'innocent until proven guilty', which contradicts the EU water policy precautionary principle.

Session 2: Emerging substances: challenges for the future

Emerging substances in a changing world: vision of NORMAN

K. Thomas (NIVA, NORMAN SC Member) introduced the NORMAN visions:

- Independent, transparent and open network, working for a sustainable environment without harmful substances
- Go-to organisation for issues on emerging substances in the environment
- Watch-dog and alarm bell for emerging environmental threats
- Bridge between science and policy-making
- Platform for innovative bottom-up initiatives to explore new monitoring challenges.

NORMAN has structured its work in six working groups for development, validation & harmonisation of approaches for the more efficient identification and prioritisation of chemicals of emerging concern.

The prioritisation of CECs relies on three pillars: EMPODAT is a tool for use by regulators & scientists alike for the prioritisation of CECs. It goes along with the ECOTOX module, an essential tool for the derivation & harmonisation of predicted no-effect concentrations (PNECs). The integration of 'comprehensive' non-target screening techniques & effect-based tools will result in a more robust identification of priority CECs.

For non-target screening a NORMAN guidance document will be developed to facilitate application of these techniques in research and regulatory frameworks. Non-target screening will become an efficient tool to identify new CECs, prioritise them and identify the effect-causing compounds. It will therefore become a powerful additional option in routine monitoring.

NORMAN aims at the implementation of effect-based monitoring tools in water quality assessment.

Effect-directed analysis (EDA) may be established in the future as a protocol to be applied at the sites where effect-based trigger values are exceeded. As an advanced screening tool, non-target screening data and effect-based measurements can be integrated via the application of multivariate

analysis (virtual EDA approach), in order to find correlations between effects and typical contamination patterns.

NORMAN promotes the use of passive sampling tools, *inter alia* to address the current lack of temporal representativeness in water body monitoring as well as an alternative for biota monitoring. NORMAN will establish harmonised guidelines for data reporting for passive sampling tools in order to facilitate the wider exchange of monitoring data obtained with these new tools.

There is potential for extending the scope of NORMAN activities to other environmental matrices and compartments (air, sediments, biota and humans).

For treated water reuse and antimicrobial resistance NORMAN aims at: 1) the definition and establishment of a harmonised measurement protocol; 2) the development of a European database to compile information on the overall abundance and diversity of different genetic determinands in wastewater effluents and receiving environments and 3) the drafting of recommendations to the European Commission.

A new NORMAN activity for indoor environment aims to identify the contaminants of emerging concern for the indoor environment and to store the respective data in EMPODAT. Measuring goes along with prioritisation of relevant compounds in the indoor environment, the identification of emissions of CECs and relevant exposure pathways. The ultimate goal is to raise awareness of CECs in indoor environments and possibly to contribute to development of a new EU legislation regulating occurrence of prioritised pollutants in the indoor environment.

The view of WG Chemicals

Stefanie Schaan (DG ENV) introduced the legislative framework for the assessment of the chemical status under the EU WFD. Recently, Directive 2013/39/EU amended the first EQS Directive from 2008. It introduced the so-called watch list for substances that may pose a significant risk at EU level but which lack European monitoring data (data available in less than 4 MS). According to the current legislation, the list of priority substances is reviewed at regular intervals. The Commission proposal for the next review is expected for 2018. Technical work led by the JRC with the support of the review sub-group under WG Chemicals is part of the Common Implementation Strategy for the WFD. Monitoring data is derived from several data sources, including NORMAN EMPODAT.

International river basin commission view on NORMAN

Igor Liska (International Commission for the Protection of the Danube River; ICPDR) stated that there is established fruitful cooperation between the NORMAN network and the ICPDR, tested most recently on the case study of the third Joint Danube Survey (JDS) which is organised every six years (2001, 2007, 2013) by the ICPDR's 14 member countries and the EU. In JDS3 (2013) the monitoring involved a number of new techniques provided by the NORMAN network in synergy with the FP7 research project SOLUTIONS, including effect-based screening using large-volume solid-phase extraction, target, suspect and non-target screening of hundreds of organic pollutants using latest

state-of-the-art chromatography–mass spectrometry techniques and a new passive sampling approach to detect trace concentrations of organic substances. The prioritisation methodology developed by NORMAN, which has been presented to the Monitoring and Assessment Expert Group of the ICPDR, was applied to the JDS3 results and produced a list of 20 pollutants suggested as relevant for the Danube River Basin. These substances were presented in the second Danube River Basin Management Plan published in 2015. The above cooperation has been proclaimed as a unique example of science-to-policy action in a wide European context. The next JDS is planned for 2019 and it is already foreseen that it will include large-scale analysis of CECs as well as non-target screening in surface, ground and waste water (possibly biota) samples.

Regional Seas Conventions, the Marine Strategy Framework Directive and NORMAN

G. Hanke (JRC, Ispra) recommended that NORMAN should take an active role in the discussions about chemicals of emerging concern in the marine compartment. This would involve active support for the Regional Sea Conventions, Non-EU Partners in shared marine basins and the Marine Strategy Framework Directive (MSFD) to define a list of substances of sub-regional concern. NORMAN should also have a role in ensuring improvement of the ability of the laboratories to achieve quantification limits (LOQs) in line with toxicologically relevant concentrations in the marine environment.

Georg Hanke stressed also the importance of the non-target screening techniques for the monitoring of chemical contaminants in the marine environment. Non-target screening will provide major changes in policy options but for their implementation further collaboration is still required. NORMAN should have a role in providing an independent review and support for the development and implementation of innovative techniques in the marine environment.

Finally, he mentioned the need for a repository of geo-referenced harmonised marine data on emerging substances from scientific publications and projects.

Horizon scanning: identifying emerging contaminants issues and trends

M. Depledge (University of Exeter) explained that his institute, the European Centre for Environment and Human Health, conducts regular horizon scans drawing on a combined Delphi & web-based approach. Horizon scanning is defined as the systematic search for incipient trends, opportunities, challenges and constraints that might affect the probability of achieving societal goals and objectives, such as those related to the maintenance of public health and sustainable ecosystems (Depledge, 2012, modified from Sutherland, et al., 2012).

M. Depledge highlighted some important issues regarding the future emerging environmental threats related to chemicals.

There are 25 times more chemicals in use in 2016 than there were in 1940 and there is growing evidence that a link exists between pollution and human diseases, also including in high-income countries (in particular as regards the incidence of cancer diseases).

Various studies of the National Health and Nutrition Examination Survey (NHANES) show the correlation between the occurrence of specific chemicals in the environment and the incidence of certain diseases (e.g. PFOA and thyroid disease).

Trends in technologies (e.g. mobile phones) can effectively be used to predict future trends of the chemicals that are put on the market, the body burden of contaminants and the associated diseases of tomorrow.

The increasing average age of the population will affect the impact of emissions of pharmaceuticals in the environment (growing consumption of pharmaceuticals, in particular certain therapeutic categories).

Antimicrobial agents and their residues are present in increasingly large amounts and there is already evidence of the development of resistant strains (bacteria, viruses, fungi) as a result of exposure to low concentrations of antimicrobial agents.

Nanomaterials and nanotechnologies are another relevant example of emerging threats.

In conclusion, the vision for the future should aim at a net reduction of the number and amount of chemicals that are produced.

To achieve this objective the impact of chemicals should be dealt with in an integrated manner, with a global Chemicals policy framework covering all types of chemicals (industrial chemicals, pesticides, pharmaceuticals, etc.) and all sectors of use, overarching the current sector-specific regulatory frameworks.

2nd panel discussion (afternoon session): NORMAN's way forward - what are the pollutants of the future and how can they be assessed and regulated in an anticipatory manner?

Participants: S. Schaan (EC DG ENV); I. Liska (ICPDR); G. Hanke (JRC, Ispra); M. Depledge (University of Exeter); H. Piha (ECHA); K. Thomas (NIVA). Moderator: Jan Koschorreck, UBA

Henna Piha (ECHA) started the panel discussion with an impulse presentation on ECHA's plans to study the possibility of making use of monitoring data in addition to the information (hazard properties of substances, use patterns and tonnages) currently used for the safe marketing of industrial chemicals. As yet, monitoring data is not used as a selection criterion in screening approaches for identification of candidate substances of very high concern (SVHC). ECHA's chemical strategy involves a candidate list of all relevant currently known SVHCs by 2020. Until then, registration dossiers will be screened for exposure, use and hazard criteria to identify potential CMRs (Cat. 1A/1B) with regard to human health. PBT, vPvB substances and endocrine disruptors are screened with regard to environmental concerns. An additional option in a common screening approach is to identify among (potentially) hazardous substances those which have a high tonnage and wide dispersive use.

Currently, ECHA is reflecting on using monitoring data for assessing likelihood of exposure and hazard, and of wide dispersive use. These data could be used in the so-called PBT-assessment where

EU Member States discuss the hazard and risk assessment for the SVHC candidates. To make use of existing sources in a systematic manner, links are helpful to platforms hosting environmental and human monitoring data, including IPCheM, the Regional Seas Conventions and NORMAN.

Further conclusions of the panel discussion:

- Further development from science is needed as regards effect-based tools and their implementation in future regulations: they are indeed very promising tools and there is already clear evidence from recent research studies of their added value, but the range of endpoints should be broadened. Today we have achieved very promising results in the assessment of oestrogenicity, but other endpoints (e.g. neurotoxicity) need to be looked at.
- More research and more monitoring data are needed for mobile compounds (persistent and mobile organic contaminants – PMOC): they are difficult to remove in WWTPs and they can therefore be seen as relevant emerging contaminants in the aquatic environment.
- Grouping of compounds by categories is needed: different grouping criteria / categories (e.g. mode of action, use sector, etc.) are possible.
- In spite of the need for more and better data for some categories of compounds, a lot of data on chemicals in the environment are already available, but what is the information we need to present to inform sound policy-making? What are the chemicals we are exposed to? The link between emerging contaminants in the environment and human exposure is needed and should be improved in NORMAN. Protecting the environment and human health is the ultimate goal.
- The “Human biomonitoring for Europe” project is just starting. NORMAN could provide – based on its experience – ideas for environmental contaminants to be targets for research in human biomonitoring.
- Environmental and human monitoring should be carried out in an integrated manner.
- Another point identified for the future roadmap of NORMAN is the possible extension of NORMAN’s focus. NORMAN has been strongly involved in issues related to emerging substances in the water protection field and the associated EU policies. With the establishment of a new working group, NORMAN has already extended its scope recently to the indoor environment. The marine environment could also be further developed in the NORMAN network.
- Moreover, emerging threats are global in a global economy, and a wider view of these emerging issues is key. NORMAN should seek to increase the scale of its impact at the global scale.
- Vision: reduce the number and amount of chemicals that are produced.
- Vision for future chemicals policy: the impact of chemicals should be dealt with in an integrated manner in policy with an overarching Chemicals Policy framework covering all types of chemicals and all sectors of use, beyond the current sector-specific regulations.

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