

Dealing with emerging substances in the water cycle

● Interest in the effects and removal of micropollutants in the water cycle is continuing to grow, leading to the TAPES (Transnational Action Program on Emerging Substances) project and the development of a web-based decision support system. **ADRIANA HULSMANN** and **GERARD VAN DEN BERG** discuss TAPES' investigations into how to address emerging substances.

The growing issue of emerging substances in the water cycle requires an integrated approach of all stakeholders involved, including consumers and regulators. The TAPES (Transnational Action Program on Emerging Substances) project, funded by the Interreg North-West Europe Programme 2014-2020, has produced an online tool to help decide where and when to act to control the pollution of our water with micropollutants. But the problem cannot reasonably be solved through technological solutions alone, especially not where it becomes technically too difficult or too expensive. Measures also need to be taken at the source of the problem, through influencing consumer behaviour and restrictions in the production and use of products.

The TAPES project works at a transnational level (the Netherlands, Belgium, Switzerland, Germany and the UK) to find the most optimal way to deal with the increasing use of pharmaceuticals, personal care and lifestyle products, but also pesticides

and industrial pollutants and their impact on the quality of water. The general public is worried about the potential presence of emerging substances in the environment and in their drinking water from a health point of view, but also about the impact on aquatic animals and the higher resistance to antibiotics. The growing attention on micropollutants, as mentioned above, and also on nanoparticles is made clear in the scientific press describing research projects and in the popular press such as newspapers and television. The water sector in the Netherlands and Belgium has already produced policy papers and vision documents at company and national level to highlight the need for concerted action to address the problem across the sector from the technical and regulatory point of view. Experiences and results from the TAPES project on the ability and inability to remove key substances with traditional and more advanced techniques were used as a basis for these papers.

The TAPES project systematically looked at research projects and results that are available in the literature. This

The general public is worried about the potential presence of emerging substances in the environment and in their drinking water from a health point of view, but also about the impact on aquatic animals and the higher resistance to antibiotics. Credit: KWR.

data was entered into a database and complemented with results from research carried out within the project by the various partners. The database holds information on occurrence, sources, ecological and human health impacts, behaviour, removal efficiency in wastewater treatment and in drinking water treatment, removal cost and regulation within the EU.

TAPES has developed a web-based decision support system (DSS) to use the information stored in the database to help decide where and when to best address emerging substances in the water cycle. Once the scale and the impact of one or more emerging substances in an area is known, various alternative solutions to deal with them can be identified. The DSS is produced to assist operators in the water cycle, but regulators and politicians can play an important role in the process by developing a plan of how to deal with emerging micro-pollutants. The TAPES DSS will soon be made available as part of the Watershare suite of tools (www.watershare.eu). Watershare provides active sharing of water sector knowledge and experience through benchmarked, user-friendly tools.

Tackling emerging substances

In principle there are a number of ways to abate emerging substances in the water cycle. The success of each will differ from one contaminant to the other. Firstly, the problem can be addressed at its source. This implies creating awareness about the consumption of products that will end up in the water cycle and might cause harm; affecting human behaviour in the sense that they use less or less harmful products. The industry could produce 'green products' and they will if it will improve a company's image and consumers ask for them. At the regulatory level, decisions could be made to restrict the production or use, or even ban, harmful products, but also set stricter discharge limits or demand additional treatment. Source control can also imply that wastewater or run-off water from agricultural land is treated before being discharged to open water. At Erfverband in Germany, research has been carried out in TAPES to treat agricultural run-off with retention soil filters. This is an expensive solution, but through clever operation, costs can be reduced, for example by using the soil filters for polishing the effluent from a wastewater treatment plant in times of low run-off.

End of pipe solutions are the



removal of contaminants in wastewater treatment plants or during drinking water production. The policy to be adopted will depend on regulatory constraints such as EU and national legislation, technical possibilities, the availability of alternatives and of course costs. In the TAPES project new treatment technologies are studied, from control measures at source in the case of diffuse pollution, to during wastewater treatment and in the drinking water production. In addition to soil-retention filters, techniques studied in TAPES include advanced oxidation processes as well as light, membrane filtration, advanced adsorption processes using new filter media, affinity adsorption dissolved air flotation and fourth step polishing filters. These processes were tested for a number of commonly occurring micropollutants in the study areas at TAPES partner sites. In most cases, emerging substances can be removed, but in some cases costs will be a limiting factor for actual application. The comparison of wastewater treatment processes for the additional removal of substances in Germany, Switzerland and the Netherlands for example indicates that the price per

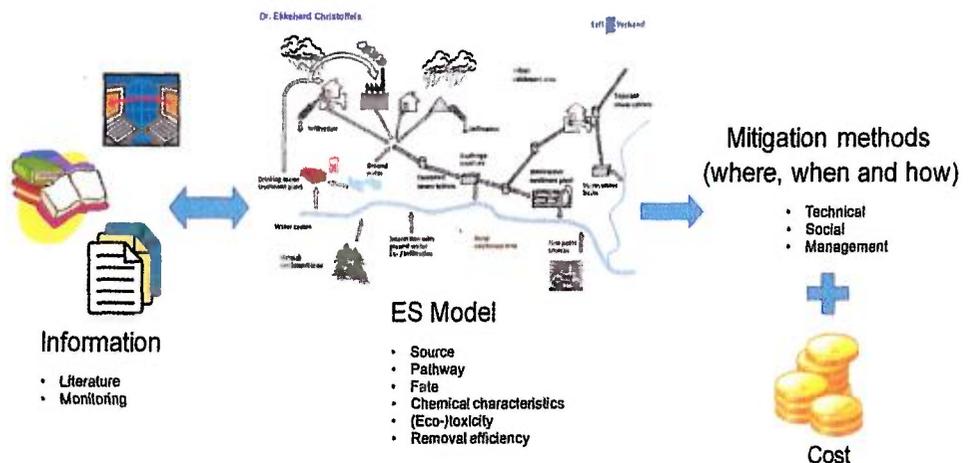


Figure 1:
Framework of the
decision support
system

cubic metre treated could increase by 10% or more.

For the DSS to be used in the most efficient way it is obvious that all stakeholders need to sit down together and jointly decide the best way forward. The best solution requires the active involvement of politicians, regulators, industry, agriculture and the general public. The TAPES partners (Waternet Amsterdam, KWR and TU Delft in the Netherlands, Erfverband and TZW

in Germany, De Watergroep and VITO in Belgium, FHNW in Switzerland and Cranfield University in the UK) will organise the final conference on the project on 24 September 2015 in Brussels, Belgium, more information on which can be found at:

www.TAPES-Interreg.eu ●

About the authors

Adriana D Hulsmann and Gerard van den Berg are coordinators of TAPES at KWR.

READING AND RESOURCES

New publication

Sanitation, latrines and intestinal parasites in past populations

Edited by Piers D Mitchell

● 'Surprisingly little research has been undertaken to investigate the big questions such as how did sanitation change as early populations changed their lifestyles from hunter-gatherers to city dwellers, and what impact did those sanitation technologies have upon their health?' says editor Piers Mitchell in his introduction to this collection of papers on ancient civilisations and intestinal disease.

This book outlines the latest research into waste management in ancient studied sites such as Mesopotamia, Ancient Greece, Ancient Rome and Medieval London, but also includes areas which have seen less research – Africa, the Middle East, Asia and the New World, to understand differences between parasites in different areas, their geographical range and how different parasites

The data presented helps build the picture of how moving from a hunter-gatherer culture with small, mobile groups to an agricultural culture with settled population centres and the use of waste as fertiliser led to an increase in the spread of parasites.

The research in this book is just a step on the way towards understanding the variety of sanitation practices used, with much more work needing to be undertaken in researching records and applying paleoparasitological analysis at excavation sites, says Mitchell, but it does advance the topic and provide hypotheses for further investigation.

Catherine Fitzpatrick

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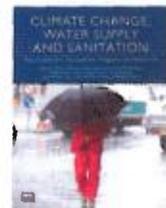
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