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WEISS Newsletter 2014

WEISS stands for Water Emissions Inventory planning Support System. It was developed in the period 2010-2013 by the Flemish Environment Agency (VMM) and the Flemish Institute for Technological Research (VITO). This WEISS project was possible in part through the financial support of the LIFE+programme of the EU (LIFE08 ENV/B/042). As part of the project's after-life the partners of WEISS would like to share with you an update of the developments of WEISS in 2014.

The story of WEISS goes on

The development of WEISS continued after the end of the Life+ project: the LIFE+ prototype of the Flanders region has grown into a full instrument for the emission inventory water. For that end, the application is continually updated by the Flanders Environment Agency in with VITO, allowing it to be used for policy purposes (mitigation, reporting, etc.). New versions of the system concerns new functionalities as well as the availability of new pollutants. So, the Flanders WEISS systems calculates now the input of pharmaceuticals in surface water and the relation with point sources from hospitals. Also the relation between the use of pesticides in agriculture and the input in the surface water via different pathways is available.

Other authorities within the International River Basin Scheldt, made concrete their interest in the WEISS system. In 2013, WEISS was used for the development of an emission water inventory for the Brussels Capital Region. In Brussels, more than 50 diffuse and point sources, together 86 substances are included in the WEISS-system, leading to the new application of adjustable percentages of overflow for each overflow. Since 2014, WEISS is also under development in the Walloon Region with around 30 sources and 30 substances.

Also in 2013, outside the scope of the Water Framework Directive, WEISS was expanded and used to set up an air emission inventory (EISSA) and even to support the compilation of a heat map (under Directive 2012/27/EU) and the development of energy landscapes. Outside Belgium, VITO is negotiating with the city of Tainjin (China), Vietnam (county of Hoa Binh) and Turkey about the potential use of WEISS.

The objectives of WEISS

Good water quality in our rivers is a matter of concern to us all. To ensure that all Member States of the European Union endeavour to optimise the water quality of their rivers, Europe established the Water Framework Directive (2000/60/EEC) in 2000. Achieving these European objectives is far from simple, especially in highly urbanised and densely populated regions such as Flanders. Integral water management requires measures for cost-effective improvement of the water quality. This is possible by monitoring the current water quality, but also and above all by identifying the sources of pollution, so that targeted measures can be taken. These may be point sources such as discharges by a company, but also the so-called diffuse sources such as atmospheric deposition. After the sources are detected, it must be examined how the pollution reaches the river and how much of the pollution eventually ends up in the water. Only then can an accurate picture of the major sources emerge and efficient measures be defined. For a clear answer to these and other questions, the WEISS system was developed as part of this Life+ project.

What does WEISS do?

WEISS as a computer model aims to inventory the location and size of sources of pollution as accurately as possible, as well as the routes along which the pollution reaches the surface water. WEISS is highly innovative in the way in which the sources are literally mapped out. This not only involves the totals for a specific area of study, but each source is located as accurately as possible by assigning it to raster cells in a regular grid that is superimposed on the area of study. These data can be viewed as a map, but in WEISS they are also aggregated into various types of tables and graphics (see results). WEISS can save data for different moments in time, so it can also calculate and visualize trends. Consequently, it can also quantify the effectiveness of measures, changes in technology, application of new materials and products. It also supports scenario analysis. The implementation of a measure can be evaluated via a "what if" exercise.

System design

WEISS is a Decision Support System that supports the mapping of the emissions of all relevant pollutants in a geographically detailed manner. This covers all pollutants caused by all major sources and their pathway to the water bodies. The WEISS system has a generic design, which also makes it unique. It can be applied to areas of different sizes: from industrial or rural complexes to entire EU Member States or transnational river basins. The area is represented as a regular grid made up of cells. Its resolution can vary from a few square metres to several square kilometres according to the quality of the available data, the specific requirements and, of course, the processing speed expected during use of the system. WEISS also allows the user to decide what sources and what substances are to be included in the system. WEISS handles both point and diffuse sources and the aggregation of both. The system is available as a software application that can be fully configured to the user's needs and abilities, and is perfectly able to grow with the user's needs and the availability of data. WEISS can be used to create and maintain an emissions inventory of annual loads per substance and per source. Loads can be aggregated by sector, by sub-area, by substance, etc., both at the source and in each point of the material flow diagram. The material flow diagram represents all possible transport routes, from the source to the surface water. This makes it possible to track the substance on its way to the surface water and allows the contributions of different pollutants to be determined at all times on a geographically detailed basis. WEISS thus provides an insight into the origin of the concentrations that are measured in the rivers.

Bottom-up approach in WEISS

The representation of sources is based on a basic formula which holds that the gross emission (GE) of a substance is the product of an emission explanatory variable (EEV) and an emission factor (EF). The emission explanatory variable is the physical activity or the physical element that causes the emission. The emission explanatory variables in WEISS are generally assigned a detailed localization. The emission factors represent the quantity of substance that is annually released per unit of the emission explanatory variable. Emission factors may also have a spatial dimension. Scientific research is required to gain an insight into both the EVV and the EF. WEISS supports the automation of the necessary calculations on the basis of this scientific knowledge.

For whom?

Other European organisations similar to VMM that have reporting obligations. Countries like the Netherlands, Sweden and Germany have also expressed a keen interest in the system. Water boards, as they are known in the Netherlands, and basin operators of rivers, whether transnational or not, have also shown great interest in the capabilities of WEISS. In addition, the system is particularly useful for users other than public authorities who stand to gain from a thorough knowledge or improvement of the water quality, such as operators of ports, logistics complexes or infrastructure. WEISS is also of direct use to groundwater managers and drinking water companies that need to be aware at all times of potential threats to their inventories. For sectors that contribute to the pollution, WEISS can be used to gain an insight into ways in which the application of reduction programmes can be optimised. One example is the use of crop protection agents in agriculture or in the public domain. The web portal (<http://weiss.vmm.be/geoloket/>) developed as part of the WEISS project allows individual citizens to inform themselves about sources of pollution in their immediate

environment and to estimate their own contribution to the pollution.

Results

In support of the development of WEISS, VMM and VITO have developed an application for the entire territory of Flanders. All maps are calculated and visualised at a level of detail of one hectare. WEISS is currently populated with all reported point sources and a hundred or so diffuse sources for heavy metals, PAHs and crop protection agents in agriculture for the years 2010, 2011 and 2012. A total of forty substances are covered. For this, WEISS uses the best available GIS and other data for the accurate localisation of the sources. All results can be consulted and analysed in the WEISS system. The geoportal contains only the results at emission source level (the so-called gross emission maps) and at surface water level (the so-called net emission maps). Results can be viewed for all substances present in the WEISS system for Flanders. In addition to the spatial distribution for each source and sector, a total map across all sectors can be viewed. The user can zoom in on each 1 ha cell, a specific river basin, town or province. Municipal boundaries, rivers and roads can be visualised to facilitate orientation on the map. Apart from the spatial distribution map, the results can also be represented as tables, pie or bar charts. The results can also be exported to an overview report.

A demo version of the WEISS model, together with a syllabus with practice exercises and a comprehensive manual, is available via the WEISS website (<http://weiss.vmm.be>). It allows new users to quickly set up a demo version of WEISS for their area of study and to actually experience the usability and user-friendliness of the system.

Acknowledgement and contact details

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