Workshop 6 (synthesis): monitoring, understanding and managing waste fluxes within a drainage basin

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Abstract Waste is produced in a number of activities and transported within the drainage basin by natural as well as man-made processes. The pollution of water courses, i.e. rivers, lakes, coastal areas and other waterbodies, tends to negatively influence both use of the water and aquatic life. Tools are needed in order to decide on how to minimise the negative effects of waste fluxes, supported by appropriate monitoring procedures.

Keywords Drainage basin; monitoring; pollution; waste fluxes

Introduction
A general issue that emerged very clearly during the course of the workshop, was that the nature of problems relating to the identification and management of waste fluxes, differed substantially between developed and developing nations. Initiatives to deal with pollution are seriously undermined in developing countries through the lack of funding and expertise. It is also the case that waste fluxes in developing countries arise mainly from municipal and storm water drainage (often involving poor management of garbage and other solid waste) and agricultural runoff. Industrial sources are less important than in developed countries.

Identifying waste fluxes in the drainage basin and monitoring them
The workshop agreed that properly designed monitoring systems and assessment tools are vital to trace and control pollution fluxes. However, this is a case in point where a lack of expertise and funding is hampering developing countries to install and operate such systems and to properly interpret data. The suggestion was made that donor countries should include relevant capacity building and infrastructure support in their water-related support projects.

The workshop also learned of the special problems relating to the monitoring of pollution in transboundary water courses where differences in methodology often made comparisons and interpretation of results very difficult.

Questions arose about the availability of international guidelines for planning and operating monitoring systems. Note was taken of the guidance documents on water quality assessments of rivers, lakes, groundwater and reservoirs, produced by the GEMS water program under the auspices of WHO, UNEP and UNESCO (see www.gemswater.org). Various guidelines are also available within the EU (see http://forum.europa.eu.int). The observation was made that these documents were usually very extensive and therefore not user-friendly. It was suggested that they be used as a basis to develop simplified guidelines which could meet minimum requirements.

A significant observation made in Japan was that hazardous substances in factories could find their way through evaporation into the atmosphere and subsequent precipitation...
and runoff to the water environment. This might contribute to the present worrisome problems relating to carcinogenic micropollutants and endocrine disrupters.

**Influence on the drainage basin and most important sources and fluxes**

The impacts of waste fluxes can be numerous and will be determined by local and prevailing conditions. In the short term, measures to alleviate pollution levels should focus on health issues. Longer term efforts should consider the negative impacts on agriculture and biodiversity.

As far as the preservation and restoration of ecosystems are concerned, the knowledge base on the requirements of aquatic ecosystems needs to be drastically extended. A cautionary note was sounded, namely that in this regard pragmatic and practical approaches are necessary when financial resources are limited. In such cases a priority approach should be followed. In instances where ecological degradation has proceeded beyond certain limits, it should be recognised that the best option, in the short term, might be to accept the situation and use the water for purposes that would not require pristine water quality.

**Tools to minimise the waste fluxes and their effects on a short term and long term perspective respectively**

There was consensus that appropriate policies, laws and regulations are essential for the control and prevention of water pollution. These should be reasonable and easy to understand. At the same time, such measures will be ineffective if their enforcement is poor through a lack of funding, expertise and political will. It was agreed that economic instruments could be effective whereby, for instance, polluters have to pay substantial fines.

An additional strategy to ameliorate pollution problems is to create public/private partnerships whereby stakeholders collaborate towards agreed upon strategies and objectives. In such partnerships, factors such as a sense of responsibility and good ethics can be very important.

The workshop took note of a decision-support system for river basin water quality that was in the early stages of development and testing. When fully refined and validated, this model could become a valuable tool in directing efforts in pollution control. It was indicated that the method was flexible and could be adapted to the needs and circumstances of developing countries, where the quantity and quality of data might be substantially poorer than in developed countries.

It was urged that cleaner production methods should be more widely encouraged and practised. The whole issue of by-product recovery, “Wealth from Waste”, should receive increased global attention, and international collaboration between researchers in this field should be encouraged.

The establishment of companies with the necessary expertise to provide centralised technical support to “industrial estates” or groups of factories on a regional basis, in the management of pollution and environmental issues, should be encouraged. Along this route ISO 14000 requirements could be achieved by participating industries.

**General**

Of the eleven papers presented at the workshop (6 oral papers, 5 poster papers), ten dealt with case studies of severe regional pollution problems. It was noticeable that in not one of these papers was any mention made of similar problems or approaches in other parts of the world. This is a clear indication that there is much room for improvement in the diffusion and exchange of knowledge in the global water sector. This is a problem that needs serious attention, particularly in view of the prevailing lack of support funding and expertise in many developing countries. Some international agencies should consider the establishment of simple databases for appropriate case studies and available tools and guidelines for addressing pollution problems, particularly on a drainage basin scale.