Goal-Driven Drainage Basin Security in the New Millennium

At the 2003 World Water Week, the 13th Stockholm Water Symposium focused on "Drainage Basin Security – Balancing Production, Trade and Water Use." Many different perspectives were addressed. The Chair of the Scientific Program Committee, Professor Malin Falkenmark, presents summarising conclusions and some personal reflections.

Drainage basin security and the Millennium Development Goals

After Johannesburg, water is now high on the international agenda, and the Commission on Sustainable Development (CSD) is devoting the first two-year period to water. In view of the recommendation that countries should be developing Integrated Water Resources Management (IWRM) plans by 2005, the Symposium discussions were extremely timely.

Drainage basin security will in fact be a key to reaching most of the Millennium Development Goals (MDGs), most of which are directly or indirectly water-related and therefore internally linked. Moreover, since the priority countries for the MDGs are those in the semi-arid regions of Sub-saharan Africa, South Asia and Central Asia, the focus on climate variability, droughts and dryspells – all phenomena known to complicate socio-economic development – was equally timely.

Climate variability will have to be mainstreamed into IWRM. Although coping with climate variability is nothing new, the vulnerability to long droughts in some of the global breadbaskets, like California, makes the challenge much larger today. Numerous adaptive mechanisms were highlighted in Stockholm, including hope-provoking practices such as water harvesting, subsurface dams and simple methods for dryspell mitigation.

The discussions made clear that drainage basin management will have to be properly linked to both local actions and national policy and development plans. Of fundamental importance for a meaningful stakeholder dialogue will be broad understanding, knowledge and access to reliable data. Since river basin management is an inherently political process, it will also be crucial to find ways to influence politicians and their perceptions of the problems.

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Balancing production, trade and water use

According to world statistics, seven out of ten food-importing countries are water short, and a similar proportion of food exporting countries are water rich. The scale of virtual water flows – the flows of water virtually embodied in food products – have been assessed at 700–1100 km^3 /year, a sizeable amount. Possible liberalisation of trade might cause this flow to more than double.

Due to the high consumptive water use behind food products, importing of food may save water for other purposes. Differences in water use efficiency between exporting and importing countries may lead also to a net global water saving. It is important to stress, however, that only the water physically embodied in the product is being moved, while the consumptive use behind the production stays in the exporting region and is recirculated by atmospheric feedback. In that sense, the phrase "virtual water flow" is in fact hydrologically misleading.

Many different rationales may stimulate virtual water trade: as an alternative to bulk water transfer through mega water projects; to save water for downstream users and ecosystems; or to compensate for loss of water in other ways, such as poor agreements. Import of virtual water may in other words be a mechanism to abate conflicts in a region, adding options for negotiations on transnational river basins.

Balancing consumptive use and water for aquatic ecosystems

The evident link between downstream biodiversity and human activities upstream is reflected in aquatic ecosystems being those which are suffering the largest loss of biodiversity. The habitat of these ecosystems is accumulating and reflecting, in their waters, the human activities upstream. Thus they are reflecting both upstream losses through consumptive water use, pollution loads added, and agricultural chemicals leached. Measures to protect aquatic biodiversity therefore have to be taken upstream in the drainage basin by, for example, addressing land use and pollution load.

One effort to protect aquatic ecosystems is by securing a certain minimum flow. Although current efforts have basically addressed only water quantity, water quality is an equally fundamental determinant as reflected in a reported 50% loss globally of aquatic biodiversity since 1970. Within

the European Framework Directive a sophisticated analysis is currently going on to translate "good water status" into water quality components.

A set of widespread misconceptions around forests and water were highlighted, referring to water flow, to dry season flow, to reduction of floods, to water purification, etc. Based on field studies it was shown that none of these perceptions are generally true: competing processes are at work, with often quite site-specific results. The misleading perceptions might in fact be due to a confusion between spatial and temporal differences: on the one hand, observations of forests being associated with particular phenomena like more rainfall, higher dry season flow, cleaner water, etc., and on the other hand effects of intentional switches in land use from one vegetation to another.

Balancing pollution load and downstream usability

In 2002, the Stockholm Statement stressed the importance of decoupling economic development and water pollution load. While urban and industrial development are fundamental components of socio-economic development, both are accompanied by pollution generation. Water pollution abatement on the basin level therefore has to be an integrated part of IWRM so that good ecological status can be secured in rivers and coastal waters. Unfortunately, the response time involved in water pollution abatement tends to be extremely long, first due to socio-political delays and later to hydrosystem delays in terms of slow water exchange. For nitrate, the response time already is more than 50 years.

An example from the Yodo River in Japan showed the effects of delayed decision making. Serious biological impacts were caused by endocrine disruptors arriving along different pathways and originating from multiple sources. These impacts caused fertility disturbances in biota, visually demonstrated by three cases of snails from the coastal waters. Sorted according to sex, there were practically no snails in the case for females, while the case of quasimales was almost as full as the one with males. These snails are expected to enter the food chains in the region. The possible consequences for the Japanese population in terms of fertility disturbances will need attention.

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Although efforts towards water pollution abatement were discussed at some length, not many results were demonstrated, in fact supporting the response delay phenomenon. Most effective was probably the approach of the national water agency in Brazil, providing subsidies to treatment plants, but only paying for results, not for promises.

Balancing water for humans versus ecosystems

The balancing of humans and ecosystems is subject to rapidly growing interest in terms of needs for priorities and trade offs. The World Wildlife Fund's approach is to focus on particularly valuable ecosystems, based on freshwater ecoregions, and identified as especially biodiverse drainage basins. Altogether 34 basins have currently been identified.

The way to address the balancing between human use and ecosystems along a river will in practice have to start from the downstream end, defining the ecological bottom lines, based on environmental flow and quality conditions, and then moving segment-wise upstream, defining minimum water flow and quality conditions at each segment border – an approach now being developed for the Yellow River in China.

Coping with perceptual gaps and growing complexity

The Symposium demonstrated an ongoing increase in water problem complexity, which makes a conceptual development essential so that problems can be properly defined and the challenges addressed. The current confusion between water withdrawal for conventional "water consumption" and literally consumptive water use is unacceptable. In water stressed basins it will be necessary to solve upstream/downstream problems by thinking in terms of sequential reuse, also referred to as cascading reuse. More attention will therefore have to be given to what happens to water after use.

From the lessons learnt regarding forests and water it is evident that we have to find out how to bridge perceptual gaps between current scientific understanding and the perceptions dominating among the general public and policy makers, sometimes reflected even in legislation and policies. No problems will be solved based on erroneous understanding since this involves the risk that quite foolish decisions might be taken. ■

The challenge is to cope with complexity.

Drainage Basin Theme Continues in 2004

"Drainage Basin Management: Regional Approaches for Food and Urban Security" is the theme of the 2004 Stockholm Water Symposium. The Symposium takes place August 15–21, 2004. The 1st Announcement/Call for Abstracts will be mailed together with the November issue of Stockholm Water Front, and also available beginning in November at SIWI's home page, www.siwi.org.

Abstracts for proposed workshop presentations will be due by February 1, 2004.