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## Conference Paper

# Tackling the tragedy of the water commons

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## The Global Environment

# Tackling the Tragedy of the Water Commons

### The Challenges

Water is one of our basic resources, but it is often in short supply not only for human use but also for ecological systems. While in some countries groundwater resources still are abundant and readily available for development, in others depletion due to over-drafting, water-logging, salination as well as pollution cause severe problems.

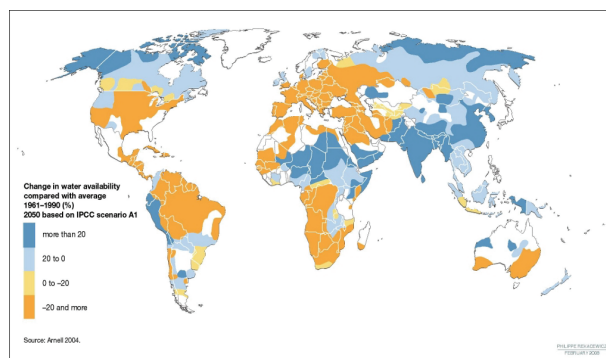


In addition, the uneven distribution of water (and population) among regions has made the adequate supply critical for a growing number of countries. Rapid population growth and an increasing consumption of water per capita have aggravated the problem.

This tendency is likely to continue as water consumption for most uses is projected to increase by at least 50% by 2025 compared to 1995 level. One additional reason for concern is (anthropogenic) climate change. Climate model simulations suggest that changes in precipitation patterns, intensity and extremes, as well as shifts in seasonal runoff will increase the unevenness in water availability further.

Suitable adaptation strategies for sustainable development will differ between regions and sectors. Strategies that are appropriate for the industrial sector might not be that appropriate for agriculture, the largest consumer of water. Also, suitable approaches for developing regions might be unsuitable for developed regions.

- Which adaptation strategies are most likely to be successful in regions that will be hit most severely by climate change? How could these strategies be implemented?
- Could the import of water-intensive products constitute one solution for water-short countries to preserve domestic water resources? What would be crucial for such a strategy to be successful?
- How do management techniques and water-use policies have to be designed to foster sustainable water use?
- What is the role of business and how can business help alleviating the problem? How can business be incentivized to do so?
- Which would be the appropriate institutional level for bringing about adaptation—regional, national, or international?
- How do institutional arrangements have to look like to facilitate the implementation of effective adaptation measures?







## **Proposed Solutions**

### **Christine Bertram**

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## **Shift the focus in water management away from technical solutions like building dams and pipelines**

Suitable adaptation strategies for managing water scarcity will differ between regions and sectors. China for example has started a huge project including the construction of pipelines to sustain water supplies for households and industry in the growing Beijing area. Where appropriate, this might be a solution for other countries at different scales as well. However, taking into account the substantial inefficiencies due to evaporation, likely adverse environmental side effects, high investment costs as well as uncertainties related to the amount of water that could be supplied, the extent to which this strategy can help to solve the problem of water-shortage seems limited.

## **Shift to more integral ideas like importing water in the form of food**

Compared to industry and residential water use, the agricultural sector is the largest consumer of water. Today, many water-short regions and countries still use the little water they have for growing crops. With climate change impacting on these regions, water availability is likely to decline and competition for water use is likely to rise. Importing water-intensive agricultural products from countries where water is more plentifully available is, therefore, one possibility for water-short countries to preserve domestic water resources.

## **Implement effective techniques for water conservation tailored to local and regional circumstances**

Another option to preserve water is to help developing countries to implement more efficient irrigation technologies. Today a lot of water is wasted by the use of old irrigation systems. Investing in rain water harvesting could alleviate the problem as well. Since markets for water are not well functioning or do not exist in many countries and regions, policies need to be implemented that are able to signal the demand and supply more realistically. All this needs to be accompanied by raising the awareness of producers and implementing incentives for more efficient water use. Knowledge transfer and capacity building at this level is essential.

## **Increase the ability of local communities to manage their own water resources**

Local management of water resources should be conducted in a partnership of public and private bodies and include all local stakeholders. This can induce innovative ideas and increase acceptance of new water policies as well as participation in water conservation activities. This requires capacity building of the local community, especially farmers, but also of municipal officials. Moreover, institutional arrangements need to be designed according to local and regional requirements and corruption and inefficiencies in local municipalities need to be countered.



## **Increase consumer awareness about the water footprint of products, so that demand can take water scarcity issues into account**

The consumer plays an important role for global water consumption. Often, consumers do not know how much water enters into the production chain of a product or if the water used for production comes from regions where water is already scarce. To raise consumer awareness, products could be labeled providing information on the water content needed for production, the degree of water-scarcity present in the area of production as well as on the water-use efficiency of production processes. Like for fish or organic products, certification and labeling of products could be a way to inform consumers about sustainable water use. This could not only help consumers in taking appropriate decisions, also producers could benefit from concise information about the amount of water used during the different stages of production. Together with a more sensible pricing system, this could influence investment decisions and enhance water efficiency in production.

### **Colin J. Chartres**

*Director General, International Water Management Institute*

Agriculture uses about 70% of the available water resources in many countries. Increasing competition for water suggests that a gap between supply and demand will emerge by 2030 given current rates of economic development and water usage. In India this gap has been predicted to be as high as 50%. Climate change threatens to increase temperatures and evaporation, shorten wet seasons and intensify storms. As a response to these factors, that will impact all water users, it is imperative that we investigate to what extent and by what methods we can increase water storage.

Countries like the USA and Australia store approximately 5,000–6,000 cubic meters per person respectively. Yet recently in Australia under a drought probably driven by climate change even this volume was insufficient. The outcome was very significant reductions in allocations to farmers and water rationing in major cities. Many of these cities are turning to climate-proof sources of water such as desalination of sea water to ensure future supplies. But desalination comes at a high capital and energy cost and is not an option for smallholder farmers or landlocked countries.

If we consider many of the poor, agriculturally based economies of sub-Saharan Africa, levels of water storage are often less than 100 cubic meters per person. Kenya and Ethiopia, for example, store as little as 4 and 43 cubic meters per person respectively. These numbers demonstrate that too little investment in the development of water resources is often the reason why women and children often spend hours carrying water to their homes, livelihoods and health standards decline in droughts and people are subject to famine. The International Water Management Institute describes this underinvestment as economic water scarcity.

A lot can be done to alleviate the situation. Water storage systems are not just those that we associate with major dams that often are subject to social and environmental controversy. In reality, they range from improving the soil's ability to store water, through rainwater harvesting systems, to small reservoirs to medium and large dams. Also, not to be forgotten is the fact that underground aquifers can store very large volumes of water, furthermore this water is not subject to evaporation losses.

The livelihood, health and broader economic benefits arising from having access to stored water are very significant. This water can be used to irrigate home gardens that can tide families through periods of drought when rainfed crops fail or yield poorly and provide drinking water for animals that often underpin smallholder production systems. It can also be used to grow cash crops that are marketed and thus allow farmers access to cash to buy staples, fertilizers or to invest in education of their children.



The critical issue is, however, that storing water costs money. We need to see significant investment in determining the best and safest ways to do this (remembering that poorly managed storages create physical and health risks from insect borne diseases such as malaria) and we need investment to build the most appropriate structures and means of extraction. In my view investment in these areas is equally as important as in drinking water supply and sanitation. Furthermore, well designed multiple water use schemes can be used for food production and domestic uses. So, the critical challenge is to convince governments and donors (from countries to individuals) that investment in multiple use water supply systems is critical. Whilst large and medium sized dams may be built anyway because of hydropower demand, we need to explore micro and meso-financing schemes that can be used to install smaller systems and exploit groundwater where sustainable supplies are available. This investment will not only insure against climate change impacts and food insecurity, but also against competition for water from other users. The GES is a very appropriate forum to bring together the cross sectoral expertise that may be able to facilitate the required investment.

## **Dieter Gerten**

*Senior Scientist, Potsdam Institute for Climate Impact Research*

### **Manage and increase productivity of the full water resource**

Agriculture is the largest consumer of freshwater. On a global average, almost two third of the “blue” water withdrawn for irrigation from rivers, reservoirs and aquifers is lost before reaching the field and boosting crop production. While this situation can be improved by funding and implementation of more efficient irrigation systems and better maintenance of existing systems, there are huge, largely underexplored potentials for improving the use of “green” water (precipitation stored in the soil) particularly in rainfed agriculture, e.g., by techniques of soil conservation and rainwater harvesting. Unlocking such low-cost, “soft” water management potentials through capacity building, investments in infrastructure and investments in (old and new) technologies would help to strengthen resilience, reduce vulnerability to droughts and, thus, move poor farmers out of their quandary. However, as a recent study by PIK suggests, even maximized water use on present rainfed and irrigated cropland would not be sufficient to produce the food for a world population of 9–10 billion people, suggesting the need for further cropland expansion (at the expense of other land uses) and/or increased import from water-unstressed regions.

*Actors: national water, land and environment ministries and authorities, NGOs*

### **Recognize global teleconnections**

Already today, a number of countries suffers from the fact that their internal freshwater resources are not sufficient to produce the food and other commodities required by their inhabitants, which renders them dependent on imports (thus, on the “virtual” water embedded in the imported products). Due to anticipated future decreases in water availability in conjunction with population changes, economic development and lifestyle changes, even more countries are likely to loose their capacity to produce all required food and other products on their own. From a global perspective, increasing trade of products from water-rich to water-poor countries—or even moving production to water-rich countries—appears to be an option. However, such a transformation would probably encounter many obstacles and potentially adverse implications at the local scale both in importing and in exporting countries (e.g., undesired changes in land use and water allocation, losses of income and livelihoods of rural population, and increased dependency on exporters, thus on potential adverse climate change impacts in the export country). In any case, it should be ensured that the water “saved” in the import country is effectively used.

*Actors: WTO, UN Water System, multi-national companies*



## Engage the global community

While an optimized virtual water trade would help to reduce the external “water footprint” of countries, companies and individuals at least in water-scarce regions, perhaps the largest potential to reduce the footprint is on the water demand side. For example, dietary shifts away from meat towards vegetarian products would release huge amounts of water that may be used for other purposes. Also, there are enormous losses along the meat production chain—from field to fork. However, it is mainly green water (the precipitation falling onto the grazing land) that would be released by abandonment of grazing land, and alternative uses of green water depend primarily on the land use—natural grassland, forests, or crops. This points to the fact that land use decisions can not be separated from water use decisions, which requires tradeoffs between different land uses and their water requirements to be incorporated in decision-making. Wider dissemination of information about the water footprint of products—and also about their linked ecological footprint and their carbon balance—is needed in order to raise public awareness of these issues, and (price-linked) incentives are required to facilitate decreasing the footprint along the production chains. Labeling of products with their water footprint should reflect whether the origin of the water is green or a blue, and whether the product was produced in a water-stressed area. Perverse incentives that increase the water footprint in water-scarce regions are to be reduced.

*Actors: national water authorities and services, water-intensive companies, NGOs, civil society.*

## Consider ethical, cultural and religious concerns

Climate change will affect different regions and groups differently, thus increasing inequalities. Not least for this reason, water use and allocation should be guided by ethical principles—such as participation of a diversity of stakeholders in water (and land use) planning; transparency of decisions; “hydro-solidarity” within and beyond river basins; provision of water to the poor; empowerment of women; preservation of ecosystems; water pricing schemes that adequately consider the overall value of water and its services; and ultimately acknowledgement of access to clean water as a human right. Support for these guidelines can come from the cultural and religious background of many societies. For example, the potential of religions—virtually all of which offer incentives for safeguarding water resources—for ethically informed water management awaits systematical review at global scale.

*Actors: NGOs, water authorities at all scales, civil society, religious leaders and communities.*

## A summary

Future climate change and other, societal developments will exert multiple pressures upon the global water system. Continuing current trends of resource (over)exploitation and simply up-scaling present methods (e.g., ever larger infrastructure/supply-side projects) is unlikely to guarantee global food and environmental security. Knowledge and methods to help water-scarce regions more sustainably out of their predicament are available, but they require immediate implementation both at river basin scale (integrated land and blue-plus-green water management) and at international if not global scale (information campaigns and incentives for rethinking and shifting consumption, production and trade patterns; global water governance). Respective policies and business activities need information and support by systematic research on 1) potential future increases in water scarcity (including uncertainty assessments); 2) robust adaptation options that work under uncertainty; 3) limitations of local management options to adapt to instationary conditions and increasing water scarcity; 4) the resulting need for global-scale interventions especially on the water demand side. Such model and scenario-based research is to be complemented by comprehensive monitoring of water resources, water demands and water management practices (including observation of their efficiency and maintenance).

*Actors: all mentioned above, and science (global hydrology).*



## **James P. Leape**

*Director General, WWF*

### **Plan for a water resilient economy**

Who speaks for the commons? In that sense do we assume the commons is us or the resource from which we over-draw? Water is often decoupled from major debates—from climate, the green economy, energy security and the MDGs, yet water literally underpins our societies, our food and energy systems, our health and our economies. When water stops flowing, life literally grinds to a halt. The maintenance of key river processes such as environmental flows and connectivity, we argue are the foundation on which water security is built. Compromising these basic elements of life support only erode our ability to manage a planet with 9 billion people. We must therefore recognize that the commons have to be represented in this debate, and it is not just a division of resources, but rather a wider recognition that functioning and healthy systems must be at the core of our shared future.

Keeping the above in mind, how do we create the institutions needed to respond to the 21st century challenges we face? The crisis of water governance spans a range of political, social, economic and administrative architecture, institutions at international, national and river basin levels that must be in place to develop and manage water resources.

Placing water at the center of social planning requires critical thinking around what constitutes a water resilient economy, one that ensures the effective use of water amongst a number of competing users and stress factors. Principally, a water resilient economy is based on the consideration and effective trade-off between food—the nourishment for a nation; energy—the prerequisite for modernization and industrial growth; and water—which underpins both, but is essential for health, biodiversity, urbanization and environmental sustainability. Meeting needs around food, water and energy presents a challenge for societies as these sectors are highly interlinked and often compete for resources for implementation. In addition, demand in each of these sectors is projected to grow between 30% and 50% by 2050. Addressing these interlinkages and competing interests requires comprehensive solutions amongst diverse industries and stakeholders who often lack effective incentives and institutional structures for cooperation.

A water resilient economy must formulate public policy that considers the requirements and alternatives for food, water, energy in an integrated fashion and creates institutions to dynamically implement these policies to respond to local, regional, national, and international challenges and stress factors. It also requires a coherent and mature discussion between government, local communities, NGOs and the private sector around the management of water and the associated implications for failing to account for the commons.