Reflections on Integrated Water Resource Management

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Water

Water was the primeval substance of Creation.
Through water God vanquished chaos.
All cultures have talked of the gods and goddesses of the seas and rivers: the water nymphs, mermaids, and sirens of the sea.

Water comes out of the earth as a spring, moves as a river, remains stationary as a lake.
It is the sea in its eternal serenity and endless movement.
It transforms into ice and steam.
It moves upward through evaporation and downward as rain, snow or hail.

Water is soft, but stronger than stone. It creates shapes: valleys, coasts, and grottoes.
Water frightens, threatens, injures and destroys people and their facilities by means of floods, storms, tides and hail.
Without water there is no life[1].

These few words translated from the German poet Böhme remind us that water permeates and is the source of all life in Nature, including that of the human species.

[1] Inspired by Böhme 1988; as quoted (translated from German) in *World in Transition: Ways toward sustainable management of freshwater resources*. German Advisory Council on Global Change (WBGU)

Civilisation has made water its mainspring. Human societies have throughout history found new means to secure availability of water where they settled. They have devised ingenious methods to harvest, transport, and store rainwater, spring water, groundwater, and even air moisture. They dug canals and drains and constructed dikes and earthen dams in order to either get rid of excess water or bring water to parched fields. These first attempts to manage drainage and irrigation water, no matter how feeble or elementary, marked a revolutionary shift in the way people interacted with water. We now use it to provide our food, our energy, transportation, and practically all of our manufactured goods.

The quantity of freshwater has been fixed since the beginning of time on earth. It is approximately 45,000 cubic kilometres. Humans use less than 10% of this. So why has the availability and management of water become a major concern?

Why Worry about Water?

Consider first availability. Of global water resources, a large fraction is available where human demands are small, such as in the Amazon basin and parts of Canada and Alaska. In some heavily populated regions, rainfall and water resource availability is low. Even though people use only a small fraction of renewable water resources globally, this fraction is much higher -- up to 80–90% -- in many arid and semiarid river basins. Rainfall and river runoffs often occur in large amounts during very short periods, such as during the monsoon periods in Asia, and are not available for human use unless stored in aquifers, reservoirs, or tanks. In many river basins a large amount of water is available on average over the year. However its unequal temporal distribution means that infrastructure is required to protect people from it and to store it for later use, with considerable social and environmental impacts. Studies of climate change indicate that the frequency and intensity of such extreme events will be increasing.

Meanwhile, what has been happening on the demand side? The evolution of man as a species is relatively new to the planet in geological terms. Our impact on the surrounding environment probably was not significantly different from that of other species until about 10,000 years ago when we developed tools, learned that we could cultivate our own food instead of just gathering it, and began migrating long distances. Until a century ago, with a few local exceptions, our behaviour continued to have little impact on the environment. This situation changed drastically in the past century. During that period the world's population more than tripled, while water use for human purposes placed unprecedented demands on natural resources to provide sustenance and shelter. At the same time, we developed new processes to produce goods and services that are perceived to improve the quality of life. Japan would require several times its available water resources to maintain its current standard of living.

Human activity is having another impact on water resources. Rapidly growing cities, burgeoning industries, the rapidly rising use of chemicals and pharmaceuticals in agriculture and health care, and water use in the production of energy have undermined the quality of many rivers, lakes, and aquifers. Major investments in wastewater treatment and cleaner production have gradually restored the recreational and environmental value of water in some parts of the world. While even basic data on water quality are not available on a global scale, we may be sure that on the whole water quality is deteriorating at an increasing rate. Increasingly complex pollutants are being carried by water and accumulating in river, lake and ocean beds, in groundwater and in the soil. We do not know what their impact will be.

All that I have described relates to the activity of one species of life on earth. But water not used by humans generally does not flow to the sea unused. It is used in myriad ways by aquatic and terrestrial ecosystems - forests, lakes, wetlands, coastal lagoons - and is essential to their well being. Moreover, these same ecosystems purify and store water for humans and provide many humans with food and livelihoods. We are not sure how much water must remain in our ecosystems to maintain them, but indications are that we are approaching the limits of how much we can divert. We have surpassed that in many places.

With current trends, human demands will continue to increase to satisfy the life-sustaining needs of the still growing global population and to improve the quality of life for all. With current water management practices, such development is not sustainable.

Learning from History

As we look for solutions for the future it can be useful to examine our past for lessons. The organisation of society has evolved as well over these past millennia. It started with the extended family, grew through communities and villages and cities to groupings of these to form nation states. Over the years empires were created through dominance of the more powerful and then faded to be replaced by others. In the last century we began looking to world government to ensure cooperation.

Water management evolved in parallel. Early on people from neighbouring villages made deals and mutual support pacts with their neighbours. This included co-operating to repair a breached embankment or dig a canal. They suffered equally from flood disasters, and went hungry when droughts ruined their crops. Sharing grain and other foodstuffs in regional networks, using boats or donkeys whenever available, was a successful mechanism to buffer local communities against food shortages.

To-day nearly half of the human population lives in cities. Water has challenged human inventiveness. River regulation, dam construction, irrigation facilities, sewer systems, and shipbuilding have been the result. Conflict over water management led to laws. These began with water use regulation in the cities of antiquity. To-day we are approaching domestic and international regulation of all water on earth. This evolutionary development, which was not linear, gradual, or universal, marks a major transformation in the way societies manage their water resources.

The human species continues to demonstrate its distinctiveness - dare I say superiority? Increasingly we find ways to transform the natural resources of the planet to meet not only our basic life-sustaining needs of food and water, but to improve the quality of our human existence. We continuously seek to improve our physical comfort and to satisfy our intellectual, cultural and social needs. Ultimately we seek security of this way of life. With to-day's global communications systems, everyone on the planet is aware of the quality of life of those who are perceived to have the most and the best. This has become the expectation of all.

Vision

It was exactly five years ago this week that Prof. Frank Rijsberman and I began to write the fourth and final version of the World Water Vision. We did our best to balance the often-opposing viewpoints and to incorporate the many geographic and sub-sector visions that had been developed in a consultative process involving thousands of people. Those who participated in the Vision process were asked to describe the world they would like to have in 2025.

They envisioned a world in 2025 in which almost every woman and man; girl and boy in the world’s cities, towns, and villages will enjoy safe and adequate water and sanitation and have enough food to meet their nutritional requirements. It would be a healthy world - for them, and for all species that inhabit the Earth with them.

This sounds very modest, does it not? One could almost say that it is a statement of fulfillment of basic needs. Some would even argue that humans have a "right" to what is described in this Vision. Surely, lack of water would not be a constraint on achieving this minimal standard? It need not be. But scenarios constructed during the Vision exercise showed clearly that it would be if we continue "business as usual". The Vision report, following its analysis, concluded that there is a water crisis, not a crisis caused by a shortage of water, but rather by its bad management. We are threatening our water resources with bad institutions, bad governance, bad incentives, and bad allocation of resources.

Vision participants didn't just describe a dream world, but a Vision based on measures that could be taken to make it happen. They said that the Vision could be reached if the world's leaders accept that there is a spreading water crisis. They assumed this would happen as a result of increasing public awareness of the issues, and through respect for commitments that would be made at the Second World Water Forum in The Hague following recommendations of the World Water Commission.

They saw that it would be achieved in a world where people at the local level work closely with governments and non-governmental organisations. Together, using science of the "knowledge society", they would manage water resources efficiently to provide services to meet everybody's basic needs in a sustainable manner. The emphasis would be on sustainable development and on research and development of technologies in the poorest countries to meet their particular needs. Through closing the yield gap, raising productivity, lower population growth, and more concern about the environment, the food deficit in low-income countries would be reduced while water scarcity would be limited. Communities and governments would benefit in terms of economic development as well as by improved health of humans and ecosystems.

Let me be clear about one thing. The Vision cannot be achieved without accelerated investment in water infrastructure and services. At the same time, the key to achieving

the Vision is a change in values and behaviour. A scenario based on water use efficiency, higher technology and economics would not be enough to achieve the Vision.
You will remember that the Vision was one of satisfaction of basic needs for all. How much more than this are we aiming for? And why? Recent studies have clearly demonstrated that the world's natural resources cannot support a world population living in the same style as the populations of to-day's advanced economies. Yet as I noted earlier, global communications tend to set this as the standard. I submit that it is clear that the challenge is not one of only better managing water resources, but also of managing ourselves and our expectations.

Behavioural change takes time. Integrated water resources management including behavioural change will take time. It will often be a matter of trial and error. It cannot be achieved without involving all of the stakeholders. At all levels - community, basin, national and international - people will have to make difficult choices.

Water is indeed everybody's business!