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Topic: „*Water Security and Global Change: Solutions towards Sustainability*"

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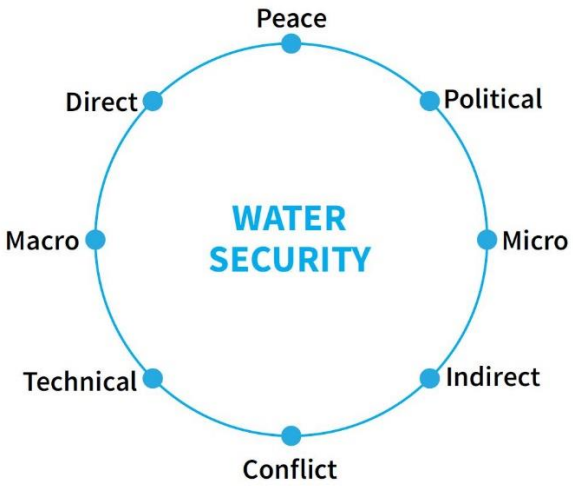
Water security has emerged as a major theoretical framework in environmental governance and resource management. An insecure supply of clean water and safe access to freshwater and sanitation raises the dangers of economic disruption, social tension, and even conflict over water resources at both the domestic and international levels.

These dangers are highest where water is scarce and governance (at local, national or international levels) is poor. Water scarcity, aging or inadequate infrastructure, population growth, pollution, more intense and more frequent storms, droughts, and floods—all these pressures are converging to lend urgency to the need to increase global investment in water infrastructures and to develop smart water conservation and management solutions. Water security is a concept with several aspects and dimensions.

In a recent study (Varis et al., 2017), water security is defined in four dimensions, each consisting of two complementary aspects: direct-indirect, macro-micro, technical-political, and peace conflict. I will highlight some water challenges in the direct and indirect dimensions, introduce a conceptualization of water security that appreciates its complexity, and present some efforts to secure water development for the future at different scales, with more focus on water and agriculture, water and health, and rural development to show how it could be used to develop a framework for all stakeholders in a community to address their current and future water needs. Such frameworks, developed by communities, should form the basis for a national water policy based on sustainability.



Dimensions of water security and sustainability (Varis et al., 2017)

Getting to the world we want: "connecting the dots"

"The water world we want" is a motivational notion to stimulate thinking and action to reduce water insecurity, with the well-being of future generations in mind. It is therefore a social invention that can be

defined as an idea or a slogan that motivates large numbers of people to take action. Successful social inventions can have as great an effect on humanity as new scientific or engineering breakthroughs.

Thinking about water in a world we want generates an image of a child's game called *Connect the Dots*. The picture that appears after connecting the numbered dots is often surprising. This may be a way of raising awareness of the interdependencies among climate, water, food, health and energy activities. The diagram below provides an overview of connecting the dots. It is one perspective of a multifaceted process to move towards the world we want that has water for all.

The world we want

There are many reports about "water affairs" that span different disciplines. Some of these are on the growing scarcity of water, competing demands for and access to water, water conflicts and hot spots, water pollution, human health and so forth. New water-related issues and conflicts are occurring around the globe.

Demands for access to water, which is essential for meeting basic human needs – drinking, cooking and hygiene – can create conflict among stakeholders with various needs, wants and demands:

- for development-related socioeconomic activities (e.g. factories versus food production);
- for irrigation of commercial crops or biofuels crops as opposed to meeting the public need for food and water security;
- for the protection of wetlands and other ecosystems versus commercial exploitation; and
- for growing food locally versus for export (e.g. exporting "virtual water").

It is difficult for those in water-fortunate situations to relate directly to people who spend hours every day searching for water. Water quantity cannot be viewed by itself, because its availability and societal access, as well as increasing demands, are highly variable in both time and place. Gaps that exist between "water haves" and "water have-nots" must be addressed. Throughout history, societies have found reasons and devised means to move water from places of excess to places in need. These methods include using viaducts, surface and underground irrigation schemes, river diversions, rainfall harvesting techniques, water impoundment in dams, reservoirs, and artificial ponds and lakes.

Source: R.J. Ross, CCB. 2018

Sustainable Solutions

It seems that most environmental problems in which humans are involved are taking place imperceptibly because they are low grade, incremental and cumulative over the long term. Seemingly insignificant problems from one year to the next become environmental crises in several years or decades. These problems include, but are not limited to, tropical deforestation, soil erosion, ozone depletion, greenhouse gas emissions, air pollution and water pollution.

Many water and water-related problems are due to creeping environmental changes. They appear most often at the subnational to regional levels. Societies have difficulties recognizing and coping with slow-onset, incremental, imperceptible but cumulative changes in the environment, so there is a tendency to deal with it later.

Water quality is an example of a creeping environmental problem. Today's water quality in a given location is not much different from yesterday's, and tomorrow's is likely to be not much different from today's. This thinking is replicated daily, so there appears to be no need to take action. However, after a few years, the degradation of water quality will have become noticeable, significant, harmful and possibly at a costlier crisis stage. It would likely have been easier and cheaper to resolve the water quality contamination earlier.

Water demand is also a creeping change, because of societal factors such as population increase, expansion of water-intensive industrial processes, increasing affluence, migration and the likely increase in variability in extreme hydrometeorological events as the global climate varies and changes. Related extremes – droughts, floods, flash floods, tropical cyclones and others – will not only appear in the currently identified vulnerable regions, but will also occur in unsuspected new regions.

While countries on opposite sides of the planet may be struggling with similar water issues, they are generally most concerned about resolving their own crises. Perhaps a social invention could be devised that would bring together spatially disparate groups with varied interests to work together to resolve the planet's range of water crises and to work towards the water world we want.

Conclusions

To encourage better management and conservation, many countries are sharing responsibilities for water management between several ministries, while engaging water

stakeholders at various levels of governance. Consequently, improving relationships between competent authorities and stakeholders at all levels of governments, strengthening democracy and combating poverty remain issues of high priority.

Policymakers must strive to improve and extend cooperative institutions to prioritise the sustainability of water resources and increase human security. Water politics are still politics. As environmental problems are increasing across different regions and different scales, there is an urgency to take measures for the protection of the water and to improve legislation and public awareness in this field to find the

optimum way to manage, protect and serve our limited water resources, and enforce water pollution control and the protection of water by suggesting remediation alternatives to reduce or control the influence of the contamination.