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Hydrolink

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Water security in the context of several broadly accepted high-level water management principles

Recognizing old and new threats to water security has changed the way we think about water over the last few decades. In many parts of the world water security is threatened by a combination of factors, such as water scarcity caused by growing populations, economic growth, and climate change; extreme weather and climate conditions, such as floods and droughts; water pollution; and the degradation of aquatic and terrestrial ecosystems.

Several high-level principles and concepts related to the response to these threats emerged over the years. These ideas included the recognition that water resources are limited, the concept of sustainable development, the need to shift from supply augmentation to demand management, the human right to water, the economic value of water and the role of women in water management. The high-level principles around these ideas have been expressed in many documents and declarations by international bodies, such as the the ministerial declaration of the Hague on water security in the 21st century, the Millennial Development Goals and later the Sustainable Development Goals of Agenda 2030. Even though the high-level principles and goals of these declarations have been embraced almost universally and their language can be found in many water policy documents of most countries, the challenge of how to translate these principles to action remains.

A range of solutions consistent with these principles are available to improve water security. They include the re-evaluation of water-dependant economic activities (e.g. growing water thirsty crops in dry climates); balancing supply augmentation (e.g. building new large infrastructure projects) with demand management (e.g. conservation and public education, use of smart meters, and pricing with equity considerations); the use of non-conventional water sources (treated wastewater, desalination, rainwater harvesting, etc); increased water use efficiency (reduction/elimination of leaks/losses, efficient irrigation methods, water efficient household appliances, etc); nature based solutions and smart land use planning.

Obstacles on the road to the implementation of these high-level principles to improve water security include conflicts with different policies whose success depends on water, legal and institutional barriers, financial constraints, opposition to regulation by those benefiting by the lack of regulation and in some cases the lack of political will of elected officials, driven often by the short-term interests of their constituents, ignoring the consequences of inaction. As pointed out in an OECD report[1] a special challenge for water security is to properly consider the nexus between water, energy, food, climate and biodiversity and ensure coherence between the policies in all these sectors. It is essential that nations have coherent policies in all these sectors and develop intersectoral decision making as an essential ingredient for the success of all sectors (agriculture, industry, energy, health). Water security is not only closely related to food security, but also to national security. A recent report on water policy based on interviews with national water leaders from 88 countries concluded that the greatest challenges in most countries are related to governance issues and fragmented water institutions[2]. The same report found that the highest water risks are related to climate change which threatens water supplies, the increasing demand, and increases in extreme events such as floods and droughts. Policy challenges between richer and lower income countries do however present different priorities. In Africa for example, water leaders also place a high priority on their need to overcome inadequate and inaccessible data and information, as well as inadequate infrastructure.

Policy incoherence undermines water security

One way to understand how specific policies may undermine water security is to distinguish between:

A | Policies aiming at short-term benefits ignoring their long-term consequences.

B | Policies introduced in the past for a specific purpose and remain almost frozen in time, even though the original purpose has long been achieved.

C | Policies establishing water rights, often codified into law long time ago, which, when exercised today, undermine sustainability.

Many of these policies are related directly or indirectly to other sectors such as energy, industry and agriculture, the largest water user around the world. Visioning the future, projections from a global think tank, the OECD as well as others, point towards significant shift in global withdrawal and water consumption patterns, with thirst from energy production and manufacturing set to become proportionally much more significant than in the past. Increasing demand and potential rising competition for water calls for policy coherence across time scales, and between sectors that incentivizes and guides decision makers and practitioners to improve the use of fit-for-purpose water.

There are many examples of shortsighted agricultural policies that lead to the depletion of non-renewable water resources, undermining long-term water security. Such policies are sometimes aimed at achieving food security or to provide socio-economic development in rural areas, where farming may be the only employment opportunity and where many depend on subsistence farming. Even though they may provide short-term social benefits, they can be short-sighted if they don't consider the long-term sustainability of irrigated agriculture in these areas. This is the case of the agricultural policy of Saudi Arabia in the 1980's. Motivated by the need to diversify the country's

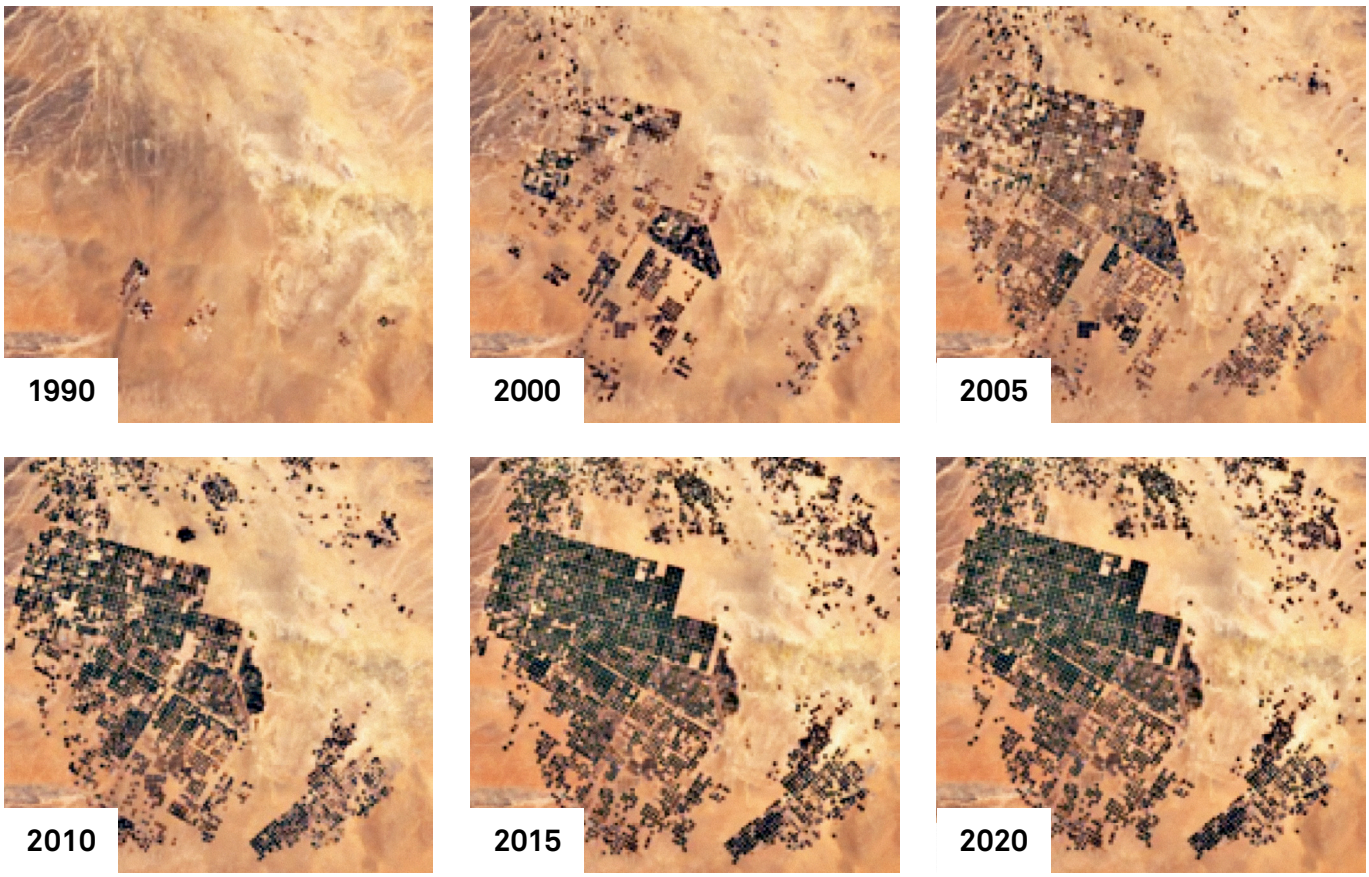

Figure 1 | Expansion of irrigated farms in the desert using non-renewable groundwater: an example of agricultural policy undermining long-term water security.

economy and achieve food self-sufficiency it introduced several measures such as crop price support, and subsidies for wells, pumps, and energy to use fossil groundwater making in few years a desert country an exporter of wheat by rapidly using a good part of its non-renewable water resources. Realizing that such groundwater use is not sustainable, this policy was abandoned few years later.

An example of a policy that was adopted more than a hundred years ago, but remained in place long after its goal was achieved, is the policy of the United States government of providing heavily subsidized water in the American West, introduced early in the twentieth century as part of the effort to develop and populate the region. Several large water infrastructure projects continued to subsidize irrigated agriculture long after the goal of this policy had been achieved. This encouraged farmers to continue growing some very thirsty crops, such as cotton and alfalfa, in arid and semi-arid parts of the region.

Water security can also be threatened by policies codified in some types of water rights. Among those are groundwater rights based on the doctrine of absolute ownership, according to which landowners have the absolute right to the water beneath their property, without any restrictions on the amount of water that they can abstract. The uncontrolled exercise of such groundwater rights in some parts of the world has led to the severe depletion of local aquifers.

Equally threatening to long-term water security is the lack of government intervention or enforcement of regulations aimed at protecting valuable water resources. The unsustainable use of water resources is supported by those with vested interests in continuing existing practices, such as, for example, large and small farmers benefiting in the short term from the overexploitation of groundwater. An example is the absence for years of any controls in groundwater abstraction in many parts of the High Plains aquifer in the United States, especially in North Texas.

Financing, infrastructure and engineering: essential policy for water security

Traditionally policies for securing adequate water supply were focused on water resources development through engineering infrastructure projects. In many parts of the world this is not an option anymore. This is not because all available water resources have already been developed (even over-developed) in some countries, but also because water policy must recognize the interdependencies that infrastructure solutions have with the environment, geo-political stakes and socio-economic well-being.

In some cases, the only alternative is to adopt policies aimed at balancing water supply limitations with demand management for sustainable water use. An example is the Sustainable Groundwater Management Act (SGMA) introduced in California in 2014 to address the severe overexploitation of many of its aquifers. The SGMA mandated the formation of local agencies with the responsibility to develop and implement plans for the

sustainable use of groundwater within a 20-year timeframe. Each of these agencies has the authority to require registration of groundwater wells, mandate annual water extraction reports and impose limits on the rate of groundwater extraction.

Water infrastructure and engineering solutions that are multi-purpose and work in harmony with the environment and other sectors are absolutely essential for water security. Newer hydraulic solutions need to urgently be engineered and implemented in order to realize the development potential of many countries around the world. In Africa for example, two thirds of the sub-Saharan population still lack access to safely managed drinking water[3], irrigation potential is largely under-developed, and almost 90% of hydropower potential is not yet harnessed. Many developed countries such as Korea, Singapore or Spain are orienting public policy towards complementing traditional hydraulic works with digital infrastructure. A 3 billion Euro program has recently been launched by the Spanish Government, aiming at digitalizing water management in the country and involving new technologies in urban and industrial settings, digitalizing irrigation, transforming administrative settings and catalyzing training, research and innovation.

Policy must also incentivize the renewal, replacement or decommissioning of existing hydraulic works. A study by the United Nations University-INWEH[4] alerts us to the fact that most of the 58,700 large dams around the world were constructed between 1930 and 1970 with a design life of 50 to 100 years. Understanding that by 2050, a good part of the population of the planet will live downstream of one of these infrastructures; and that climate change scenarios in the coming decades present deep uncertainty, there is an urgent need for policy makers and designers to integrate future scenarios that are not simply based on historical data, but follow a holistic approach for planning, design and construction of the water works that will assure global water security.

A critical path towards ensuring water security for all is the financing of water-related infrastructure. A partial estimate of the scale of global economic losses related to water insecurity amount to a USD 260 billion per year from inadequate water supply and sanitation, USD 120 billion per year from urban property flood damages, and USD 94 billion per year of water insecurity to existing irrigators[5]. Despite this, projections for future investment needs far outweigh current financing measures, with global estimates ranging from 6.7 trillion by 2030 to 22.6 trillion by 2050[6]. To meet these needs, the High-Level Panel on Water, made specific policy recommendations to: maximize the value of existing assets for water-related investments; design investment pathways that maximize benefits over the long term; ensure synergies and complementarities with investments in other sectors; attract more financing by improving the risk-return profile of water investments[6].

The policy options to support much needed infrastructure and engineered solutions are difficult to achieve. Complex demands for sustainable financing and "bankable" investments, that align with the appropriate technical solutions, geo-politics, societal demands and environmental protection represent a challenging task for policy makers. Sharing common challenges, approaches and solutions amongst decision-makers can provide a "policy scaffolding" to support difficult decision making that is adapted to local contexts.

The role of learned societies

The language of water security has been widely adopted in policy declarations around the world, but there are many barriers to turning it to action. Learned societies of researchers and practitioners, scientists and engineers can help overcome some of the barriers to linking policy to water solutions. They can start by trying to communicate to the public the findings of scientific and technical studies using plain language and increase efforts to inform/educate political leaders and other decision makers, possibly by preparing policy briefs. They should also foster cross-disciplinary collaborations with different societies joining forces to launch joint initiatives, prepare information briefs, and organize join meetings or conferences. International platforms create space and opportunity for practitioners and innovators to freely exchange ideas with policy makers and scientists to catalyse change for a more water secure future.

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