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# BETTER WATER INFRASTRUCTURES FOR A BETTER WORLD – THE IMPORTANT ROLE OF WATER ASSOCIATIONS

BY ANTON J. SCHLEISS

History shows that the economic prosperity of a society and its cultural wealth has always been closely related to the level of development of its water infrastructure. In view of climate change, especially dams and reservoirs, but also other water infrastructure will and has to play an even more important role than in the past as part of mitigation and adaptation measures that are necessary in order to satisfy vital needs in water, renewable energy and food worldwide.

International organizations and national governments have shown that there is political will to improve water, energy and food security at a global level through the so-called NEXUS approach that integrates management and governance across sectors and scales.

Nevertheless, these political intentions must be translated into concrete actions for the urgently needed enhancement of the worldwide water infrastructure including reservoirs and dams. To gain wide acceptance and to obtain a win-win situation for all stakeholders, such large water infrastructure projects must be designed as multi-purpose projects by multidisciplinary teams recognizing the complexity of these systems and adhering to the principles of sustainable development as expressed in Agenda 2030 of the United Nations. This calls for excellence in engineering, sciences and management. All water associations should contribute with concerted actions to the worldwide vision “better water infrastructure for a better world”.

## Vital water infrastructures for reaching the sustainable development goals (SDG)

For thousands of years, humankind has continuously developed techniques to use water and at the same time to protect itself against water. The term «hydraulic schemes» or «water infrastructure» covers all measures and human interventions aiming at controlling parts of the water cycle. A vital element of our environment, water also has great destructive potential. Thus, the water infrastructure projects can be divided, according to their objectives, into two groups (Figure 1) [1]:

- schemes for water utilisation
- schemes for protection against water.

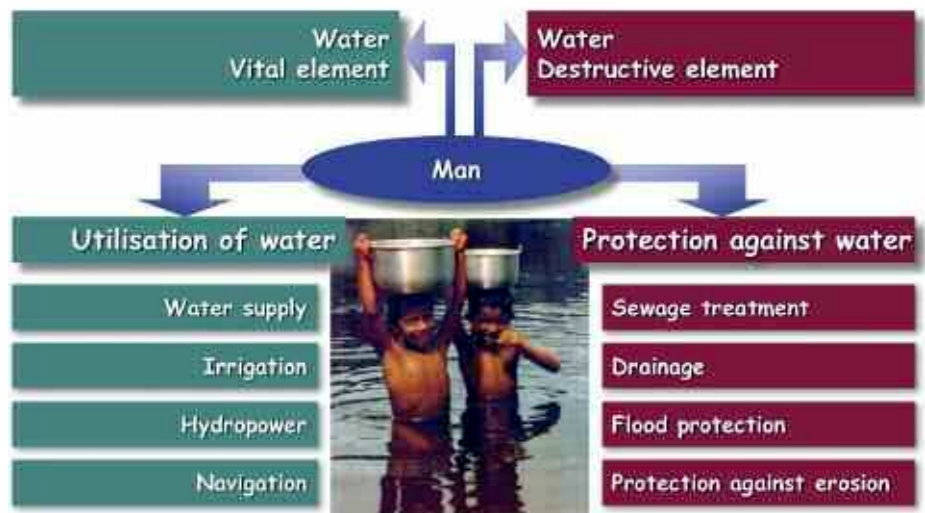


Figure 1. Application of water infrastructures [1]

The hydraulic structures or water infrastructure designed for water utilisation are often multi-purpose projects providing water supply, irrigation, hydropower production and navigation. The structures designed for protection against water hazards include, besides flood control reservoirs, also sewage treatment facilities (hydraulic structures to eliminate pollution), drainage, flood protection and erosion protection measures. Today large water infrastructure projects should be designed as multipurpose schemes in order to benefit from synergies between different objectives of use and protection and to gain wide acceptance from all stakeholders.

## Dams and reservoirs as key water infrastructures

According to the ICOLD register, today more than 58000 large dams – often called the useful pyramids [1] – are satisfying the worldwide vital needs for water, energy, food and flood protection (Figure 2). The total storage volume of all reservoirs registered by ICOLD is about 6700 km<sup>3</sup>, of which about 4000 km<sup>3</sup> can be used directly. To put the magnitude of useful storage of these reservoirs in perspective, it is noted that all the water stored at a certain instant in all rivers worldwide, is between 1000 and 2000 km<sup>3</sup>, which shows clearly that the reservoirs can significantly influence the water cycle.

This is, above all, of highest importance for food production around the world, a good part of which depends on irrigation.

The major problems of the world population in this century will be without doubt the safe supply of ecological and renewable energy, as well as the supply of water of good quality and sufficient quantity in order to eliminate famine, poverty and disease in the world. Still today water supply and sanitation services leave much to be desired; 40% of the global population suffer from water scarcity, which is projected to rise, and almost 800 million people do not have access to clean water. Furthermore, an important part of the world population is still threatened with famine. This risk could be considerably lessened by irrigation to produce food in arid areas, which are not cultivable today. Thus, in many countries, especially in Africa, there is still an urgent need for increased development of water and energy resources as the basis for the economic prosperity and cultural wealth of these societies.

Figure 3 shows where the new large dams have been built since the beginning of this century [2]. Thanks to these new water infrastructures, a security belt is formed around the world to ensure water, food and energy. The zone of high density of new dams extends from Southern Europe over to the Middle East, to Central and

East Asia. It covers the area of high water stress in arid and semi-arid regions, as well as the Monsoon- exposed regions with extremely high population density. The belt of new dams shown in Figure 3 is less apparent across North America over the World's most productive crop growing region, where only a few dams have been built this century. This is due to the fact that significant dam development took place in this region in the last century. It must also be noted that the regions along this belt are already affected perceptibly today by climate change, whose effects are expected to become even more dramatic in the future, according model simulation predictions. The existing dams and reservoirs, as well as future projects will play a key-role in the mitigation of the effects of climate change [3]. The belt of dams and reservoirs which covers these threatened and very vulnerable regions around the world will help provide food security, water and energy. Therefore, it can be called a security belt. Figure 3 illustrates another worldwide problem addressed through the construction of new dams, which is the huge economic gradient from the global North to the global South, i.e. from the developed countries to the emerging and developing countries. The trend for more new dam construction in the South compared with the North can be seen clearly in South America, as indicated by the arrow attached to the security belt mentioned earlier. The same cannot be said for Africa. In this part of the world, the security belt has to be fixed with extensions to the South in order not only to secure food, water and energy but also equitable worldwide wealth for all countries. Dams and reservoirs are a major part of the water infrastructure, which strengthens the security belt and its extensions.

### Important role of water associations

Among the 16 sustainable development goals (SDGs), water associations should at least

promote the following goals in their activities which are strongly related to the worldwide development of water infrastructure:

- Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 13. Take urgent action to combat climate change and its impacts
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

How can this be achieved? First the members of the water associations have to be aware of the importance of the SDGs and of how they can contribute through their research and development activities to achieve them. One possible suggestion could be to require that any paper submitted to an IAHR Congress include a short paragraph, if applicable, explaining in two to three sentences how it contributes to the SDGs. Furthermore, a new best **SDG paper award** could be set-up. This could be used as a vehicle to publicize to a broader audience outside IAHR the most relevant three papers contributing significantly to the SDGs. A next step could be to extend this initiative to papers published in IAHR journals. This would greatly increase the awareness of the SDGs among the authors and readers of Congress and journal papers. Most of the water associations are fighting today alone to promote and communicate their viewpoint on social-political issues related to or affected by water. To be heard really, they would have to unite their voices in such communica-



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tions. A significant platform is the World Water Council (WWC) with its globally known communication and promotion vehicle the World Water Forum (WWF). In order to have an influence on the water themes to be treated and discussed during the WWF it is important to be elected on WWC's Board as a Governor. For single water associations, such as IAHR or ICOLD, it is very difficult to be elected alone in WWC's Board as a Governor. Thus, all water associations having several votes should unite their forces to get one of the associations elected to represent and defend the common interests of all water associations. In addition, the water associations could also prepare together a declaration to publicize issues of common interest and/or concern. ■

### References

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Figure 2. Location of the 58'000 large dams according to the ICOLD register ranging from medium size dams (up to 50 m high, shown in yellow) to very high dams (above 150 m, shown in red)

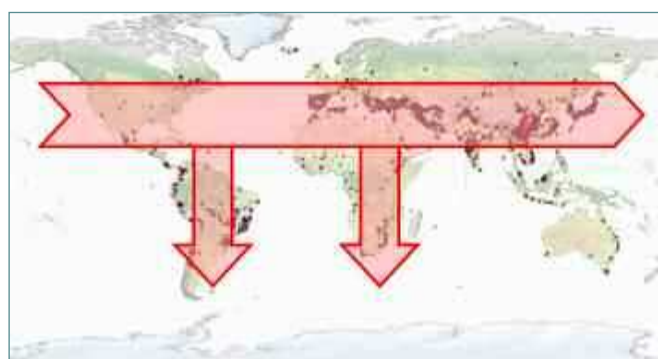


Figure 3. New dams and reservoirs commissioned since 2000 creating a security belt around the world to ensure water, food and energy [2], [3]