Hydrodiplomacy in Rapid Action:
Early Insights from the Sardoba Dam Disaster in Central Asia[1]

September 2020

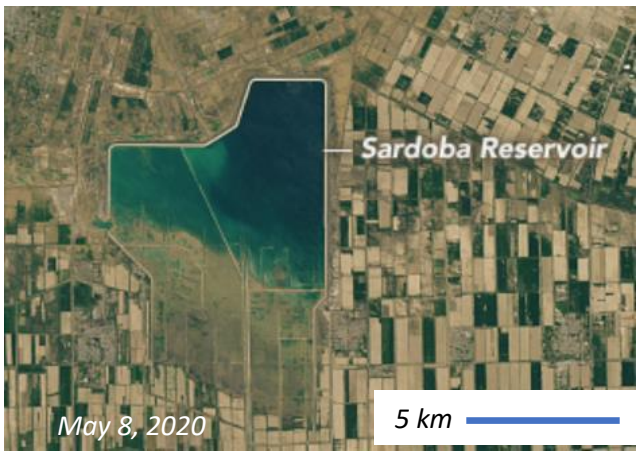
On May 1st, 2020 following days of inclement weather, a dam wall at the Sardoba reservoir in Uzbekistan collapsed. An estimated half billion m3 of water poured through a breach onto villages and cotton fields, causing the evacuation of more than 110'000 people and affecting more than 35,000 hectares of land in Uzbekistan and Kazakhstan. In spite of the COVID-19 crisis, and despite a history of water mismanagement and regional tensions in the Syr Darya river basin, both countries managed not only to cooperate over the immediate recovery, but also to strengthen good neighborly relations, taking further steps towards joint management of the shared basin. They thus effectively turned water from a potential source of conflict into an opportunity for cooperation and peace. A first important milestone was reached on July 2, 2020 with the signing of a joint roadmap for transboundary water management. The Sardoba dam disaster could become a watershed in reshaping the transboundary water dynamics in Central Asia, which are central to the COVID-19 response and recovery. Indeed, strengthened regional water cooperation could become a driver of sustainable socio-economic recovery in a profoundly changed world economy, fostering peace and security. This note discusses early insights focusing on transboundary, regional and global levels.

THE DISASTER AND ITS AFTERMATH: CRISIS MANAGEMENT AND HYDRODIPLOMACY

The western wall of a dam around the Sardoba Reservoir in Uzbekistan failed on May 1st, 2020. A gap formed in the 29m-high concrete structure, sending water rushing downstream toward nearby villages, ultimately pooled across an area of almost 300 km^2 spanning the border of Uzbekistan and Kazakhstan. Fortunately, the breach did not cause the entire dam to collapse.

[1] Strategic Foresight Discussion Notes of the Global Observatory for Water and Peace (GOWP) are informal think pieces prepared by staff and partners of the Geneva Water Hub (GWH) with contributions from the GOWP network and external partners to encourage forward-looking discussions and exchanges of ideas. As an objective is to get the findings out quickly, they do not follow procedures that are appropriate to formal printed texts. Findings, interpretations and conclusions expressed in this work do not necessarily reflect the views of the financial and technical partners of the GOWP and of the GWH.


Sardoba Reservoir
Source : NASA Earth Observatory, April 22, 2020

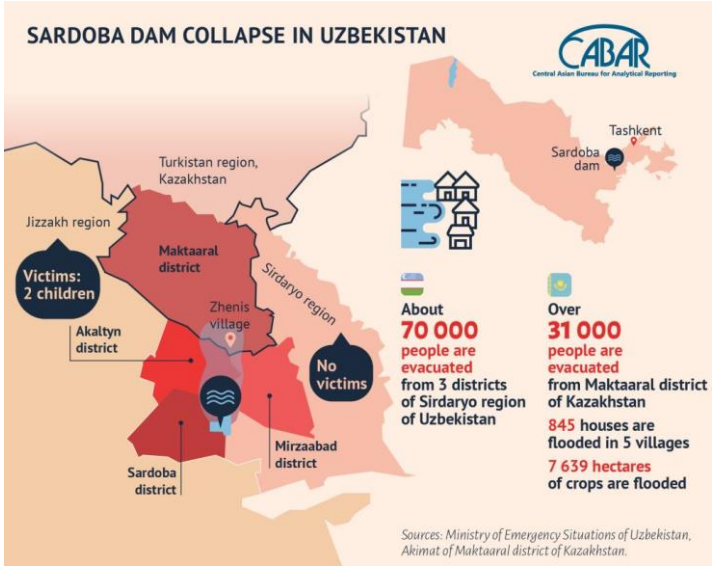

Sardoba Reservoir
May 8, 2020
5 km


KAZAKHSTAN
UZBEKISTAN
Gulistan
Sardoba Reservoir
Jizzakh
TAJIKISTAN
Source : NASA Earth Observatory, April 22, 2020


Source : knews.kg


Source : hydropower-dams.com


Source: PrimeMinister.KZ


SARDOBA DAM COLLAPSE IN UZBEKISTAN
CABAR
Central Asian Bureau for Analytical Reporting
Tashkent
Sardoba dam
Turkistan region, Kazakhstan
Jizzakh region
Maktaaral district
Victims: 2 children
Sirdaryo region
Zhenis village
Akaltyn district
No victims
Mirzaabad district
Sardoba district
About 70 000 people are evacuated from 3 districts of Sirdaryo region of Uzbekistan
Over 31 000 people are evacuated from Maktaaral district of Kazakhstan
845 houses are flooded in 5 villages
7 639 hectares of crops are flooded
Sources: Ministry of Emergency Situations of Uzbekistan, Akimat of Maktaaral district of Kazakhstan.


Source : cabar.asia

However, the flooding submerged homes and destroyed farms and infrastructure across important agricultural areas. 10 settlements were flooded, the number of evacuated residents exceeded 100 thousand people in both countries, and 6 flood-related deaths were reported (see details above, CABAR 2020). Total losses just in agriculture exceeded USD 10 million.

The circular dam impounded 922 million m^3 of water – more than twice the volume of the Grande Dixence, Switzerland's largest artificial lake. About half of the volume burst through the ruined dam. The construction of the reservoir began in 2010 under the late President Karimov and was completed in 2017. Its main purpose was to store water for irrigation. Its cost of about USD 400 million was entirely financed from the state budget. The general contractor and operator for dam was not a certified hydroengineering company, but a subsidiary of Uzbekistan Railways Company – a large state-owned enterprise involved in Belt and Road Initiative (BRI) developments.

The Sardoba reservoir was built in the so-called Hungry Steppe – which is naturally arid but was transformed during the Soviet era into an intensively irrigated agricultural area that straddles Uzbekistan, Kazakhstan and Tajikistan. The reservoir is a result of the limited regional water cooperation that prevailed in the 25 years after the collapse of Soviet Central Asia's integrated water-energy management systems[2], causing downstream countries to implement various strategies to minimize dependence on their neighbors, notably by building "buffer reservoirs" such as Sardoba that made their water supply less dependent on dam release regimes from upstream countries.

Transboundary Disaster Management. Rapid actions were taken, even though Uzbek authorities had initially and incorrectly assured that Kazakhstan would not be impacted. The Uzbek President immediately visited affected regions in both countries, and assured Kazakhstani neighbors that they would assist in the aftermath of the floods. Uzbekistan sent heavy machinery to Kazakhstan to help with disaster-relief efforts. About 200 Uzbek specialists arrived in Kazakhstan and brought equipment with them. More than a thousand Kazakhstanis joined in restoration work. In Uzbekistan itself, 1300 people were mobilized to combat the effects of the flood. Both Tajikistan and Kyrgyzstan sent building materials and humanitarian aid to the affected areas (pictures below). On May 10, the Kazakh and Uzbek Prime Ministers jointly visited the flooded areas and announced a joint rehabilitation and reconstruction program, symbolically laying the foundation of new house in Kazakhstan (pictured below). On May 22, the Uzbek government allocated a $100 million grant to build housing and restore infrastructure of Syrdarya region.

In early September 2020, the Uzbek government reported that out of the 89,450 evacuees, 83.4% had returned to their places of residence, and that the construction of 66 multi-storey buildings with 2,640 apartments to provide new housing for citizens who have lost their homes has been fulfilled by 56%.


Source : akipress.com


Source: PrimeMinister.KZ

[2] In Soviet Central Asia river waters were regulated by dams, prioritising supply for agriculture -- though large scale water diversions led to the drying up of most of the Aral Sea. The upstream republics of Kyrgyzstan and Tajikistan received fuel in winter to offset the hydropower energy they had agreed not to generate. However in the early 1990s, following the collapse of the USSR, international boundaries and markets for fuel changed the terms of this barter and became a significant source of regional energy-water tensions because upstream countries started producing more hydropower in winter at the expense of water supply for irrigation downstream.


Source : UZ President official site

Source : akipress.com

Source : uzreport.news

Early Hypotheses and Investigations. Uzbek President Mirziyoyev himself pointed out that corruption in the construction of the reservoir could be a cause of the disaster. On May 5 he stated that "all guilty people, regardless of who they are or what position they held, will be held to account before the law" (The Diplomat, 2020). The Uzbek leader also ordered an in-depth examination of all dams and hydropower facilities with the involvement of international experts. Given its recent completion, the dam failure is suspected to be rooted either in design or construction flaws. Indeed, on July 27, 2020, the Prosecutor General's Office concluded that there were shortcomings in the project design, construction and operation; notably that the building materials were of inferior quality and operators were insufficiently trained and equipped (BBC News Uzbek, 2020). The "wind and heavy rain" factor, which was considered initially, was however excluded.

However, doubts have been expressed that the investigation will go all the way up the chain of command, pointing out that this appears to be a "classic example of a potential conflict of interest, ignored and possibly feeding corruption" (The Third Pole, 2020). Indeed, many large infrastructure projects in Central Asia have often been criticised for lack of transparency in procurement and for side-stepping regulations and standards. Therefore, "how the Uzbek government handles the investigation matters because in addition to public integrity and fairness issues, it is also key to the current Government strategy to attract investors, as proof of progress on transparency and anticorruption issues after an era marred by grand corruption scandals—an era during which the dam was constructed" (The Third Pole, 2020).

In an August 6, 2020 article, *The Economist* also pointed out that while "Mr Mirziyoyev positions himself as a champion of transparency and has pushed through an impressive array of reforms to improve the investment climate and reduce corruption, ordinary Uzbeks still need to be convinced that it is the public good, not private interests, that dictate how the government spends its money".

Transboundary Hydropolitics. The Sardoba dam disaster was the first serious incident in relations between Kazakhstan and Uzbekistan. However, as bilateral relations had vastly improved after the regime change[3] in Tashkent with many agreements concluded and bilateral trade reaching US$5 billion, the new cooperation discourse laid the groundwork for a "textbook case" of rapid, transboundary hydrodiplomacy:

- On May 2, the day after the disaster, the Uzbek and Kazakh Presidents discussed the situation by phone and agreed on the coordinated work of both governments;
- On May 5, the Kazakh Vice-Minister of Environment initially announced a diplomatic note would be sent out to demand a full picture of events and discuss compensation, especially as the reservoir had been constructed unilaterally with no prior notification to Kazakhstan as downstream riparian. The Kazakh Government however announced shortly afterwards that the incident would be settled in accordance with existing bilateral agreements and with the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention) – no diplomatic note was sent.

[3] Uzbekistan's first President Karimov used harsh measures to retain his country's water rights. He blocked supplies to neighbours who violated water allocation schedules, reforms of regional water bodies IFAS and ICWC proposed by Kyrgyzstan and other countries, and even threatened military action in case of new dam construction. When President Mirziyoyev assumed office in 2016, he sought to reach out to his neighbors and restore collective water management, offering electricity purchases and joint dam construction to Kyrgyzstan and Tajikistan (The Third Pole, 2020).

- On May 11, Kazakh President Tokayev stated "We are located in one river basin and we must work to ensure the fair and rational use of water resources, as well as to prevent threats and challenges of a transboundary nature on trust and transparency";
- On May 11, Kyrgyzstan sent aid by train with 1000 tons of cement, rice and vegetable oil (picture above);
- On May 14 Environment Minister Mirzagaliev of Kazakhstan and Water Minister Khamraev of Uzbekistan met and agreed to jointly conduct a technical audit of the Sardoba Reservoir with international and national experts – based on which a decision would be made on the fate of the structure;
- On May 20, Tajikistan sent 51 freight wagons with building materials (picture above);
- On May 25, 2020 it was reported that Nur-Sultan and Tashkent agreed to formulate a roadmap on water cooperation, to develop an intergovernmental agreement and to establish a permanent bilateral Commission on the joint management, use and protection of transboundary water resources**.** Simultaneously the Kazakh government posted a draft treaty proposing a bilateral commission on transboundary water bodies. It listed several cooperative activities, including information exchange, joint decision-making and financing **(see Box 1 below)**. The draft agreement was however removed from the website a few days later, possibly because its publication could be seen as putting pressure on parties;

BOX 1: Summary of Draft Agreement between Kazakhstan and Uzbekistan on the Joint Management, Use & Protection of Transboundary Water Bodies (source: portal of open regulatory legal acts legalacts.egov.kz)

The draft agreement is consistent with the UNECE Water Convention that Kazakhstan and Uzbekistan acceded in 2001 resp. 2007. It states that parties have the right to use transboundary water resources in an equitable and reasonable way and have the obligation not to cause a significant harm. It requests parties to:

- *jointly implement measures to save water and reduce water losses at transboundary water bodies, including concrete canals, automation and modernization of water facilities;*
- *jointly monitor the use and protection of transboundary water bodies and water management facilities, with online data transmission and information exchange as approved by the Joint Commission;*
- *interact on issues of reconstruction, operation and financing of repair and maintenance works;*
- *share operation and maintenance costs of water works in proportion to the volume of water consumed;*
- *develop joint programs to prevent and reduce the effects of floods and droughts;*
- *coordinate the construction of new water facilities on transboundary water bodies as well as the conservation of their ecosystems.*

To implement the provisions of the agreement, it is planned to create an ***Interstate Commission for the Joint Management, Use and Protection of Transboundary Water Bodies*** *between the two countries. Its functions will include coordinating the actions of state bodies, reviewing and approving annual limits for water withdrawals, making decisions on joint repairs of interstate waterworks and irrigation systems, developing joint schemes for the integrated use and protection of transboundary waters.*

On July 2, 2020, the Uzbek and Kazakh Ministers of Water and Environment signed a roadmap on transboundary water cooperation (pictured opposite). As the Kazakh Minister wrote on his Twitter page: "The document is very important; it regulates a number of issues in the water sector. In particular, it involves conducting a joint technical study and monitoring of water bodies built and reconstructed since 1991, and taking joint measures to ensure additional discharges from the upper reservoirs. Another important feature of the roadmap is transparency in the allocation of water resources. Negotiations are still ongoing. There are several other strategic issues on the agenda".

EARLY INSIGHTS AT REGIONAL AND GLOBAL LEVELS

Overall. This strategic foresight discussion note explores systemic insights at basin, regional and global levels, both from the disaster itself and from the hydrodiplomacy process that followed. It does not examine the dam itself as the results of the technical audit and of the judicial inquiry are several months away.

These remarkable developments are testimony to the new regional cooperation discourse overall and to the increasingly positive transboundary water dynamics of the last couple years. In just a few weeks, in the midst of the COVID-19 health and economic crisis, Uzbekistan and Kazakhstan – with the contribution of other Central Asian states – were able to jointly turn a water disaster from a potential source of conflict into an opportunity to cooperate across multiple levels and scales. In fact, through the actions described above they effectively put in practice several key recommendations of the Global High-Level Panel on Water and Peace (GWH, 2017) to make water an instrument of peace and prosperity.

Indeed, major disasters have often acted as catalysts of political change, provided solid geopolitical and geoeconomic foundations had already been established, as is increasingly the case in Central Asia. Water-related disasters – whether natural or man-made – have sometimes resulted in transboundary agreements such as the 1964 Columbia River Treaty between Canada and the USA that was triggered by the flooding and destruction of Oregon's second-largest city.

With COVID-19 cases reaching new record levels globally in September 2020, and amid severe socio-economic impacts expected in Central Asia, there is now a major opportunity for regional leaders to capitalize on the goodwill that the Sardoba disaster generated to take bold political action with a new integrated and inclusive socio-economic and financing framework to boost the water-energy-food (WEF) security nexus as the main driver of sustainable recovery, stability and peace. Water in all its uses will be critical to stabilize Central Asian economies during and after the pandemic as 40 percent of their population still lives in rural areas, and all countries seek to jointly and sustainably[4] develop their hydro-energy and food export potential.

The impacts of the COVID-19 pandemic are clearly multi-dimensional so it is becoming increasingly apparent that there is great value in bringing not only the water and energy sectors together in strategic planning, but also food, the environment, the economy, finance and investment, municipal management and others. However, this is a grand challenge due to the complexity of each sector and their long history of being planned, operated and regulated in isolation. Bridging the gaps between sectors with multi-sectoral planning and recovery approaches can significantly help shape this pathway towards a brighter and greener future.

Indeed, a new integrated, regional WEF socio-economic and financing framework should help Central Asian countries to more effectively promote their common interests post-crisis, using water as their most important strategic resource to boost prosperity, security and peace in the region.

Hydrodiplomacy Does Not Happen in a Vacuum. Much has been written on the subject of hydropolitics, or the interplay between transboundary water resource issues and politics. But the role of the discourses produced and deployed by the different actors in the basin in shaping hydropolitics is key[5]. Discursive

[4] As Central Asian countries devise ways to respond and recover from the pandemic, development actors will need to seriously consider how poorly designed, uncoordinated and high risk investments may not only drive negative environmental, socio-economic, climate, and biodiversity impacts, but may also facilitate the spread of diseases. We need to build back better, boosting flexibility, capacity and resilience in the economy, in an ecologically safe, people-oriented, and sustainable manner with lower carbon footprint. We need to ensure that COVID-19 related financial resources are allocated to sustainable investments and skills development that will be beneficial after the crisis, supported by local communities, and aligned with international standards and best practice.

[5] See Bréthaut et al., Opening the Black-Box of Hydropolitics: A New Conceptual Framework and Research, forthcoming.

practices construct and enact the actors' power positions in the governance of a transboundary basin: actors, discourses, practices, and institutions. In addition to the diversity of scales and actors, one should not neglect the multiple dimensions of water that affect its governance in a transboundary setting (Bréthaut et al., 2020). The fascinating developments that followed the Sardoba dam disaster might not have happened if the discourses on regional cooperation including water hadn't improved so clearly in recent years.

Systemic Design Issues Do Matter: Location, Type and Size. As noted above, this paper does not discuss conceptual and design issues in relation to the reservoir itself as this analysis awaits the results of the joint technical audit. The paper therefore focuses on the broader, systemic design issues, including:

The Hydropolitics of Reservoir Location and Spatial Configuration. As can be seen in the pictures above, the reservoir looks rather incongruous. Why would engineers have located a major water reservoir of almost a billion m^3 on flat agricultural land, looking like a giant pool? Surely more favorable sites existed in hilly areas upstream. But the reservoir's configuration is the product is an era of low trust and low water cooperation.

Indeed, huge water reservoirs have been constructed half a century ago by Soviet engineers in former Soviet but presently independent republics of Tajikistan and Kyrgyzstan, mainly to store water for irrigation use in downstream areas particularly for cotton production. With the collapse of the Soviet Union, these reservoirs became source of disputes and tensions because their new owners in upstream countries preferred to use them in hydropower rather than in irrigation mode. Downstream countries were now dependent on reservoirs located on foreign soil for their critical irrigation needs and therefore sought to increase their security by building new "buffer reservoirs" within their borders, despite an unfavorable topography.

Indeed, location is not a simple technical issue as it is dependent on the prevailing hydropolitics and hydro-economics, especially as the pandemic has shown the risks of an overreliance on cross-border trade and supplies. Dam projects, selections and constructions have definitively political aspects of importance and may sometimes ignore viable alternatives (GWH, 2020). As IUCN underlines **(see Box 2)**, sustainable water infrastructure requires a strategic, systemic basin-wide approach. This has been lacking in Central Asia for many decades and is among the most important and urgent tasks post-pandemic and post-Sardoba disaster.

BOX 2: Extract from The Future of Dams, Viable Options or Stranded Assets? – IUCN Water, 2019

Location, location, location. *Where exactly a dam will be constructed is challenging. Maximising electricity generation whilst managing the risks is a strategically difficult decision. Sites are often remote, requiring roads and infrastructure, as well as vast amounts of labour and equipment. Sites can harbour indigenous communities, or reservoirs can flood and encroach indigenous lands causing social disruption, or far worse, retaliation. Are dams still viable options or stranded assets? What is clear is that hydropower will remain on the agenda as part of a low-carbon renewable energy future. However, the need to address energy poverty and the economic ambitions -especially of Africa and Asia- must lead to the application of a broader range of renewable energy sources that recognise the social and ecological realities and avoid increasing damage to river basins. For both large and small, the key word is system: sustainable hydropower requires planning, siting, and operating dams within an overall system that seeks to balance a range of resources and values. For long-term high impact infrastructure such as hydropower dams to remain viable, they must get smarter. Smarter in terms of where they are located, how they are designed and operated, and how they help unlock other renewable energy technologies such as solar and wind.* Source: digital.iucn.org/water/the-future-of-dams/

Surface vs. Groundwater Storage. A key systemic design question is whether such large amounts of water should be stored above and/or underground, though these options are of course neither directly comparable nor interchangeable. The International Water Management Institute (IWMI) has published useful guidance[6]

[6] This section draws upon *Groundwater Solutions Initiative for Policy and Practice (GRIPP)* at https://gripp.iwmi.org

in this regard. Globally and in Central Asia, there has been a historic bias in favor of surface, grey infrastructure solutions to water storage. However, as IWMI underlines, interest for nature-based solutions has grown as the option of building more surface water reservoirs is increasingly limited, risky, controversial and/or inefficient – global warming leads to increased water loss through evaporation.

Aquifer recharge, storage and recovery can play a key role in helping communities to adjust to climate variability and cope with droughts. It can be more sustainable and cost-effective than traditional infrastructure such as dams. Also, in contrast with centralized surface storage, managed aquifer recharge (MAR) is decentralized, allowing for the diversification of water source types used to augment recharge, helping to build local resilience. Indeed, Groundwater-based Natural Infrastructure (GBNI) offers a variety of co-benefits, like flood control, water purification, conjunctive use, habitat benefits and recreation. In joint investment plans and transboundary water management they must be part of the alternatives studied.

In Central Asia, several studies already have shown the potential of GBNI to store water in downstream countries, notably in the Ferghana Valley where it was reported that free capacities of the aquifers exceed 3 billion m^3 which could be used in winter for temporary storing of the excessive flow of the valley's many transboundary tributaries (IWMI, 2013). In the aftermath of Sardoba, the attention of policymakers should be brought to this alternative development of basin water management, which requires cooperation of riparian states across the water-energy-food nexus.

For decades there were low incentives for farmers to practice groundwater irrigation under the state cotton and wheat quota systems supplying subsidized canal water. However, as Central Asia now moves firmly towards agriculture diversification with water farmers producing cash crops, such as orchards and vegetables, and following Uzbekistan's historic decision in March 2020 to abolish the 100-year old cotton quota system, investment in groundwater development becomes much more interesting. Downstream surface reservoirs such as Sardoba could then become an anachronism with increased transboundary cooperation and more efficient joint investment planning that systematically compares all alternatives, including surface vs. groundwater, grey vs. green infrastructure[7] etc.

Sizing, Water Efficiency and the Socio-Economic Value of Storing Water. Though hydrological sizing of reservoirs is a highly strategic issue, it often results more from hydropolitics rather than from publicly discussed decision-making based on sound technical, economic/financial and socio-environmental analyses. In addition, when such analyses are carried out, they are rather deterministic, while they should instead fully account for variables such as flow variability, climate and demographic change as well as water efficiency gains through better pricing policies, technology and/or as it is now the case in Central Asia a shift from water-intensive to high-value crops. As the new Deputy Water Minister V. Akhmadzhonov recently underlined, Uzbekistan is now "focusing its efforts on drip irrigation, which will reduce consumption by half". Kazakh Minister Mirzagaliyev also called for developing drip irrigation and new land planning technologies.

While it is not the purpose of this note to carry out an ex-post analysis of the Sardoba reservoir design – even though experts have pointed out it was likely oversized – it is important that the right design questions are asked as the reservoir is being reconstructed and other large water infrastructure is planned elsewhere in Central Asia. A crucial, though often overlooked decision-making variable is the *economic value of storing water* (FutureDAMS, 2018), including for crisis prevention and insurance against possible geopolitical and natural shocks such as droughts and floods. Indeed, this valuation whether implicit or explicit is key for water reservoir design and management, noting that values and rules do evolve via socio-political processes.

In the Rhone river basin for example, trust levels between France and Switzerland are such that the regulation of upstream lake Geneva was never a prominent transboundary issue – indeed no institution for transboundary cooperation exist to that day, even though France is highly dependent on lake and river levels for safe operation of key strategic infrastructure downstream such as nuclear power plants, navigation and

[7] On July 31, 2020, the GEF launched a new initiative to use financial modelling and climate change projections to help investors and policy makers consider nature-based solutions when making infrastructure spending decisions.

irrigation canals. However, this is evolving as the basin is facing future climate and water quality challenges; discussions and studies about the future governance of the river are ongoing (see Bréthaut & Pflieger, 2019).

In Central Asia, following the collapse of the integrated Soviet system, countries have endeavored to minimize dependence on their neighbors. This implied energy self-sufficiency for upstream countries, and for downstream countries reliance on "counter-balancing reservoirs" to reduce their dependency on upstream dam release regimes (Adelphi & CAREC, 2017). Though these national solutions are very costly as infrastructure is duplicated and capital is misallocated from a regional point of view, they could be partly justified from a risk management perspective, especially as the ongoing COVID-19 crisis has demonstrated the risks entailed by an excessive reliance on economic efficiency criteria. Indeed, an "efficient" level of redundancy in a transboundary basin, informed by the socio-economic value of water, could be seen as insurance into crisis and conflict prevention, increasing trust levels and prospects for regional cooperation.

Towards Smarter Joint Investment Planning. The best combination of green versus grey infrastructure, or large-scale centralized projects versus small-scale decentralized projects, will depend on the context of each nation and region for the highest socio-economic gain with the lowest environmental impact. Scaling up cooperation to include more stakeholders over larger water basin areas can help to share costs, increase benefits, and minimize the risk of conflict caused by uncoordinated development.

Indeed, there is an urgent need for more joint basin wide investment planning in Central Asia and globally to avoid piecemeal, inefficient and potentially risky designs, as the Global High Level Panel on Water and Peace also recommended. As discussed above, because the building of large infrastructure is a political affair, their planning and design should be informed by comprehensive analysis of alternatives at different levels[8], as well as the provision of quality, dependable data which can be facilitated by remote sensing coupled with new digital technologies and approaches.

It is also necessary to develop new hydrological models that take into account climate variability and upgrade infrastructure to prepare for the greater likelihood of catastrophic events, especially in Central Asia where precipitation patterns are changing dramatically and rapid glacial melt increases river flow. Crucially, because water and energy systems are so interlinked in Central Asia, joint investment planning will need to carefully and efficiently share benefits between stakeholders **(see Box 3 below).** New approaches and effective collaboration are essential to manage water under regional resource conflicts (FutureDAMS, 2020).

BOX 3: Spatial and Sectoral Benefit Distribution in Water-Energy System Design – FutureDAMS, 2020.

Traditionally planners considered the effects of water and energy systems on the other in simplified ways or not at all. This has often led to inefficient use of resources and a somewhat arbitrary allocation of benefits and costs across sectors and geographic regions. But the need to decarbonise energy systems is introducing unprecedented interdependencies in multi-resource systems, and creating demand for integrated water-energy systems. A new study published in July 2020 by FutureDAMS researchers shows how water and energy systems can be planned to carefully and efficiently share benefits between stakeholders. The developed framework uses new methods of jointly designing river basins and energy systems, including a model-assisted multi-criteria design process to suggest synergistic combinations of infrastructure and policy interventions, such as irrigation canals, thermal and hydroelectric plants and multi-purpose reservoirs and their operating rules, to satisfy a range of objectives. Source : www.futuredams.org/benefits-water-energy-systems/

Importantly, a basin-wide, systemic approach may also increase basin resilience by allowing policy-makers to set redundancies at an efficient level, which depend on techno-economic and political considerations. As

[8] See an example of an analysis of alternatives integrating solutions across sectors in a World Bank-funded project in Kenya. A comprehensive sediment management approach will allow the government to lower the environmental impact of a proposed dam and save tens of millions of dollars by reducing the amount of sediment that the dam traps https://blogs.worldbank.org/water/reducing-dam-impacts-and-costs-by-thinking-of-the-land-above-the-dam

the COVID-19 crisis has revealed, economic efficiency is a necessary but incomplete metric. Redundancies can boost confidence to cooperate over transboundary water resources. They however should be based on a systemic analysis, unlike the Sardoba reservoir which was planned, designed and operated unilaterally. The systemic approach should extend beyond planning and design to operation and management stages, where the political context and wider institutional setting of water infrastructure matters a lot **(see Box 4 below):**

BOX 4: Reservoir Management: Benefits, Risks and Prospects – Geneva Water Hub, 2019

Among major issues and contestations that pop-up after a dam is built, filled-up and made operational:

- *Timing of downstream consumptive use (including irrigation, agricultural and urban planning);*
- *The management of other dams (hydropower generation and power pool regulation);*
- *Ecological impacts (conservation efforts and human health implications).*

In order to understand and address these critical issues raised late in dam construction and operation processes, the political context of dam management should be assessed through the following lenses:

- ***Power relations,** which are very fluid and change over time. For example, in the case of the Roghun dam, Tajikistan, they have been used in various arenas, respectively, hard (economic) power and soft power, to convince its counterparts to achieve its objectives regionally and nationally. Power relationships are indeed resilient to international factors as well as national politics.*
- ***Political economy of the dam**. This aspect is well illustrated by the example of the Mekong Xayabury dam in Laos. Despite the governments' official arguments presenting a dam as key for the regional development, the key question is to identify the real beneficiaries of such a project because the real trade-offs and monetary benefits are distinct of those of the investors. The building of such large infrastructure is a political affair and alternative options are often hidden away, if not totally ignored.*
- ***Existing institutional arrangements of the basin:** Once a dam is built and operational, a pending issue is to know what rules will apply to its operation and functioning and how potential (if not real) conflicts should be mitigated. It takes a new mindset to achieve efficient cooperation around an existing dam. The infrastructure has to be understood and addressed as an object impacting transboundary and national settings, both in the political and environmental dimensions: ultimately, changes in hydrological regime by dams come with important social consequences.*

Take away lessons:

- *Dam projects, selections and constructions have definitively political aspects of importance and may sometimes ignore viable alternatives.*
- *Building, operating and maintaining a dam, as well as its decommission when security or purpose is not met, all have transboundary/international and national dimensions.*
- *Tension management of dam disputes should be factored by implications of actual conflict transformation. Not only the biophysical processes but also the social processes need to be considered.*
- *Dam projects should be considered in a wider institutional setting by focusing on historical perspectives, rules of water allocation, existing and evolving institutional governance architectures in the basin.*

Questions for future action:

- *How can we handle the symbolism of large dams (as political object used to build a national identity) in international negotiations?*
- *How can States address alternatives to dams when the official purpose of a project can be perceived by other riparian states as achievable through other means?*
- *The issue of trust among stakeholders at all levels (sub-national, national, regional and international) was brought up as a key ingredient for any kind of cooperation. It is key at the planning and the building phase, as much as during the operation or the decommission stage of a dam.*

Source: https://www.genevawaterhub.org/news/round-table-role-large-dams-transboundary-water-negotiations

Strengthening the Science-Policy Interface for Improved Policy-Making. Indeed, benefits and costs of water infrastructure as well as trade-offs between various options, should be assessed and tracked (over time and space) to facilitate negotiations between concerned parties. To this end, policy making may be helped by scientific research that combines scenario simulations while ensuring stakeholders' participation and knowledge diversification. Research and data collection are indeed key to support negotiation processes and help tip the balance away from potential conflicts towards cooperation potential (GWH, 2019).

For instance, river basin simulation models and multiobjective trade-off analysis can be used to compare the performance of many different development and management options across a range of performance criteria, spanning economic, social and environmental objectives. In this approach, the river basin is simulated so that different groupings of water infrastructure (their spatial configuration, size and operating procedures) can be considered in an integrated manner rather than through a project by project approach. This means cumulative impacts are evaluated and system-scale strategic outcomes can be assessed before making investment decisions, and can influence siting, design, and operational decisions (FutureDAMS 2020). As the ongoing tensions around the Great Ethiopian Renaissance Dam (GERD) demonstrate, filling period performance impact acceptability of new dams in large systems. Indeed, making policy makers listen to, understand and engage in the use of science may be challenging given prevailing political agendas.

Importantly, as transboundary water infrastructures such as dams are a matter of foreign policy, they are typically only one of the components of the negotiations – which may include for instance trade or migration policy. A credible systemic analysis should therefore link water with other aspects such as trade, energy markets and socio-economic development.

Focusing on these challenges and existing dynamics at play, in view of a growing number of large dams being constructed or decommissioned, the Geneva Water Hub and IUCN's Environmental Law Centre launched in June 2020 the initiative "Dams: water flows regulation in a fragmented world" whose first step will be to elaborate an assessment of the legal tools applicable to dams planning, developing and monitoring.

Dam Safety a Growing Concern for Water, Security and Peace Globally and Regionally. The Sardoba dam disaster is a harbinger of challenges to come, with on the one hand the fast growth of new dam constructions in low capacity countries, and on the other hand the growing number of dams having exceeded their useful life and in need of expensive rehabilitation or decommissioning. In 2017, an independent forensics investigation concluded that the failure of the Oroville dam in California was due to a "long-term systemic failure" of general industry-wide practices for identifying and addressing problems. In 2018, a fatal hydropower dam collapse in Laos that wiped out numerous villages was blamed on substandard construction. On May 27, 2020 the nearly century-old Edenville dam in Michigan collapsed after a deluge of heavy rains. In the United States, more than 2,000 of the 15,000 U.S. dams with high-hazard potential are considered deficient due to a lack of investment in maintenance—leading the American Society of Civil Engineers to give the country's dam safety a grade of "D" on its Infrastructure Report Card. An insightful Lessons Learned from Dam Incidents and Failures website was recently created at damfailures.org.

Dam failure can be catastrophic for people, property, and power, potentially leading to conflicts—and the risks are rising, due to governance failures, lack of maintenance, growing vulnerability to climate change, and the demonstrated potential of cyberattacks. The risk is also growing because of hazard creep— the increasing risk resulting from continued development and urbanization below a dam or within its reservoir area. According to the International Commission on Large Dams, more than 59,000 dams have reservoirs big enough to flood entire communities. Dams symbolize water as precious but dangerous, as an instrument of peace and prosperity but also of a potential cause of hardship and conflicts during all its stages – design, construction and operation.

Another context is dams used in mining to store waste product materials, known as tailings. The failure of these structures over time, or due to natural disasters such as a flood or earthquake, can have devastating

consequences for neighboring water resources, or anything caught in its path. These failures can have long lasting impacts on water resources; the Brumadinho tailings dam disaster in 2019 is among Brazil's worst environmental disasters. UNEP has called for efforts to establish best practices and stronger international regulations on the construction and monitoring of tailings dams.

Developing Capacity and Policy for Dam Safety Cooperation in Central Asia and Globally. Fortunately, a number of steps in this direction have been taken recently in Central Asia, notably the establishment in 2018 with UNECE and Russian Federation support of the International Dam Safety Training Centre in Taraz, Kazakhstan **(see Box 5).** In view of the Sardoba dam disaster and growing risks in Central Asia and beyond, these efforts would need to be further supported, expanded and operationalized.

BOX 5: Central Asia Program for Dam Safety Cooperation – UNECE, 2019

A UNECE program developed capacity and policy for dam safety cooperation in Central Asia with financial support from the Russian Federation including: (i) Strengthening of national legislation and institutions; (ii) Capacity building, notably through the establishment of an ***International Dam Safety Training Centre in Taraz, Kazakhstan;*** *(iii) Regional-level harmonization of technical norms, data exchange and early warning systems, and (iv) Support to bilateral cooperation to ensure dam safety of individual dams or dam systems on transboundary rivers, such as the Ortotokoi dam in Kyrgyzstan where a safety monitoring system has been installed. The programme concluded in 2019 and it was agreed that the IFAS Executive Bureau in Kazakhstan could provide a platform for continued cooperation between the Central Asian countries. Remaining challenges include inadequate legislation and the establishment of responsible institutions in some of the countries as well as improved safety inspections and monitoring not only of large dams but also smaller ones.*

Source: https://www.unece.org/env/water/damsafety_third_phase.html

In addition, the World Bank is currently conducting a *Global Dam Safety Legal and Institutional Study*, whose objectives are: (i) to provide a comprehensive set of country case studies with a balanced representation among a diverse set of countries with varying economic, political and cultural circumstances; (ii) to carry out a comparative analysis of the legal, regulatory and institutional metrics along with financial and operating model analysis to identify a continuum of elements of exemplary practice and precedents and (iii) to recommend a set of legal, regulatory and institutional frameworks suitable for different country circumstances supported by a menu of different options.

On May 17, 2020, a group of experts affliated with Deltares in the Netherlands carried out a rapid preliminary analysis of the Sardoba dam disaster based on satellite data (Giri et al., 2020). Though the preliminary analysis based on satellite data cannot replace a more thorough and detailed assessment relying on ground a few preliminary insights and related recommendations were highlighted:

- Reviewing and enhancing water resources management system and disaster preparedness;
- Institutional strengthening including improving technical capabilities, human resources, policy and decision-making processes
- Enhancing non-structural measures such as establishing advanced and regular monitoring systems and inspections, developing water information, forecasting, early warning, decision support and asset management systems, impact assessment and emergency action plan, risk-based management of extreme events and disasters etc.

Other experts have recommended creating *a single database of hydraulic structures for Central Asia*¸ with technical "passports" for each object, methods of operation, maintenance and decommissioning.

These recommendations are relevant regionally and globally, it is vital to enhance dam safety by introducing innovative technologies that improve monitoring and forecasting of hydrological processes and extremes as well as safety and stability of the dams and embankments.

Harnessing Digitalisation Potentials for the Monitoring of Transboundary Agreements, Data Transparency and Exchange. As no transboundary monitoring and data exchange system was in place, Kazakhstan was initially surprised by the flood. The Sardoba dam though it is located in a transboundary basin had been built without notifying Kazakhstan as the downstream riparian and UNECE Convention principles were not adhered to. But as mentioned earlier, the Sardoba dam is the product of a low trust, low regional cooperation era which is clearly over as the remarkable hydrodiplomacy actions taken in the wake of the dam disaster do demonstrate, including drafting a proposed Agreement between Kazakhstan and Uzbekistan on the Joint Management, Use and Protection of Transboundary Water Bodies (see Box 1 above).

It should however be underlined that a transboundary agreement is only a starting point; the main issues remaining in implementation such as downstream flows impacts from dam filling and response mechanisms to droughts and other issues downstream. How effective will the mechanism for notification and adjustment be to ensure all parties get what they need from the river? Indeed, transboundary agreements only function as well as they are implemented and communicated. Therefore, reliable and transparent monitoring and forecasting of water resources is crucial. But the data necessary for water resources management are often insufficient and, when they exist, they are difficult to exploit because they are produced and managed by various organizations working in different sectors with little coordination.

In this regard, the accelerating digital transformation offers new opportunities for innovative water information systems to help move towards pooling, sharing and optimizing data, resources, services and spaces[9]. In particular, innovations in remote sensing[10] and crowdsourcing coupled with digitalization could transform the management, governance, financing and diplomacy of water in intersectoral and transboundary contexts, especially where conventional in-situ methods are neither feasible nor practical.

Ongoing NASA and ESA satellite missions already provide unprecedented insights into water balances at local, national, transboundary and continental scales. The future Surface Water and Ocean Topography (SWOT) mission of NASA and CNES will provide data with outstanding accuracy for river basin monitoring, including measurements of water levels, variations in reservoir water storage and estimates of river discharge. In addition, global planetary scale platforms like Google Earth Engine transform the capacities for the retrieval and analysis of remote sensing data: there is no need anymore for a river basin agency to have local heavy-duty and expensive computer infrastructure in place. These innovations could boost hydrodiplomacy and potentially help reaching an interstate agreement on the exchange of hydrological information in Central Asia which has been lacking for the last 20 years.

Developing Legal and Financial Instruments for Sustainable Dam Construction and Management.

The Central Asian countries have developed a fairly stable, although not perfect, legal framework of interstate cooperation in the management and use of transboundary water resources, though compliance monitoring has not been working well (Ibatullin & Ziganshina, 2020). However, like elsewhere in the world, design, construction and management of large water infrastructure including dams are not regulated by a single legal instrument and are instead guided by a set of binding and non-binding standards and guidelines **(see Box 6 below)**. These include procurement, social and environmental policies of international financing institutions; ESG principles voluntary applied by the private sector, and various norms and guidelines for construction, operation and decommissioning such as those of the International Commission on Large Dams (ICOLD) or the US Bureau of Reclamation (USBR).

[9] In July 2020 the Geneva Water Hub and the Pôle eau de Dakar, together with WMO, INBO and other partners organized a think tank roundtable on digital transformation challenges and opportunities river basin development organisations. The roundtable also discussed recent examples in Central Asia including in the Ferghana Valley and in the Chu-Talas basin. See details at https://www.genevawaterhub.org/news/digital-transformation-challenges-and-opportunities-west-african-river-basin-development, https://hydrohub.wmo.int/, and https://imomohub.org/

[10] See up to date information on remote sensing in the webinar organized in Sept. 2020 by INBO (International Network of River Basin Organisations) in partnership with the Geneva Water Hub: https://www.genevawaterhub.org/news/2nd-virtual-think-tank-roundtable-digitalisation-water-information-systems-governance-and

BOX 6: Construction and Management of Dams – Take Away Lessons (Geneva Water Hub, 2019)

The construction and management of dams are not regulated by one single legal instrument. They are guided by a set of binding and non-binding standards, norms, principles, guidelines, recommendations and customary rules. They provide a starting point and good guidance for negotiation processes. In the face of current and future environmental pressures (e.g. climate change) it is urgent to further develop specific guidance to coherently inform the stages of dams' planning, building and monitoring. Recent dams' failures highlight the importance of data collection and data exchanges as well as the development of warning systems and procedures. Diplomacy and public participation are key during the planning process to establish a good balance between various actors' interests and level the playing field among them.

Questions for future action include: (i) How to implement international laws more effectively in dam planning, construction and maintenance, and (ii) How to stimulate private sector actors to comply with international laws and standards everywhere on the globe and not only where they are closely "watched"?

Because large water infrastructure have a wide-ranging impact across boundaries, sectors and generations, the lack of a coherent and harmonized instruments can contribute to potential tensions or even conflicts in the face of 21st century megarisks such as water security, change climate and demographic pressures. In addition, the lack of clear and enforceable international standards and guidelines make it difficult to promote compliance, for instance through financial conditionalities. Finally, because large scale water infrastructure such as hydropower dams take a long time to design and construct and cause multiple environmental and social concerns they are often regarded as risky investments, especially by private sector investors. Usually, there is no lack of financing interest for these projects. However, due in large part to legal, regulation and governance deficiencies, there is a lack of projects which have an adequately managed risk profile that would allow different forms of finance to be blended into a successful package.

To help address these issues, the Global High-Level Panel on Water and Peace (GHLPWP) has called for strengthening legal and financial instruments for transboundary cooperation for water to contribute to inclusive, sustainable prosperity and peace, including by (GHLPWP, 2017):

- Creating financial and other incentives to promote transboundary water cooperation, including through expanded ESG (Environment, Social and Governance) principles.
- Encouraging riparian countries to undertake Joint Investment Plans;
- Intensifying work on supplemental instruments to the two UN Water Conventions, including "soft law instruments" such as guidelines and procedures facilitating transboundary water cooperation[11];
- Encouraging the use of UNECE Water Convention's cooperation mechanisms, in particular resort by countries and civil society to the Convention's Implementation Committee;
- Addressing the problem of preparing bankable projects by providing a neutral, independent "safe space," i.e. through pre-negotiation opportunities, to ensure adequate quality in project preparation and address major implementation issues early and proactively.

Even though the formulation and application of standards and principles are a long-term goal at global level, harmonization efforts should be made at basin and transboundary levels notably through Joint Investment Plans, which the GHLPWP also encouraged. However, transboundary agreements also have to "trickle down" to national level which implies that laws, standards and principles need to be adopted in the countries, and adequate capacity created nationally to ensure their implementation.

[11] See for instance Principle 2 on Joint Mechanisms and Commissions of the *Geneva List of Principles on the Protection of Water Infrastructure (2019*) at https://www.genevawaterhub.org/resource/geneva-list-principles-protection-water-infrastructure : "Watercourse States should create joint mechanisms and commissions, or in any case cooperate and coordinate, with a view to ensuring the protection, safe operation and maintenance of water infrastructure located on transboundary water resources".

West Africa provides inspiring examples of Joint Investment Plans underpinned by common rules and backed by legal and financial instruments at basin level. In Central Asia, attempts to establish a joint mechanism for the region in the form of an International Water-Energy Consortium have repeatedly failed in the last 20 years, probably because implementing common standards and rules also implied greater transparency and accountability, a particular challenge in view of the prevailing national and regional hydropolitics.

However, as the next chapter of this paper suggests, the recent and vastly improved regional cooperation discourse could help turn the compound crises of the COVID-19 pandemic and of the Sardoba dam collapse into a unique opportunity to reshape the transboundary water dynamics and secure a long-term, sustainable management of water, energy and food (WEF) in Central Asia and beyond.

MOVING FORWARD AT REGIONAL AND GLOBAL LEVELS: STRATEGIC OPTIONS

Towards Joint Vision and Strategic Planning to Strengthen Regional Cooperation in Central Asia. Beyond site-specific issues of governance, compliance and possible corruption schemes in the construction of the reservoir, addressing the root causes of the Sardoba dam disaster will require regional solutions. Indeed, while the construction of such "counter-balancing" reservoirs was meant to reduce the vulnerability of downstream countries to irrigation shortfalls by capturing winter flows (Adelphi & CAREC, 2017), these reservoirs in fact do not sufficiently protect against inter-annual variability and droughts and they lead to greater evaporative losses than reservoirs further upstream which are clearly more economically efficient.

Indeed the Sardoba dam is a symbol of the unilateral, piecemeal responses of a low regional cooperation era that cannot address existing and future needs and challenges. Instead, holistic and participatory approaches are needed to enable identification of workable and acceptable solutions and future directions have to be informed by and build upon innovative thinking and best practices around the globe **(see Box 7).**

BOX 7: Key Messages on the Future of Water Resources in Central Asia, Ibatullin and Ziganshina, 2020

Water is a key driver for food, energy, environmental security and social stability in the Aral Sea Basin (ASB). With the prospective economic and population growth of the basin countries, reliance on water resources will increase, urging the cooperation in jointly exploiting benefits and reducing costs.

Piecemeal responses cannot address existing and future needs and challenges. Holistic and participatory approaches are needed to enable identification of workable and acceptable solutions through research and on-the-ground work and their implementation through engineering, institutional and other measures.

The future directions on water resources management in the Aral Sea Basin must be built upon innovative thinking and best practices in the region and around the globe. Key areas for the future include (1) developing joint vision and strategic planning, (2) improving legal frameworks and institutions, (3) strengthening data, information and capacity, (4) promoting evidence based decision-making and water diplomacy, (5) harvesting the possibilities offered by infrastructure, technology and innovation, (6) enabling multi-sectoral and participatory governance arrangements at multiple scale, (7) paying more prominent attention to water quality and environmental degradation, and (9) recognising multiple facets and values of water.

Yet, in spite of the COVID-19 crisis, and despite a history of water mismanagement and regional tensions in the Syr Darya river basin, Uzbekistan and Kazakhstan managed not only to cooperate over the immediate recovery after the Sardoba dam disaster, but also to strengthen good neighborly relations, taking further steps towards joint management of the shared basin. They demonstrated to the world a textbook case of hydrodiplomacy in rapid action, effectively turning water from a potential source of conflict into an opportunity for cooperation and peace. A first important milestone was reached on July 2, 2020 with the signing of a joint roadmap for transboundary water management.

At the regional level, political will which for decades had been elusive, hindering regional cooperation, has emerged in recent years as shown by the IFAS Summit of August 2018 and the Second Consultative Meeting of the Heads of State of Central Asia in November 2019 **(see Box 8).**

BOX 8: Second Consultative Meeting of the Heads of State of Central Asia – Tashkent, 29 November 2019

At the Second Consultative Meeting of the Heads of State of Central Asia encouraging statements on regional water cooperation were made:

- *The Kyrgyz Head of State Jeenbekov, while recalling the 45% of the region's water resources are formed in Kyrgyzstan, called for the resumption of cooperation within the framework of the 1998 regional water-energy agreement that provides for compensation mechanism to upstream countries for the services they provide to downstream countries, including a comprehensive reform of IFAS.*
- *Tajikistan President Rakhmanov, recalling to up to 60% of regional water resources are formed in Tajikistan called for the effective use of the region's water and energy potential and for the need for coordinated actions in integrated water resources management, including within the framework of IFAS.*
- *The Uzbek leader called for finding a mutually acceptable solution to the urgent problems of shared water use and complex water and environmental problems notably by using innovative technologies and implementing the principles of the "green economy", leveraging the UN Trust Fund for the Aral Sea.*

These meetings could become an enabling platform for long-term strategic coordination, to increase trust and jointly develop a long-term strategic vision and its legal, financial and institutional instruments.

In early 2020, Tashkent and Dushanbe even began negotiations on the joint construction of two hydropower plants in Tajikistan on the transboundary Zerafshan river, mainly for the needs of Uzbekistan – a prospect which would have been unthinkable just a few years ago. And in mid-2020, the remarkable response by Uzbekistan and Kazakhstan to the Sardoba disaster was an illustrative demonstration of political will to manage cooperatively a bilateral crisis, boosting the positive collaboration dynamics in the region.

However, while political will is necessary, it is not a sufficient condition to achieve a breakthrough in regional cooperation on water. As it turns out, improvement of water cooperation, among others, depends on the resolution of economic, institutional and strategic issues that place serious constraints on decision making (Krasznai, 2020). The approach to transboundary water cooperation in Central Asia has so far been one of advancing technical cooperation in the joint management of a shared water resource. A new approach is thus needed to make water resources management central to socioeconomic development **(see Box 9).**

BOX 9: Key Messages on Transboundary Water Management in Central Asia, Krasznai, 2020

Narrowly defined national interests (e.g., irrigation versus hydropower) and lack of political will slowed down transboundary water cooperation in the quarter-century that followed the birth of independent states in Central Asia. Disputes over water inflict high economic costs on the countries and hinder environmental cooperation and climate change adaptation.

Geopolitical and geoeconomic change puts increasing pressure on the countries of the Basin to end resource competition in order to open the way to closer cooperation and more effective promotion of their shared interest within broader Eurasian integration processes.

Transboundary water cooperation must be placed within the broadest economic, political and strategic context. Participation of downstream countries in building large reservoirs in upstream countries would assure joint control and operation of strategically important regional infrastructure. Long-term regional strategies would more clearly and convincingly reveal shared interest than a focus on short-term issues, thus ensuring sustained support by governments and societies.

Existing regional frameworks must either be reformed or replaced by new forms of cooperation in order to successfully translate political will into highly effective, integrated management of regional water resources.

In recent years, several interconnected processes have been driving geopolitical and socio-economic changes, including the historic rapprochement between Tajikistan and Uzbekistan and the rapid growth of water-related investments and virtual water trade with countries in Eurasia, East and South Asia. Central Asian countries are now moving towards a more pragmatic approach on transboundary water issues than in previous years, when there was higher competition over water allocation. Central Asia's water footprint increasingly extends well beyond the Aral Sea basin with the rapid growth of virtual water trade and with the greater recognition of the value of water as an instrument of security and peace in Central Asia and beyond.

Indeed, a likely game-changer in Central Asia has been the fundamental changes to the water-energy-food nexus in recent years that could contribute to the emergence of more diversified, inclusive and greener Central Asian economies. On the one hand, boosted by the approval of a new CAREC[12] regional energy strategy in Tashkent in November 2019, future intra- and inter-regional power interconnections to Eurasia and South Asia such as CASA-1000[13] and TUTAP[14] could, by better aligning hydropower and irrigation water use in the summer, mitigate the sectoral and seasonal conflict that has defined relationships between upstream and downstream countries since the end of the Soviet Union.

On the other hand, irrigation water needs are decreasing as Central Asia is improving its water efficiency and firmly moving towards high-value agriculture and horticulture where it enjoys a tremendous comparative advantage and global high-end export potential – including in the European Union, Russia, in neighboring countries and China's US$6 billion fruit import market. These changes will likely accelerate thanks to Uzbekistan's historic decision in March 2020 to abolish the century-old quota system for cotton crops.

Investments in hard and soft infrastructure to increase Central Asian countries' self-sufficiency in their water, agriculture and energy sectors have been another less noticed, but important development. Although some of these investments may appear redundant from regional cooperation and efficiency standpoints, they also contributed to nation-building, reduced vulnerabilities and can therefore also be interpreted as investments into crisis prevention. Indeed, a key emerging lesson from the COVID-19 crisis is that minimization of redundancies and reliance on long supply chains when it comes to health, water and other critical services greatly increases the risks of system collapse. Achieving a balance between a more locally-based, circular water economy and broader economic efficiency objectives should help boost confidence and trust at all levels, leading to increasingly wide-ranging and beneficial cooperation.

While each country needs to develop its own vision – addressing policy, capacity, and financial challenges that are among the root causes of the failure of integrated water management approaches at river basin level – a shared long-term vision for a water-secure Central Asia, jointly implemented through an efficient legal, institutional and financial framework and taking into account the interests of each country, could become the driver of regional integration and post-COVID-19 economic recovery.

A possible framework could consist of 3 closely coordinated levels, with:

- ✓ **At the international level, an Economic and Financial WEF Consortium for Central Asia**, to (i) bring together key stakeholders, investors and financiers; (ii) help mobilize financing more efficiently and reduce costs and risks from unilateral borrowing through smart financial engineering, incentives and guarantees; (iii) help consolidate and expand a WEF (water-energy-food) market spanning from Central to South and East Asia; (iv) promote the harmonization of local stakeholder participation, investment, procurement, social and environmental standards with a joint investment approach; (v) assist with

[12] See https://www.adb.org/news/new-regional-energy-strategy-maps-path-secure-energy-future-carec-region. The ADB-managed *Central Asia Regional Economic Cooperation (CAREC)* Program comprises Afghanistan, Azerbaijan, China, Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

[13] The *Central Asia-South Asia power project (CASA-1000)* is a $1.16 billion project currently under construction that will allow for the export of surplus hydroelectricity from Kyrgyzstan and Tajikistan to Afghanistan and Pakistan.

[14] The *Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan (TUTAP) power interconnection project* aims to export power from Turkmenistan to Afghanistan and Pakistan.

strategic monitoring and dispute resolution. Crucially, a regional mechanism/consortium should not be majority-owned by any country; it should also be managed by one or more regional development bank(s).

- ✓ **At the regional level a Long Term Vision & Strategic Framework up to 2050**, driven by Central Asian countries through the IFAS Heads of State platform, to steer, monitor and fit investment and management pathways to changing parameters. Inter-generational aspects make it crucial to fully involve Central Asian youth especially young women in the elaboration of the vision & strategy.
- ✓ **At the basin/sub-basin level and if/where needed at bilateral level, a corresponding Joint Investment & Management Framework** across local, national and regional levels, leveraging innovative processes such as the digital transformation, flexible investment pathways, basin-wide / landscape financing, payments / investments for watershed services[15], and catalytic investments for local economic development.

Transforming Water into a Driving Force for Crisis Recovery, to Foster Prosperity and Peace in Central Asia and Beyond. The pandemic still shows no sign of abating and is expected to plunge most world's countries into recession in 2020, with a historic contraction of per capita income. In Central Asia, the COVID-19 crisis is deepening existing multi-dimensional challenges and is accelerating geopolitical and socio-economic change in the Eurasian region. Urgent and systemic action is needed to cushion the pandemic's health and economic consequences, protect vulnerable populations, and set the stage for a lasting recovery.

But while the devastating impacts that the pandemic is having on all Central Asian economies – still highly dependent on oil & gas revenues or remittances – could increase internal socio-economic tensions and rekindle regional disputes, water could become a driver of sustainable recovery in Central Asia and beyond. Indeed, growing pressure to take strategic decisions in response to the crisis may help achieve major advances on regional water cooperation issues that have hindered progress for decades.

The fascinating and encouraging case of "hydrodiplomacy in rapid action" in the aftermath of the Sardoba dam disaster could contribute to reshaping the transboundary water dynamics in Central Asia, key to accelerating recovery to the pandemic. Indeed, a central lesson of the COVID-19 crisis is the importance of working together on global problems, leaving no one behind – we are much stronger united than divided.

Thus, the window of opportunity has perhaps never been greater to create a forward-looking but realistic regional economic and financial mechanism – backed by a joint vision and a joint regional investment plan – to more effectively promote common strategic interests of Central Asian countries and to secure the sustainable management of water, energy and food in Central Asia and beyond. This would help address more effectively climate change, public health, demographic and other megarisks of the 21st century by making water a key instrument for crisis recovery and sustainable peace and prosperity.

Towards Safer and Smarter Dam Planning and Management at Global Level. Twenty years after the World Commission on Dams (WCD)[16] report was published, dam construction proceeds apace across the global South and neither the impacts nor the controversy over large dams have ended. Yet the context for these debates is changing, especially with the issues of climate change and downstream impacts now much more prominent on the public and policy agenda. Still, too many dams are planned without adequate analysis of alternatives, in piecemeal fashion with little regard for the principles of integrated and inclusive river basin management, or without paying sufficient attention to their social and environmental impacts and to the conflicts they may generate between sectors or countries.

[15] The Chu-Talas Commission between Kazakhstan and Kyrgyzstan has become a model instrument through which downstream countries can participate in the management of hydraulic structures located in upstream countries.

[16] The World Commission on Dams (WCD) worked between 1998 and 2000 to try to resolve long-standing controversies between supporters and opponents of large dams, by researching their environmental, social and economic impacts, by reviewing their effectiveness, and by developing standards, criteria and guidelines to advise future decision making. The WCD recommended some ten guidelines for dam building in its final report.

Dams and their reservoirs play an important role in social and economic development as they contribute to water security, energy supply, and flood protection though they also fragment habitats of freshwater species. Nearly 50% of the world's 58'000 large dams[17] (defined as having a wall higher than 15 metres) were built primarily for irrigated agriculture which contributes 40% of the total food produced worldwide. With a growing population, more dams and storage reservoirs will be required to meet fast increasing food and energy demands, as well as supporting flood and drought management to increase resilience to climate change. But to be resilient and sustainable dams should be planned, sited, operated or decommissioned in a holistic, systemic and forward-looking fashion, using public participation and diplomacy to establish a good balance between various actors' interests and between a range of resources and values.

Dam failure can be catastrophic for people, property, and the environment, potentially leading to conflicts, and the risks are rising, due to governance failures, lack of maintenance, growing vulnerability to climate change, the demonstrated potential of cyberattacks, and hazard creep— the increasing risk resulting from continued development and urbanization below a dam or within its reservoir area. Growing challenges to safely and sustainably manage tens of thousands of existing large dams coupled with the growth of new building urgently call for the strengthening of a global dam governance framework operating at all levels, with the support of major dam-building nations, including India and China.

Indeed, for long-term high impact infrastructure such as hydropower dams to remain viable, they must get smarter. Smarter in terms of where they are located, how they are designed and operated, and how they help unlock[18] other renewable energy technologies such as solar and wind (IUCN, 2020). Because large water infrastructure have a wide-ranging impact across boundaries, sectors and generations, the need for legal tools, best practices and guidelines[19] to improve the planning and governance of water-energy-food-environment systems has never been stronger. In addition, recent dams' failures highlight the importance of data collection and exchanges as well as warning systems and procedures.

A dam governance framework should thus be inclusive and holistic and involve all stages from planning to decommissioning. It should however not overly focus on megadams which are receiving most of the attention while many smaller dams – including high risk tailings dams – are neglected until a disaster makes the headlines. Furthermore, the accelerating digital transformation in the context of the covid-19 pandemic could help developing a dam governance framework by improving the analysis[20] of the impact of dams on society and environment as well as the impact of land use and climate change on the catchments of dams. With growing concern about the safety of aging structures and increasing populations at risk in inundation zones, more automatic monitoring of dams will be required in the future, another area where digitalisation could help by boosting the deployment of remote visual surveillance together with early warning systems.

The WCD's call for comprehensive options assessments and consideration of alternatives to large dams, including less costly energy sources, demand-side management, and improving the efficiency of existing assets, continues to be highly relevant. But though the formulation and application of international laws, standards and principles are a longer-term goal, harmonization efforts should begin now at basin and transboundary levels through *Joint, Smart Investment Plans*, with adequate capacity created nationally to ensure their implementation, and with financial and other incentives in place to ensure compliance.

---

[17] According to the International Commission on Large Dams (ICOLD) database. Their aggregate storage is estimated at 14'000 km^3 (or 1800 m^3/person). There are millions more of small dams that are unrecorded by the global databases.

[18] For example, by relying on solar power during the dry season and hydropower during the rainy season; by relying on pumped-storage schemes to save solar energy for periods of higher demand in winter; or by installing floating solar panels on reservoirs to save land and reduce reservoir evaporation.

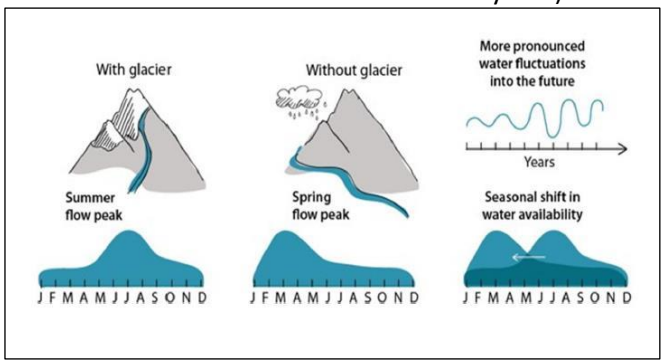
[19] Such as those in the WCD report, and from websites such as FutureDAMS.org or damfailures.org/lessons-learned/

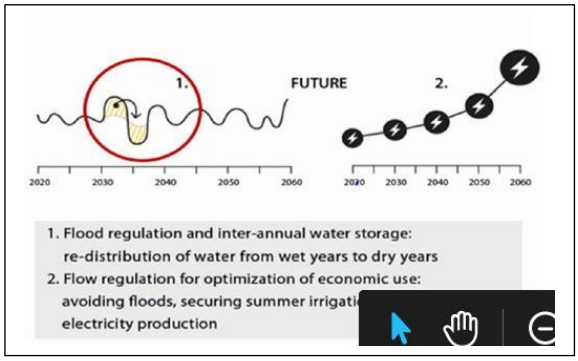
[20] In early 2020, King's College London launched a global dataset of more than 38'000 georeferenced, digitized dams as well as their associated catchments. See https://www.nature.com/articles/s41597-020-0362-5

ANNEX

Towards Water Secure Sustainable Economies in Central Asia (World Bank, 2019)

- Central Asian economies are performing far below their water potential and relative levels of water withdrawal are high in some cases unsustainably high.
- Unlocking growth requires structural transformation of economies, and releasing some water from the agricultural sector to ensure reliable supplies for industry and service sectors as the real engines of growth.
- Agriculture remains an important sector for employment especially in Afghanistan and Tajikistan, and dominates total water use. And with excessive withdrawals in some countries, and very low water productivity, improving irrigation performance is critical.
- Population growth and economic growth will continue, driving up food and energy demands, and increasing the pressure on finite water resources.
- Climate change could have major economic consequences. Significant strengthening of water governance and improved infrastructure are required to build resilience of irrigation systems, water supply services and agricultural communities.
- Growing populations mean increased demands. Higher temperatures also mean increased demands and multiple other stresses. Alternative pathways are needed to avoid this scenario.
- With the right mix of policies included for change water allocation and risk sharing, institutional reform, as well as investment in modernization of water infrastructure especially for irrigation, Central Asia can continue strong growth in the face of climate change and other challenges:
  - Action Area 1: Water & Sanitation for Social Stability & Human Capital Development. Investment required for universal WSS is less than the current economic costs of inadequate WSS. Economic losses due to lack of improved water: health care costs, productivity costs, premature death. Climate resilient utilities will increasingly have to make decision under uncertainty. Critical to: know the system, identify the vulnerabilities, take no regret and adaptive actions as climate change evolves
  - Action Area 2: Water Resources Overhaul for Increased Productivity. Modernize agriculture and change irrigation methods to increase productivity. Review water allocation polices to ensure water security for all sectors. Private sector engagement for innovation and productivity increases.
  - Action Area 3: Energy Development and Trade as Engine of Growth. Meet climate targets by developing renewable energy potential which exceeds national and regional demand. Modernize grid and provide renewable feed in mechanisms. Progressively increase trade in energy from hydropower. Develop cross border agreements on energy water tradeoffs.
  - Action Area 4: Adaptation to Climate Change for Economic and Social Resilience. Prepare for more variability in hydrology (especially more severe droughts) and a likely eventual decline in water availability. Revise reservoir operations to balance energy security, water supply and mitigation of extreme floods. Improve weather and water information services including forecasting (return on investment: 200 to 400% over 7 years)





REFERENCES

Adelphi and CAREC (2017), Rethinking Water in Central Asia: The costs of inaction and benefits of water cooperation, https://www.adelphi.de/en/publication/rethinking-water-central-asia

Asia News.ru (2020), Will the Sardoba tragedy help overcome water isolation in Central Asia? http://asiais.ru/society/26643.html

BBC Uzbek News (2020), Uzbekistan: Will there be an open investigation into Sardoba? https://www.bbc.com/uzbek/52588813

BBC Uzbek News, Uzbekistan official: Wind and rain are not the cause of Sardoba tragedy https://www.bbc.com/uzbek/uzbekistan-53555801

Bréthaut C. and Pflieger G. (2019), Governance of a Transboundary River: The Rhône; Palgrave Studies in Water Governance: Policy and Practice

Eurasianet (2020), Uzbekistan: Dam collapse raises uncomfortable questions https://eurasianet.org/uzbekistan-dam-collapse-raises-uncomfortable-questions

Fofana, A. (2020), Les barrages hydroélectriques en Guinée : D'importants investissements pour si peu de résultats. https://www.guineenews.org/dossier-les-barrages-hydroelectriques-en-guinee-dimportants-investissements-pour-si-peu-de-resultats/

FutureDAMS (2018), What's the economic value of water stored in dams? http://www.futuredams.org/whats-the-economic-value-of-water-stored-in-dams/

Geneva Water Hub (2017), A Matter of Survival: Report of the Global High-Level Panel on Water and Peace https://www.genevawaterhub.org/resource/matter-survival

Geneva Water Hub (2019), The Role of Large Dams in Transboundary Water Negotiations, https://www.genevawaterhub.org/news/round-table-role-large-dams-transboundary-water-negotiations

Geneva Water Hub and IUCN (2020), DAMS: water flows regulation in a fragmented world https://www.genevawaterhub.org/news/dams-water-flows-regulation-fragmented-world-iucn-collaboration

Harou J. et al. (2020), Stakeholders should get a fair share of benefits from inter-connected water-energy systems http://www.futuredams.org/benefits-water-energy-systems/

Ibatullin S. and Ziganshina D. (2020), The Future of Water Resources in Central Asia, in The Aral Sea Basin: Water for Sustainable Development in Central Asia, Earthscan Series on Major River Basins of the World

IUCN, International Union for the Conservation of Nature (2019), The Future of Dams, Viable Options or Stranded Assets? IUCN Water https://digital.iucn.org/water/the-future-of-dams/

Giri S., Donchyts G. and Hegnauer M. (2020), Rapid desk analysis of the dam breach at Sardoba reservoir in Uzbekistan https://www.researchgate.net/publication/341326590_Rapid_desk_analysis_of_the_dam_breach_at_Sardoba_reservoir_in_Uzbekistan

KAZINFORM.kz – News of Kazakhstan (2020), Kazakhstan and Uzbekistan signed a Roadmap on cooperation in the water sector https://www.inform.kz/ru/kazahstan-i-uzbekistan-podpisali-dorozhnuyu-kartu-o-sotrudnichestve-v-vodnoy-sfere_a3668576

Khadem et al. (2020), What do economic water storage valuations reveal about optimal vs. historical water management?, Water Resources and Economics

Krasnaya Vesna (2020), Kazakhstan prepared an agreement with Uzbekistan on transboundary waters https://rossaprimavera.ru/news/37ce420f

Krasznai M. (2020), Transboundary Water Management in Central Asia, in The Aral Sea Basin: Water for Sustainable Development in Central Asia, Earthscan Series on Major River Basins of the World

Kun.uz (2020), Kazakhstan presents draft agreement with Uzbekistan on trans-boundary water management https://kun.uz/en/news/2020/05/26/kazakhstan-presents-draft-agreement-with-uzbekistan-on-trans-boundary-water-management

Kzvesti.kz (2020), Why Does the Syr Darya Crack? https://kzvesti.kz/kv/thirdband/47853-otchego-meleet-syrdarya.html

International Water Management Institute (2013), Managed Aquifer Recharge: The Solution for Water Shortages in the Fergana Valley, IWMI Research Report https://wle.cgiar.org/managed-aquifer-recharge-solution-water-shortages-fergana-valley

International Water Management Institute, Groundwater Solutions Initiative for Policy and Practice (GRIPP) https://gripp.iwmi.org

NASA Earth Observatory (2020), Flooding in Uzbekistan and Kazakhstan https://earthobservatory.nasa.gov/images/146703/flooding-in-uzbekistan-and-kazakhstan

President of the Republic of Tajikistan (2019), Speech at the Second Consultative Meeting of the Heads of State of Central Asia http://president.tj/ru/node/21887

RITMEURASIA.org, Subsidiary regime: how Kazakhstan and Uzbekistan eliminated floods https://www.ritmeurasia.org/news--2020-06-02--vspomogatelnyj-rezhim-kak-kazahstan-i-uzbekistan-likvidirovali-navodnenie-49298

Rivers Without Boundaries (2020), Two months after Uzbekistan dam collapse: is there a hope to avoid the next one? http://www.transrivers.org/2020/3099/

Sputniknews.ru (2020), Breakthrough of a dam on a reservoir in Syrdarya https://uz.sputniknews.ru/trend/proriv-dambi-v-Sirdarye/;

Sputniknews.ru (2020), Kazakhstan presented a draft agreement on transboundary waters with Uzbekistan https://uz.sputniknews.ru/incidents/20200526/14215871/Kazakhstan-predstavil-proekt-soglasheniya-o-transgranichnykh-vodakh-s-Uzbekistanom.html

Sputniknews.ru (2020), A project on cross-border waters with Uzbekistan has been prepared https://ru.sputniknews.kz/society/20200525/14064645/kazakhstan-transgranichnye-vody-uzbekistan.html

The Astana Times (2020), Kazakhstan and Uzbekistan Unitedly Deal With Flood Consequences After Major Dam Collapse In Region https://astanatimes.com/2020/05/kazakhstan-and-uzbekistan-unitedly-deal-with-flood-consequences-after-major-dam-collapse-in-region/

The Diplomat (2020), Investigating Dam Collapse a Test for Uzbekistan https://thediplomat.com/2020/05/investigating-dam-collapse-a-test-for-uzbekistan/

The Economist (2020), A dam failure raises concerns about corruption in Uzbekistan, 6 August 2020 https://www.economist.com/asia/2020/08/06/a-dam-failure-raises-concerns-about-corruption-in-uzbekistan

The Institute for Peace and War, Central Asian Bureau for Analytical Reporting (2020), Dam Collapse in Uzbekistan. What Will Investigation Reveal? https://cabar.asia/en/dam-collapse-in-uzbekistan-what-will-investigation-reveal/

The International Journal of Hydropower and Dams (2020), Investigations underway following Sardoba dam breach in Uzbekistan, www.hydropower-dams.com/news/investigations-underway-following-sardoba-dam-breach-in-uzbekistan/

The Third Pole, Understanding Asia's Water Crisis (2020), Uzbekistan dam collapse was a disaster waiting to happen https://www.thethirdpole.net/2020/06/23/uzbekistan-dam-collapse-was-a-disaster-waiting-to-happen/

VESTI.kg – News of Kyrgyzstan (2019), Sooronbai Jeenbekov in Tashkent: 45% of all water resources of the region are formed in our mountains https://vesti.kg/politika/item/66692-sooronbaj-zheenbekov-v-tashkente-v-nashikh-gorakh-formiruetsya-45-vsekh-vodnykh-resursov-regiona.html;

World Bank, 2010, Afghanistan - Scoping Strategic Options for Development of the Kabul River Basin: A Multisectoral Decision Support System Approach, https://openknowledge.worldbank.org/handle/10986/18422

World Bank, 2010, The Zambezi river basin: a multi-sector investment opportunities analysis http://documents.worldbank.org/curated/en/724861468009989838/Summary-report

World Bank (2019), No More Business as Usual: Improving Water Usage in Central Asia https://www.worldbank.org/en/news/feature/2019/06/28/no-more-business-as-usual-improving-water-usage-in-central-asia