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SHARED RESOURCES, JOINT RESPONSIBILITIES

Transboundary Water Management in Central Asia

Central Asia is a huge landmass situated between the Caspian Sea in the West and the mountain ranges of the Pamirs and the Hindukush in the South-East. For centuries, caravans travelled along the famous Silk Road connecting Europe and Asia, and crossed the two main rivers of the region: the Amu Darya and the Syr Darya, which were known by the ancient Greeks as the Oxus and the Jaxartes. More than 1000 years ago, powerful Khans had already developed complex irrigation systems along these rivers, serving as a basis for economic prosperity and development.

Water from the mountains feeds irrigation fields in the valleys. Fed mainly by snowmelt, riverbeds are full with water in spring and almost dry in late summer.

Before the break-up of the Soviet Union in 1991, both rivers ran mostly inside the USSR, with a small upstream part of the Amu Darya in Afghanistan. Today, sharing the water has become much more complicated, because the rivers cross the territories of six independent states: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and Afghanistan. By virtue of today's political geography, these countries are destined to reach cooperation against a backdrop of growing populations, institutional upheavals and climate change.

This exhibition tells about the challenges of sustainable transboundary water management in Central Asia, the achievements so far, and how the international community can support peaceful water cooperation.

Auswärtiges Amt

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

in cooperation with

THE BERLIN PROCESS

Germany's offer for regional water cooperation to Central Asia

On 7–8 March 2012, the conference ‹Blue Diplomacy for Central Asia› reaffirmed the ‹Berlin Process›, the German Federal Foreign Office's Water Initiative for Central Asia. In the joint ‹Berlin Declaration›, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan and Germany acknowledged the success of the first phase of the Berlin Process, which had started in 2008, and expressed their intention to continue and develop their cooperation in a second phase.

On April 1st, 2008, German Federal Foreign Minister Steinmeier launched the Berlin Process at the conference ‹Water Unites›.

German Federal Foreign Minister Westerwelle and high-ranking representatives from the five Central Asian states confirm the continuation of the Berlin Process at the ‹Blue Diplomacy› conference in March 2012 in the premises of the Federal Foreign Office in Berlin.

The activities of the Berlin Process take place on three levels:

1. **Political-institutional level:**
   supporting effective institutions for water management and coherent policies
   This most extensive element of the Berlin Process is implemented with the Transboundary Water Management in Central Asia Programme, which is being carried out by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. GIZ is collaborating closely with national, regional and international partners, in particular the United Nations Economic Commission for Europe (UNECE), the Executive Committee of the International Fund for Saving the Aral Sea (EC IFAS) and the Central Asian Regional Environmental Centre (CAREC). Since 2012, the programme has been co-funded by two European Union grants under the EU Regional Environmental Programme for Central Asia (EURECA).
2. **Scientific-technical level:**
   establishing scientific and technical preconditions for efficient water management
   This component is implemented by the Regional Research Network ‹Central Asian Water› (CAWa), which is coordinated by GFZ German Research Centre for Geosciences. In order to support the establishment of reliable databases and develop technical measures designed to enhance efficiency, GFZ cooperates closely with research institutions in Germany, such as the German Aerospace Center (DLR) and the Center for Development and Environmental Research (ZEU), and in Central Asia, such as the Scientific Information Center of the Interstate Commission for Water Coordination (SIC ICWC).
3. **Capacity building level:**
   developing professional capacities for integrated water resource management
   This component takes the form of a Master's course in integrated water resource management. The programme is conducted at the Kazakh-German University (DKU) in Almaty in cooperation with the Freie Universität Berlin. The interdisciplinary course covers the technical, political, judicial and economic aspects of water management and is open to students from the whole region.

Regional partner conference taking stock of phase 1 of the GIZ programme

CAWa researchers making measurements for glacier monitoring

Central Asian students of the DKU celebrating their graduation

During the second phase of the Berlin Process (2012–2014), the Central Asian states and Germany will further strive to strengthen and develop transboundary cooperation on sustainable use of water resources with a view to improving the ecological, social and economic situation in the region. The Berlin Process is open to all players.

GLACIERS, RIVERS, LAKES

Water sources in Central Asia

Central Asia is characterised by a dry and continental climate with very low precipitation levels. Livelihoods depend to a large extent on the water from the rivers and lakes, which are largely fed by melt from snow and partially from glaciers in the Tien Shan, Gissar-Alay and Pamir mountains in Kyrgyzstan, Tajikistan and Afghanistan. Glaciers cover about 4% of the Kyrgyz and 6–8% of the Tajik territory. However, due to climate change, the volume of glaciers has decreased during the past decades and will continue to shrink.

View of Khan Tengri Mountain in Kyrgyzstan (6,995 m).

On average, 43% of the annual discharge in the Aral Sea basin formed by the Amu Darya and Syr Darya rivers originates in Tajikistan, 24% in Kyrgyzstan, and approximately 25% in Afghanistan, making these countries the «water towers» for Central Asia.

Tens of thousands of small rivers originate from these mountain areas and supply the pastures and fields with water. Many eventually drain into one of the transboundary rivers – in addition to Syr Darya, Amu Darya and their tributaries, other major rivers include the Zerafshan River flowing from Tajikistan into Uzbekistan, the Chu and the Talas Rivers flowing from Kyrgyzstan into Kazakhstan, and the Murghab and Tejen Rivers flowing from Afghanistan into Turkmenistan.

Freshwater is also stored in thousands of mountain lakes in Kyrgyzstan and Tajikistan – most of these located above 3,000 m. There are also many salt-water lakes, like Lake Karakul in Eastern Tajikistan, which has an elevation of 3,914 m.

Many small streams form in the mountain areas of Central Asia and later feed into larger rivers like here the Zerafshan in Tajikistan.

The lowlands of Central Asia are characterised by deserts and semi-deserts, steppes and low hills. They cover most parts of the downstream countries Kazakhstan, Uzbekistan and Turkmenistan, but also some smaller regions in Kyrgyzstan and Tajikistan. Oasis regions can be found along major rivers, including the Urgench and Dashoguz region on the lower Amu Darya.

Only the south-eastern part of Kazakhstan's enormous territory belongs to the Aral Sea basin, but the country also shares river basins with China and Russia. Lake Balkhash (18,210 km²), for example, is Kazakhstan's largest lake, and is mainly fed by the Ili River, which comes from China.

The majority of the surface water available in Kazakhstan, Uzbekistan and Turkmenistan originates in neighbouring countries – in Turkmenistan it is almost 100%. These countries are therefore dependent on the inflowing transboundary rivers and vulnerable to any upstream developments like construction of new infrastructure or increased water withdrawals that change the water flow and volume of these rivers.

Running through desert and steppe areas, the Syr Darya allows for irrigation agriculture along its riverside. Due to its meandering course, it is difficult to exactly measure its water flow.

Water resources and water usage in the Aral Sea Basin

Ak-Shyirak glacier in the mountains of Kyrgyzstan

Stretching 77 km, the Fedchenko Glacier in Tajikistan is the largest glacier outside the world's polar regions.

Lake Sarez (3,239 m above sea level, 86.5 km²) is 490 metres deep and was formed after a 1911 earthquake triggered a landslide that formed a natural dam blocking the Murghab River.

After Lake Titicaca in South America, Lake Issyk-Kul in Kyrgyzstan is the second-largest alpine lake. It is located in the Tien Shan Mountains 1,608 metres above sea level, and is a popular holiday destination.

The Toktogul reservoir on the Naryn river is the biggest reservoir in Kyrgyzstan.

Amu Darya and Syr Darya: Central Asia's lifelines

Central Asia's two biggest rivers, the Amu Darya and Syr Darya, flow into the Aral Sea and together form the Aral Sea Basin. The basin comprises southern Kazakhstan, most of Kyrgyzstan and Turkmenistan, practically the whole of Tajikistan and Uzbekistan, as well as the northern part of Afghanistan and a small portion of Iran.

The Amu Darya has an average annual water flow of 74 km³, making it Central Asia's mightiest river. Its origins are the rivers Pjanj and Vakhsh in the Pamir mountains of Tajikistan and Afghanistan. After their confluence, the Amu Darya forms Afghanistan's border first with Tajikistan, then with Uzbekistan and Turkmenistan. It crosses Turkmenistan and flows into Uzbekistan, where it used to reach the southern shore of the Aral Sea. Its total length from its source, the Pjanj, is 2,540 km.

The Syr Darya is considerably longer at 3,019 km, but its average annual flow is much smaller: 37 km³ per year. Its source is the Naryn river, which originates in the Tien Shan mountains in Kyrgyzstan, flows into the Ferghana valley, and becomes the Syr Darya after it joins the Kara Darya. It crosses Uzbek and Tajik territory before it flows again into Uzbekistan and then into Kazakhstan, where it ends in the northern part of the Aral Sea.

Both rivers are mainly fed by melt from snow and glaciers with water flow peaks in the spring and summer. The flow can vary considerably due to weather conditions. In wet years, the Amu Darya has reached up to 96.3 km³ (1969), while its flow shrank to 52.8 km³ in 1947. Similarly, the Syr Darya's flow was only 18.3 km³ in 1917, while it reached 72.5 km³ in 1921. In order to regulate water flows and have water available when needed, a sophisticated system of dams, reservoirs and hydro-facilities has been built over the past century. The operation of this infrastructure, much of which is of transboundary significance, requires sound coordination among the involved national agencies.

PEOPLE AND DEVELOPMENT

Water Usage and Water Management in Central Asia

Water in Central Asia as such is not scarce. But there are shortages – in some regions, at some times. This is the result of both natural and human-made causes:

Uneven distribution of water: The source of most of the renewable surface water is in the mountain regions of Tajikistan, Kyrgyzstan and Afghanistan, while most of the water is used in the downstream countries of Kazakhstan, Turkmenistan and Uzbekistan.
High variability of water: Rivers are fed mainly by snow and glacial melt. This leads to high seasonal variability in water flow, with peaks in the spring and summer. Annual water availability varies dramatically, depending on the amount of precipitation in the respective year.
Inefficient usage of water: Chronic over-exploitation, inappropriate management of water resources by users, and inadequate and deteriorated infrastructure lead to huge water losses.

The Central Asian people have adapted to the natural conditions by erecting a complex system of hydro-technical infrastructure throughout the region. More than one hundred reservoirs store water in order to release it when it is needed – either in winter to produce energy with hydropower plants or in summer to supply the irrigation systems with water. The largest reservoirs are located on the big rivers in the high mountains – like the Nurek reservoir in Tajikistan and the Toktogul reservoir in Kyrgyzstan. Several huge artificial water bodies have also been created at the middle reaches and downstream – for example the Kairakkum and Shardara reservoirs on the Syr Darya, and the Tujamujun reservoir on the Amu Darya. In order to bring water to the fields, more than 60,000 km of channels have been built. The largest piece of water infrastructure is the Karakum canal in Turkmenistan, which stretches for more than 1300 km. It brings water from the Amu Darya River across the desert country, providing almost 90% of the country's water.

Many of these hydro-technical facilities are of transboundary importance – be it because they are located right at a border, or because they regulate water discharge to a downstream neighbour.

Rice is cultivated in many parts of Central Asia and is very profitable to sell on the domestic market.

During Soviet times, Central Asia produced up to 3 million tons of cotton per year. Today the cultivation is around 1.5 million tons per year.

Agriculture accounts for 90% of water usage in Central Asia. Although the amount of arable land is limited, agriculture is an important sector of the economy for all countries in the Aral Sea Basin, absorbing a considerable part of the workforce and providing livelihoods for the rural population. The most important cash crop is cotton, planted on huge areas and providing export incomes especially in Tajikistan, Turkmenistan and Uzbekistan.

In the upstream countries, water resources are also valuable due to the hydropower potential. Kyrgyzstan and Tajikistan hardly possess any hydrocarbons like oil, coal or gas, which could be used for domestic energy production. But water is available in abundance. Hydropower plants provide more than 90% of the two countries' power and even export some energy. In addition to the existing power plants built during the Soviet period, several new ones have been constructed and more are being planned in order to overcome the energy shortage.

Turbine house of the Nurek Dam, which provides around 55 per cent of Tajikistan's hydro-electricity.

These different usages of water have to be well-coordinated – among the different sectors at the national level as well as between the upstream and downstream states on the regional level.

Cotton is cultivated on about 2.5 million hectares in Central Asia and picked by hand.

Water management has a long history in Central Asia. This water filter for supplying drinking water to the ancient city of Gonurdepe in Turkmenistan was built around 1000 bc.

There is a very limited amount of arable land in Central Asia – in the mountainous countries less than 10% of the total land. Often, even the smallest arable areas are used, like here in the Zerafshan valley.

Old pumping infrastructure at Kairakkum reservoir in Tajikistan. Due to the mountainous territory, in many parts of the country water has to be pumped up to arable land.

Water management in the past

Over centuries, complex systems of water management evolved in arid Central Asia. These ensured effective use of the water flowing from snow melt through the rivers, and provided the foundations of powerful regional empires. From the 1860s on, Central Asia fell under control of Russia. It fostered the expansion of water-intensive cotton production with new irrigation systems. The Soviet Union continued to construct large-scale irrigation networks. New water infrastructure was critical for development of this part of the Soviet Union and to boost cotton production.

The Soviet ideology believed in the human ability to exploit natural resources indefinitely. In the lowlands, tens of thousands of kilometres of channels were built. In the upstream mountain regions, reservoirs were constructed to improve the regulation of the rivers. These reservoirs were operated primarily for downstream irrigation supply. A unified water-energy system ensured that the upstream countries, in exchange for water withdrawal during the growing period in spring and summer, received energy in the form of coal and gas in winter from the downstream states.

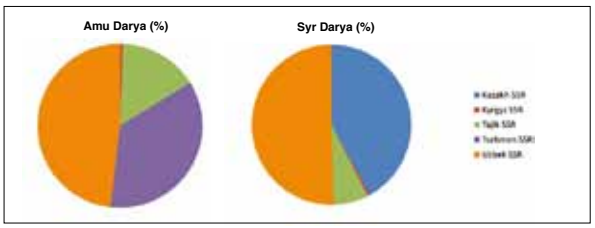
Irrigated lands rose from 4.2 million ha in 1950 to 7.4 million ha in 1989 (74,000 km²) – more than two times the territory of Belgium or the U.S.-state of Maryland. Water consumption increased accordingly, and the flow of Amu Darya and Syr Darya into the Aral Sea decreased dramatically from an average of 56 km³ per year in the beginning of the 1960s to around 6 km³ in the 1980s.

In the 1970s, the first consequences began to emerge: the shrinking of the Aral Sea, attendant desertification, the salinisation of fields, water pollution by fertilisers and pesticides, and water shortages in downstream areas. It was not until the 1980s that the government reacted with institutional changes: It set up two river basin agencies for the Amu Darya and Syr Darya along with a system of water quotas, which limited the amount of water each Republic was allowed to use from each and every river.

Facing the legacy of the Soviet Union: Challenges for water management after independence

After independence, the new Central Asian states were confronted with the legacy of Soviet water management:

- The remnants of the drying Aral Sea, now shared by Kazakhstan and Uzbekistan
- Large agricultural areas suffering from degradation and salinisation
- Huge hydro-technical facilities and infrastructural systems that had to be maintained
- The dissolution of the centralised agency that managed water allocation and provided for implementation
- A water management system mainly oriented at agricultural needs, entitling the downstream states to use most of the water
- The discontinuation of the water-energy exchange system that delivered energy in the form of coal and gas to the upstream states in winter, in exchange for water withdrawal in the growing period in spring and summer.



Water withdrawal quotas in the Aral Sea basin, established in the 1980s for the riparian Soviet Republics (SSR)

Three challenges thus needed to be addressed by the newly independent Central Asian states:

- How to distribute water among the users
- How to coordinate the timing of water releases
- How to share infrastructure costs

WATER FOR ENERGY

Potential for development or a risk to livelihoods?

The hydropower potential of Central Asia is tremendous. Hydropower meets more than 90% of total electricity needs in Kyrgyzstan and Tajikistan and is also an export commodity. Tajikistan has an installed capacity of 4950 MW and the highest per capita hydropower production in the world, but still uses only a small fraction of its estimated potential. Yet both Tajikistan and Kyrgyzstan face serious energy shortages in winter, threatening the wellbeing of the people and economic development.

The Toktogul hydropower plant, constructed in the 1960s, is Kyrgyzstan's largest. The reservoir allows long-term regulation of the runoff of the Naryn River, which influences the whole Syr Darya river basin.

After the break-up of the Soviet Union and its integrated water-energy exchange system, the upstream countries have increasingly been using their water reservoirs for energy production in winter. As a consequence, less water is available for release during spring and summer, when irrigation demand peaks. In addition, new dams with hydropower plants have been constructed or are currently being built. These include Kambarata-1 and -2 in Kyrgyzstan or Sangtuda-1 and -2 in Tajikistan. In particular, huge dams like the planned Roghun in Tajikistan provoke concerns with downstream states. They fear that less water will reach them for fulfilling their needs and worry about negative environmental impacts. Several international actors are involved in mitigating these tensions, such as the World Bank which finances objective analysis on the feasibility and impact of the Roghun reservoir. However, without the political will of the concerned parties, the potential for such efforts being successful is quite limited.

Nevertheless, there are several models to reconcile agricultural, environmental and energy water needs:

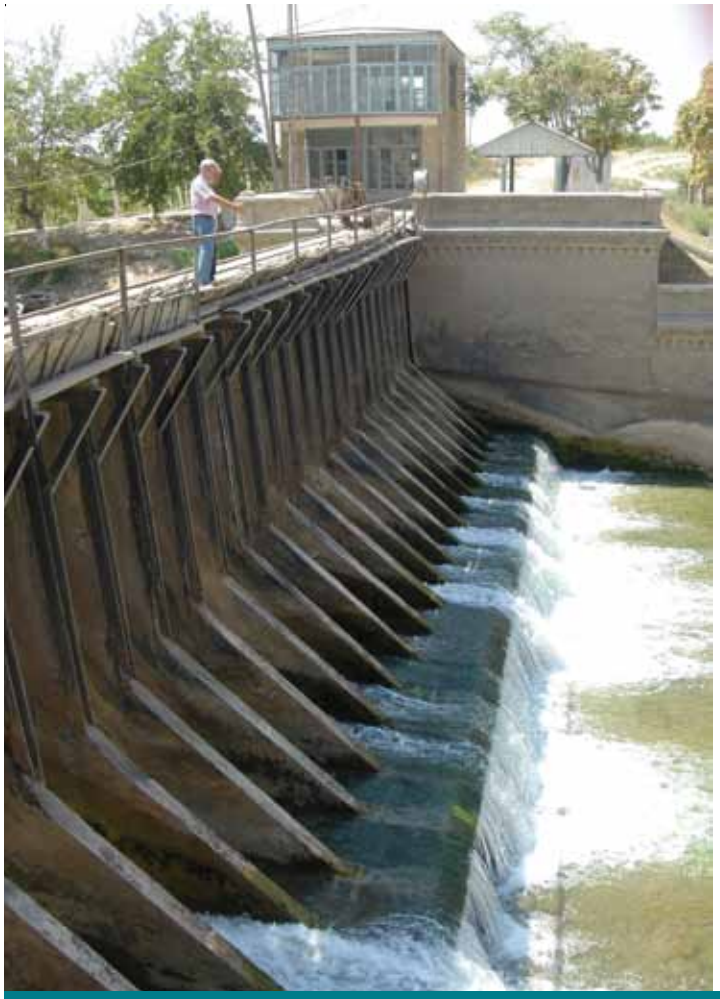
- If the release of water in summer is profitable, the money earned can be used for coal and gas imports in winter. The energy produced in summer could be bought by the downstream states or be exported to regions with high energy demand in summer. The Central Asia South Asia Regional Energy and Trade (CASA-1000) project is pursuing this option. It plans to construct high-voltage power lines linking the energy producers in Kyrgyzstan and Tajikistan with the markets in Afghanistan and Pakistan that have high electricity demand for air-conditioning.
- Cascades of dams allow for multiple uses of water. Once water has been used to produce energy and is discharged, it can be stored in a reservoir further downstream until needed for irrigation.
- Constructing a large number of small hydropower stations represents a huge potential in Kyrgyzstan and Tajikistan and does not interfere with other forms of water use, while providing energy solutions in particular for small villages in remote mountainous areas.
- Another option that does not alter the water regime is 'run-of-the river' hydropower, which uses small dams and only a very small storage reservoir or none at all.

A mini hydropower plant constructed by GIZ in the village of Dashti-Obburdon in the Tajik mountains.

It supplies about 1000 inhabitants, one school and a medical station with energy.

Energy and irrigation needs can be met in a way that improves living conditions for all riparians. Nevertheless, this requires investments in the transmission infrastructure, the will to cooperate and long-term reliable agreements. Consultative processes among all concerned stakeholders are a necessary foundation to build up this will and ensure that seemingly conflicting needs are met with a comprehensive approach that ensures benefits for all.

The Nurek hydropower plant in Tajikistan generates about 55 per cent of the country's total hydroelectric energy. At 300 metres, the earthen Nurek Dam is the highest dam in the world.



When the Hindukush hydropower plant was completed in 1913 on the Murghab River in Turkmenistan, it was the largest hydropower plant in the Russian Empire. It still operates today.

Mini hydropower stations are alternative sources of energy in remote mountain villages.

WATER – A PRECIOUS RESOURCE

Improving efficiency and overcoming over-exploitation

Physically, there is enough water in Central Asia. But the region faces water scarcity due to chronic over-exploitation and inappropriate management. The environmental disaster of the Aral Sea is the most visible consequence.

Inappropriate management has many aspects:

Inadequate and deteriorated infrastructure: Large parts of irrigation infrastructure (i.e. reservoirs, pumps, headworks, canals) were built during the Soviet Era. Many canal beds are not lined, so water filters into the ground. The annual water withdrawal is 100-120 km³. An average of 40–50% of irrigation water is lost. This water – around 50 km³ per year – would be enough to flood the entire territory of Germany with more than 10 cm of water.

Damaged infrastructure causes massive loss of water already on its way to irrigated fields.

Inefficient irrigation techniques: Much of Central Asia's agricultural land is irrigated with the water-consuming flood irrigation method. This requires much more water than advanced techniques like drip irrigation.

Waste of water: Since water was not paid for during Soviet Era and was seen as a resource available for endless exploitation towards human priorities, people are hardly aware of the need to economise water or take environmental needs into account.

In many mountainous areas water has to be pumped up to arable land. Most equipment like this pumping station requires rehabilitation.

Economic priorities: Water-intensive cotton is one of the major agricultural crops in Central Asia. State regulations and market conditions have caused many farmers not to switch to other profitable crops like vegetables, which allow for water-saving irrigation methods. Nevertheless, Uzbekistan, for example, has reduced its cotton-growing area by one-third since the early 1990s.

Many fields are irrigated with the water- intensive flood (furrow) irrigation method, in which fields are flooded with water through small furrows.

Unclear responsibilities and underfunded water agencies: During the Soviet Era, water management was incorporated into the centralised state system. After independence, new bodies were established, but competencies were often not clearly assigned. In addition, in some countries today, the budget allocated to water agencies is less than 20% of what it was during the Soviet Union – not enough to maintain the huge infrastructure. At the same time, newly-introduced irrigation fees are often not paid and are not cost-recovering.

Electronic water sensors provide for reliable data on water use. This helps to increase efficiency.

As a consequence, Central Asia has the lowest water use efficiency in the world and an extremely high per-capita water consumption.

Improved planning, maintenance and rehabilitation as well as introduction of irrigation measures that consume less water could significantly improve water efficiency. The costs of technical improvements require substantial financial investments, which cannot be covered by the water users yet, but are often only met through international grants. In the framework of the Berlin Process, GIZ supports measures to increase efficiency and water saving, for example:

- Rehabilitation of the Bad Bad irrigation canal near Samarkand in Uzbekistan and development of demonstration fields for drip irrigation in Uzbekistan and Tajikistan. These measures reduce water losses and show ways to improve efficiency.
- Development of tools for monitoring and re-use of drainage water at the Khanhovuz irrigation system in Turkmenistan. Based on this, strategies can be developed that reduce salinisation and show how improved management as to the re-use of water can provide income for the local population.
- Installation of modern flow measurement and control equipment, among others, for the Water User Association ‹Kyzyl-Kyr› in Kyrgyzstan's Southern Batken province. This equipment has helped to increase the transparency of water allocation.

All of the technical measures in the framework of the Berlin Process are accompanied through training and institution-building, the only way to ensure that technical improvements are sustainable and appropriate to the context.

This rehabilitated hydropost in Batken Province, Southern Kyrgyzstan has new sensors so that water flow and water distribution can be better controlled and regulated.

This headwork at Isfara River in Kyrgyzstan regulates water distribution to a side channel. GIZ rehabilitation work included installation of an electronic system for the sluice gates in order to better control water discharge.

Inefficient irrigation practices, as shown at this cotton field, are one reason for the overuse of water and its scarcity elsewhere.

The Bad Bad irrigation canal in Samarkand Province, Uzbekistan, before rehabilitation.

Efficiency of the rehabilitated part of the Bad Bad canal has increased from 63% to 93% of its irrigation waters reaching the fields.

Salinisation is a major cause of soil degradation and particularly affects highly irrigated land: parts of this cotton field are no longer fertile.

Water-saving technologies were introduced on an 8 hectare pilot area in Samarkand Province, Uzbekistan within the context of GIZ's Transboundary Water Management in Central Asia programme.

Well-maintained water distribution facilities, as here in Uzbekistan, ensure accurate allocation of water to different side channels and fields.

Drainage canal in Turkmenistan. About 20–25% of water withdrawals are returned as drainage water.

Integrated Water Resource Management (IWRM)

Since the early 1990s, Integrated Water Resources Management (IWRM) has evolved as major international concept in sustainable water management. Its basic assumption is that different uses of water (in agriculture, industry, for drinking water, ecological services, etc.) are interdependent and should therefore be managed holistically. The core components of IWRM are:

- Hydrographic management of water resources at basin or watershed level and not based on often differing administrative boundaries;
- Integrated management covering all water sources (groundwater, surface water, precipitation etc.) and both qualitative and quantitative aspects;
- Cross-sectoral management involving different economic sectors as well as upstream and downstream users;
- Demand-oriented management including cost recovery mechanisms and water-efficient technologies;
- Participative management ensuring that the interests of all stakeholders are taken into account to ensure equitable water access;
- Decentralised management at the lowest appropriate level.

IWRM is a not a set of strict rules to be applied uniformly around the world. Rather, the principles provide the basis for the formulation of rules adapted to the conditions and needs of the respective country or basin.

All the Central Asian states have acknowledged the importance of IWRM and have begun its implementation. As in all the other countries that have embarked on this process, it has proved to be challenging: many of the IWRM principles come into conflict with traditional fragmented sectoral management and top-down approaches.

The member states of the EU implement many IWRM principles within the Water Framework Directive (WFD). Within its EU Water Initiative, the European Union supports worldwide National Policy Dialogues (NPDs) on IWRM; in Central Asia this is facilitated by UNECE and OECD. GIZ supports the NPDs in Kyrgyzstan, Tajikistan and Turkmenistan, especially with regard to river basin planning in transboundary basins.

FROM THE ARAL SEA TO THE ARALKUM

The Aral Sea catastrophe

In its heyday, the state fish factory in the harbour town of Moynak at the Uzbek southern shore of the Aral Sea delivered 22 million cans of fish to the rest of the Soviet Union each year. Today, the view from the pier is of rusting ships and a desert, complete with camels. The Aral Sea has developed into the 'Aralkum', the Aral desert.

Once it had a surface of about 68,000 km² - almost as big as Ireland. Since the 1960s, it has shrunk to 13,500 km² – more than 80% – while its volume has decreased by 90%. Of the huge original freshwater body, only some highly saline puddles remain. It has split up into three small lakes: a northern part, fed by the Syr Darya, a deep, moon crescent-shaped south-western part and a shallow south-eastern part that occasionally disappears entirely. The southern parts were once fed by the Amu Darya, but no significant amounts of water from that source have reached the sea for years.

July–September, 1989

The consequences of the drought have been catastrophic: plants, animals and fish have disappeared. The unique ecosystem of a large lake in the middle of deserts and steppes has been destroyed. Among the population respiratory diseases, typhus, hepatitis and anaemia have spread. The infant mortality rate is one of the highest in the world. The fish industry has collapsed and the 60,000 people who depended on it have lost their jobs. The frequency of dust storms has increased, blowing salt and polluted seabed particles hundreds of kilometres away. An important element in mitigating the continental climate in Central Asia has disappeared, resulting in a deterioration of the climate throughout the region: winters have become colder, summers hotter.

August 12, 2003

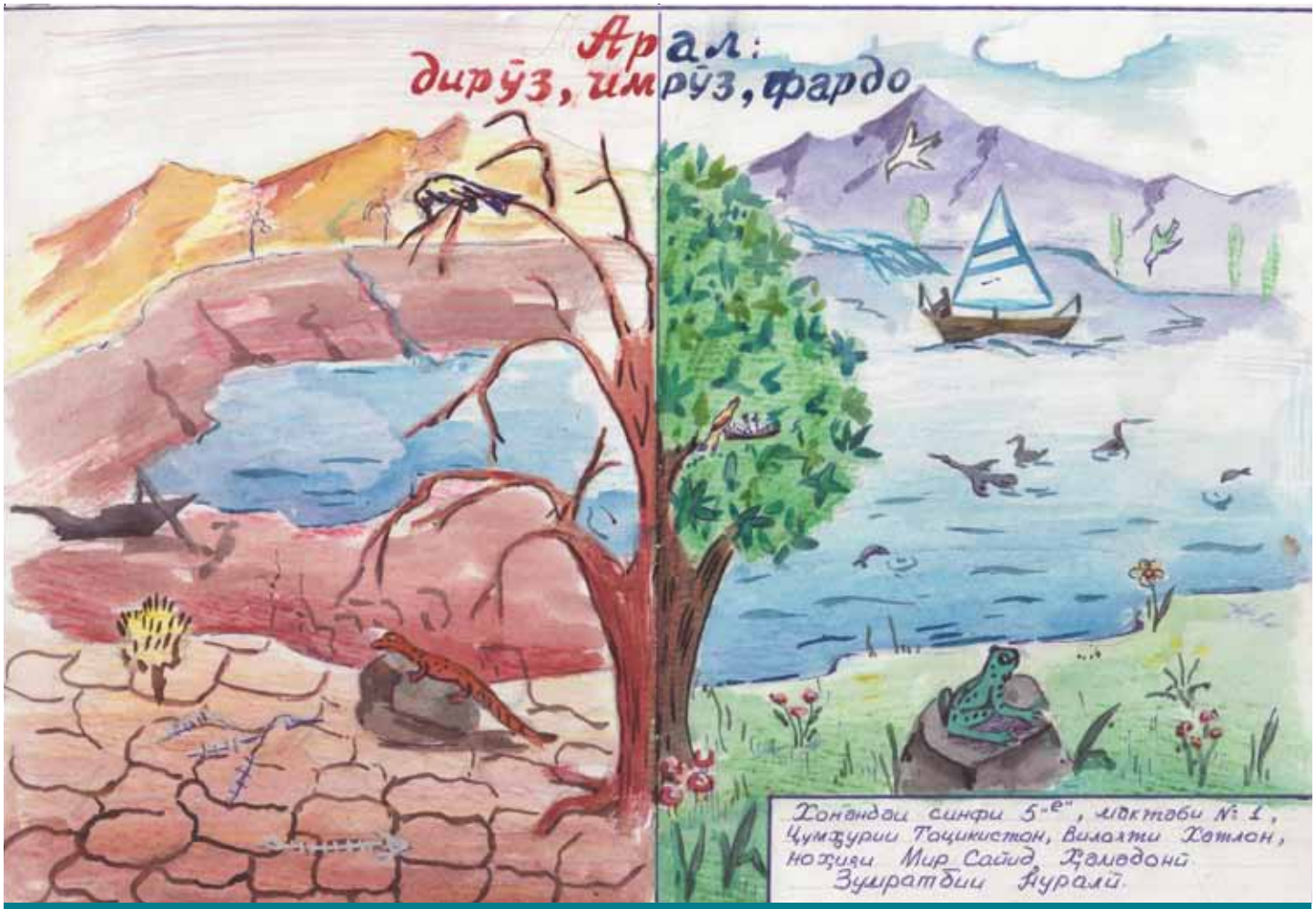
What caused this disaster? The main factor was the expansion of irrigation agriculture to increase cotton production and to develop a region with a fast-growing population. Between the first Russian census in 1897 and the final Soviet census in 1989, the population almost quintupled from 10.5 million to 49.5 million. The government therefore faced the urgent task of developing this poorest part of the USSR. From 1950 to 1989, the area of irrigated land plots in the Aral Sea basin almost doubled. Environmental and water needs were neglected. The water of the two rivers feeding the Aral Sea, Amu Darya and Syr Darya, was used to such an extent for agriculture that only a few cubic kilometres per year reached it.

August 16, 2009

An old signboard in Moynak, Uzbekistan, reminds of the times when more than 30,000 people worked here in the fishing industry.

Rusting ships on the dried-out seabed of the former Aral Sea near the former harbour town Moynak. Today, the shore is more than 150 km away.

Today, the remnants of the Aral Sea are shared by two countries: Kazakhstan to the north and Uzbekistan to the south. There is no hope that the whole Aral can be resuscitated. Though Kazakhstan has managed to revive the smaller northern part of the Aral Sea, the larger southern part continues to dry out. When UN Secretary General Ban Ki-moon visited Moynak on the former southern shore in April 2010, he described the depletion of the Aral Sea as *'a vivid testament to what (...) happens when we waste our common natural resources, when we neglect our environment, when we mismanage our environment.'*



An entry from a regional children's drawing competition on the ‹Aral Sea – past, present, future›, organised by the Executive Committee of the International Fund for Saving the Aral Sea (EC IFAS)

Salt on the sea bed in the abandoned harbour of the former port town of Aralsk, awaiting revival. Kazakhstan makes huge investments into the development of the Northern Aral Sea and its surroundings.

Completed in 2005, the Kok-Aral Dam now separates the Northern Aral Sea, fed by the Syr Darya, from the southern parts. Fishermen are once again able to earn an income with their catch.

The revival of the Northern Aral Sea

The Northern part of the Aral Sea is one of the few – maybe the only – example world-wide, where a government has managed not only to stabilise the remains of a drying out water body, but to replenish it and bring a dying lake back to life.

Kazakhstan constructed the 13-km Kok-Aral dam with a loan and expertise from the World Bank. It was completed in 2005 and prevents the water of the Syr Darya from flowing into the southern Aral, where it simply evaporates. In addition, old infrastructure on the Syr Darya was rehabilitated, irrigation systems were improved and several new hydraulic structures were constructed in order to reduce water loss and increase the flow of the Syr Darya. The positive effects are now visible:

- The surface of the Northern Aral has grown by 18% and the water level has risen by 2 metres.
- The salinity of the water has fallen from almost 30 grams per litre, unacceptable to the two dozen species of freshwater fish native to the Aral, to below 10, which was the average before 1960.
- The fish have returned – mostly native, edible species such as carp, pike perch, catfish and pike.
- Along with the fish, the fishing industry has also revived. Commercial fishery is now once again producing 4,500 tonnes per year and a fish-processing plant has started operating in Aralsk, exporting fish to Russia and other neighbouring countries.

Experts in Kazakhstan are currently discussing further plans for restoration. The aim is to raise the water-level until it once again reaches the former shores and, via a canal, the port town of Aralsk. Living conditions have improved already considerably, giving people a new perspective and future hope for their region.

REGIONAL WATER COOPERATION

Efforts among Kazakhstan, Kyrgyzstan, Tajikstan, Turkmenistan and Uzbekistan

The five Presidents-Founders of IFAS at the Tashkent Summit in 1993.

After the collapse of the Soviet Union in December 1991, the Central Asian countries had to develop new institutions and policies to govern their shared natural resources, which had formerly been managed by Moscow. On 18 February 1992, in order to preserve the benefits of regional water management, the five newly independent states signed the «Agreement on cooperation in joint management, use and protection of interstate sources of water resources». It founded a joint body, the Interstate Commission for Water Coordination (ICWC). The ICWC's main tasks are to control the regulation, efficient use and protection of the waters and to determine annual limits of water use for each state, based on the water quotas defined during the Soviet Union. In 1993, the International Fund for Saving the Aral Sea (IFAS) was set up, and ICWC and its related bodies were subsequently integrated into its structure.

One of the main activities of IFAS is the Aral Sea Basin Program (ASBP), a long-term regional action programme for sustainable water management. The first two phases between 1993 and 2010 did not generate the expected results. This was due, among other things, to structural weaknesses like the lack of a coherent legal foundation or an effective organisational structure, weak coordination, and inefficient implementation of decisions. They are related to highly politicised water relations among the Central Asian states, which have resulted in a reluctance to transfer competencies from the national level to a regional body.

On 29 April 2009, after an extremely water-stressed year, the Central Asian heads of states met for an IFAS summit in Almaty. In their joint statement, they

- confirmed their interest in the development of a mutually acceptable mechanism for integrated use of water resources
- emphasised the importance of IFAS and expressed their readiness to improve its organisational structure
- tasked IFAS bodies with developing a third phase of the Aral Sea Basin Program
- invited the international donor community to become more active in developing joint programmes and solutions for water issues in Central Asia.

With this mandate, international donors were able to engage in strengthening IFAS and regional water cooperation.

Press meeting in 2011 at EC IFAS in Almaty. Prof. Saghit Ibatullin, Chairman of EC IFAS; H.E. Jan Kubis, Executive Secretary of UNECE; Mr. Bo Libert, Regional Advisor, UNECE

Regular dialogue between the donor community and EC IFAS focused on the development of the third phase of the Aral Sea Basin Programme for the years 2011–2015.

Apart from IFAS, the Central Asian states have also undertaken a number of – predominantly – bilateral efforts to jointly regulate water use. For example, Kyrgyzstan and Kazakhstan established, with donor support, a joint commission on the shared Chu and Talas rivers. The agreement includes cost-sharing mechanisms between both countries for the operation and maintenance of infrastructure.

All regional agreements share a similar fate in that their implementation has been insufficient for ensuring coordinated water usage, leading to water shortages and tensions among the riparian states. Afghanistan, though an integral part of the Aral Sea basin, is neither a member of the IFAS nor party to any regional agreement on water resources with the Central Asian states. Nevertheless, IFAS has been instrumental in guaranteeing peaceful water cooperation. It is the only regional organisation in which all five Central Asian states are members and it has been functioning for 20 years.

The Panj River forms the border between Tajikistan and Afghanistan.

Irrigation channel between rice mill and rice fields in Isfara river basin close to the Tajik exclave Vorukh within the Kyrgyz Province of Batken.

Massive water discharge from the reservoirs in winter has led to severe flooding of the Syr Darya in several years, as in winter 2012. By the use of explosives, ice barriers are removed to prevent further flooding.

The Kyrgyz-Tajik Inter-Ministerial Working Group drafted with support of GIZ a Framework Agreement between Kyrgyzstan and Tajikistan on transboundary river basin cooperation. © GIZ archive

Country-members of IFAS and representatives of the international donor community jointly discuss the development of the third phase of the Aral Sea Basin Programme.

The heads of the Kyrgyz-Tajik inter-ministerial working group congratulate each other on the Framework Agreement on Cooperation on International Rivers between the Kyrgyz Republic and the Republic of Tajikistan.

A well-maintained infrastructure is key for secure and reliable water allocation. Kyrgyzstan and Kazakhstan jointly cover the costs for facilities on their shared rivers, such as this hydropost on the Chu river.

Within the Berlin Process, the GIZ Transboundary Water Management in Central Asia Programme works in several small transboundary river basins.

The River Murgab, flowing through an empty reservoir south of Mary (Turkmenistan). In order to provide for sufficient irrigation water, the river is filled by the Karakum Canal with water from the Amu Darya River.

At the 2012 Conference of the Berlin Process, Afghanistan participated for the first time as an observer. The Uzbek and Afghan Ambassadors to Germany enjoy their exchange.

Strengthening regional water institutions

Effective regional cooperation requires a sufficient institutional foundation. It has been a great achievement of the Central Asian states to establish a regional water institution such as IFAS, headed at the highest political level, by the five Presidents. At the same time, experiences over the last twenty years have shown that IFAS suffers from some structural shortcomings that hamper its effectiveness and assertiveness, including unclear mandates, insufficient competencies, lack of capacity and an inadequate legal foundation.

The need for legal and organisational reform of IFAS has been stressed several times by international actors striving to foster regional water cooperation. International support and cooperation can only be effective with a well-functioning regional organisation.

At the 2009 IFAS summit, the Presidents of the Central Asian states expressed in their joint statement «their readiness to further improve the organisational structure and the legal framework of IFAS to improve its efficiency and better interaction with financial institutions and donors to implement projects and programs related to addressing the Aral Sea basin crisis».

With this political mandate, discussions on how IFAS should be reformed began among Central Asian government officials and with the international donor community. GIZ, in close cooperation with UNECE, has been supporting and facilitating this process within the framework of Germany's Water Initiative for Central Asia. GIZ and UNECE have organised regular meetings with the national EC IFAS representatives and other officials to elaborate and discuss reform options. A joint proposal was developed, but is still under discussion as it involves sensitive questions on which the IFAS member states will have to compromise. The commitment of the Central Asian water officials and the political leadership as well as the continued support of the international community is required in order to further pursue this process.

The Aral Sea Basin Programme – Phase III (ASBP-3)

At the Summit of the International Fund for Saving the Aral Sea (IFAS) in April 2009, the Presidents of the five Central Asian states tasked the Executive Committee (EC IFAS) with developing a third phase of the Aral Sea Basin Programme for the years 2011–2015. Its objective is to improve the socio-economic and environmental situation in the Aral Sea Basin by applying the principles of integrated water resource management, to develop a mutually acceptable mechanism for the multi-purpose use of water resources and to protect the environment in Central Asia, taking into account the interests of all the states in the region.

Thus, ASBP-3 works towards four goals:

- Integrated Water Resources Management;
- Environmental protection;
- Socio-economic development;
- Improving institutional and legal instruments.

ASBP-3 was developed by means of extensive consultation with national and international experts. EC IFAS engaged in constant dialogue with the donor community (in particular with the World Bank, the European Union, USAID, GIZ, UNECE and SDC) in order to elicit their comments and ideas on programme priorities and project proposals.

In December 2010, the draft ASBP-3 containing several dozens of projects, each with a clear regional character, was presented to the donor community and the IFAS Board. Donors expressed their support to ASBP-3 in a joint statement, commending the close cooperation between EC IFAS and the donor community. However, they also pointed to the need for stability and full functionality of EC IFAS during the implementation of the programme and therefore called for a strengthening of its institutional structure and legal basis.

Subsequently, all Central Asian governments have adopted the programme and under the new Uzbek chairmanship its implementation will be continued in close cooperation with the donor community.

International law on transboundary waters

There are 263 transboundary river basins worldwide, but many of them suffer from a lack of agreement between the riparian states on how to share or to jointly manage the water resources. At a global level, the UN General Assembly adopted in 1997, after over 25 years of preparation, the UN Convention on the Law of the Non-Navigational Uses of International Watercourses. Its core is based on the principles of equitable and reasonable utilisation of shared water resources and the obligation not to cause significant harm to other riparian states. However, it is not yet in force as the necessary minimum of ratification by 35 countries has not yet been reached.

Nevertheless, a binding regional convention exists for the European and Central Asian region: the UNECE 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention):

- It obliges its parties to prevent, control and reduce transboundary impact (e.g. pollution or changes in discharge), use transboundary waters in a reasonable and equitable way and ensure their sustainable management.
- It also includes provisions on monitoring, consultations, warning systems, exchange of information and access to information.
- Parties bordering the same transboundary waters are urged to cooperate by entering into agreements and establishing joint bodies.

In Central Asia, Kazakhstan, Uzbekistan and Turkmenistan have ratified the Helsinki Convention and the other states participate in some of its activities. Through an amendment that came into force in 2012, the convention is open to countries outside the UNECE region.

Both international water conventions outline general principles of water cooperation. However, a number of questions regarding their application – for example on the exact definition of ‘equitable share’ or ‘significant harm’ – can only be answered in the specific context of a given basin. In this respect, the conventions provide guidelines, based on which regional agreements can be negotiated, but not a blueprint for all river basins.

Cooperation on small transboundary rivers

In addition to the large rivers, numerous smaller rivers cross the boundaries between the Central Asian states. Their joint management is no less important than that of the larger ones. Two such examples are the Isfara and Khodjabakirgan rivers, which are located in Northern Tajikistan and Southern Kyrgyzstan. Kyrgyz, Tajik and Uzbek people live in this area, and several Tajik and Uzbek enclaves exist on Kyrgyz territory, so water management directly affects social and political stability in the border areas.

Since 2007, Kyrgyzstan and Tajikistan have been working to improve transboundary water cooperation, in general, and on the Isfara and Khodjabakirgan river basins, in particular. An inter-ministerial working group has been set up to bring together the heads of the national water resources agencies and the provincial and district water management organisations of both countries. Within the framework of Germany's Water Initiative for Central Asia, GIZ provided logistic, financial and expert support to the working group. This included assistance in setting up database systems, drafting basin plans and supporting local people's participation. An interstate framework agreement on transboundary river basin management was developed. In addition to these concrete results, the process has helped to build up the capacity of the participating state agencies in regards to the drafting of legal documents and the preparation of international negotiations.

Given the difficulties and challenges facing regional transboundary water cooperation in Central Asia, which requires consensus among all five states, supporting bilateral or trilateral cooperation in small basins can create best practices for successful cooperation in the region. Such processes show that joint planning and management can work, they directly benefit the people in the basins and build trust at the political level.

IFAS: organisational structure

The International Fund for Saving the Aral Sea (IFAS) is headed by the Presidents of its five member states: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Chairmanship rotates among these members, and the Executive Committee (EC IFAS) is correspondingly located for a three-year term in the respective country. In 2013, Uzbekistan took over the chairmanship from Kazakhstan, and the EC IFAS is now located in Tashkent.

EC IFAS consists of up to two representatives of every member state and a chairman of the member state currently holding the chairmanship. It coordinates the overall work of the IFAS and the Aral Sea Basin Programme (ASBP), and is also represented by national branches within the countries. The attached Regional Centre of Hydrology (RCH) aims to improve the system of hydro-meteorological forecasting, monitoring and data exchange among the national hydro-meteorological agencies. The RCH is located in Almaty, Kazakhstan.

The most important operational body under the IFAS umbrella is the Interstate Commission for Water Coordination (ICWC). Its members are the heads of the respective national water agencies who meet every quarter to determine water distribution. The ICWC operative bodies are the secretariat in Khudjand (Tajikistan), a Scientific Information Centre in Tashkent (SIC ICWC) and two river basin organisations (BVOs): the BVO Syr Darya in Tashkent (Uzbekistan) and the BVO Amu Darya in Urgench (Uzbekistan).

The Interstate Commission on Sustainable Development (ICSD) coordinates cooperation in the field of environmental protection and sustainable development. The ICSD meets twice a year, and the chair rotates among the member states. A Scientific Information Centre (SIC ICSD) is based in Ashgabat, Turkmenistan.

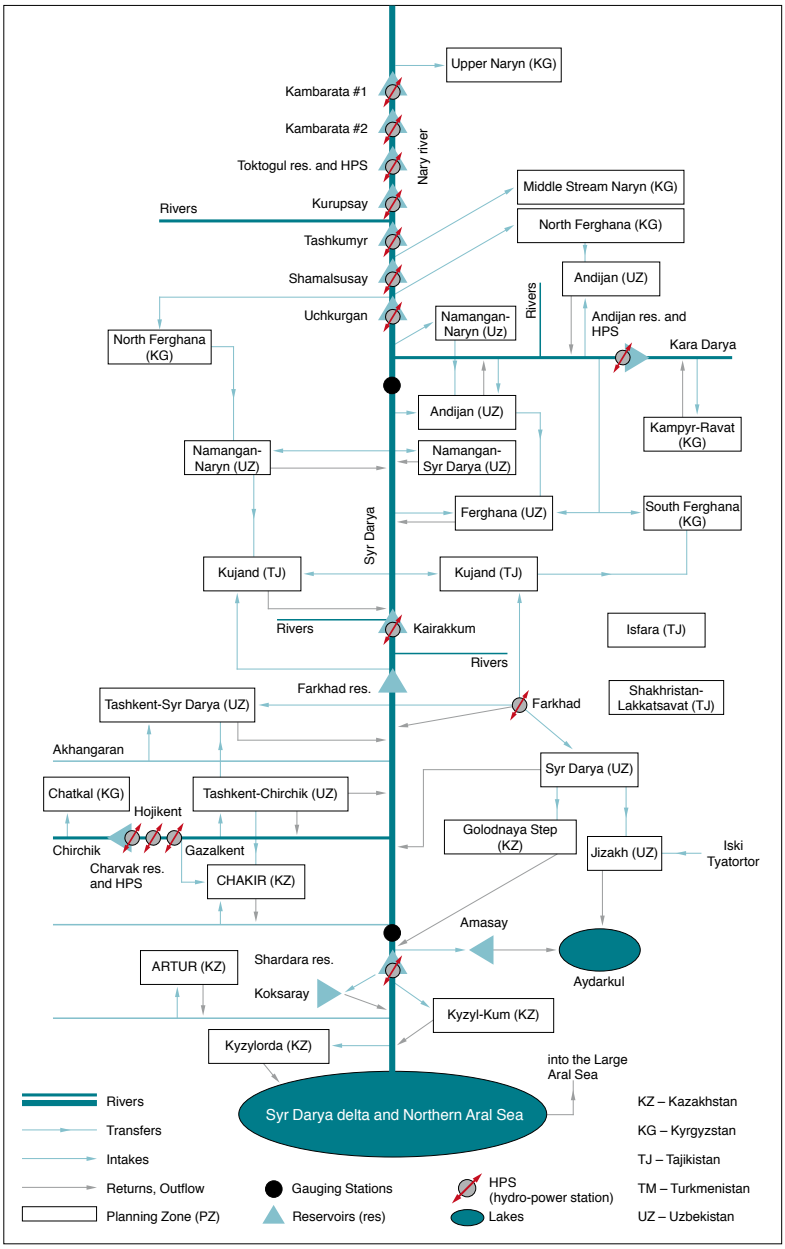
In 2008, IFAS was given observer status in the UN General Assembly.

IFAS chairmanship

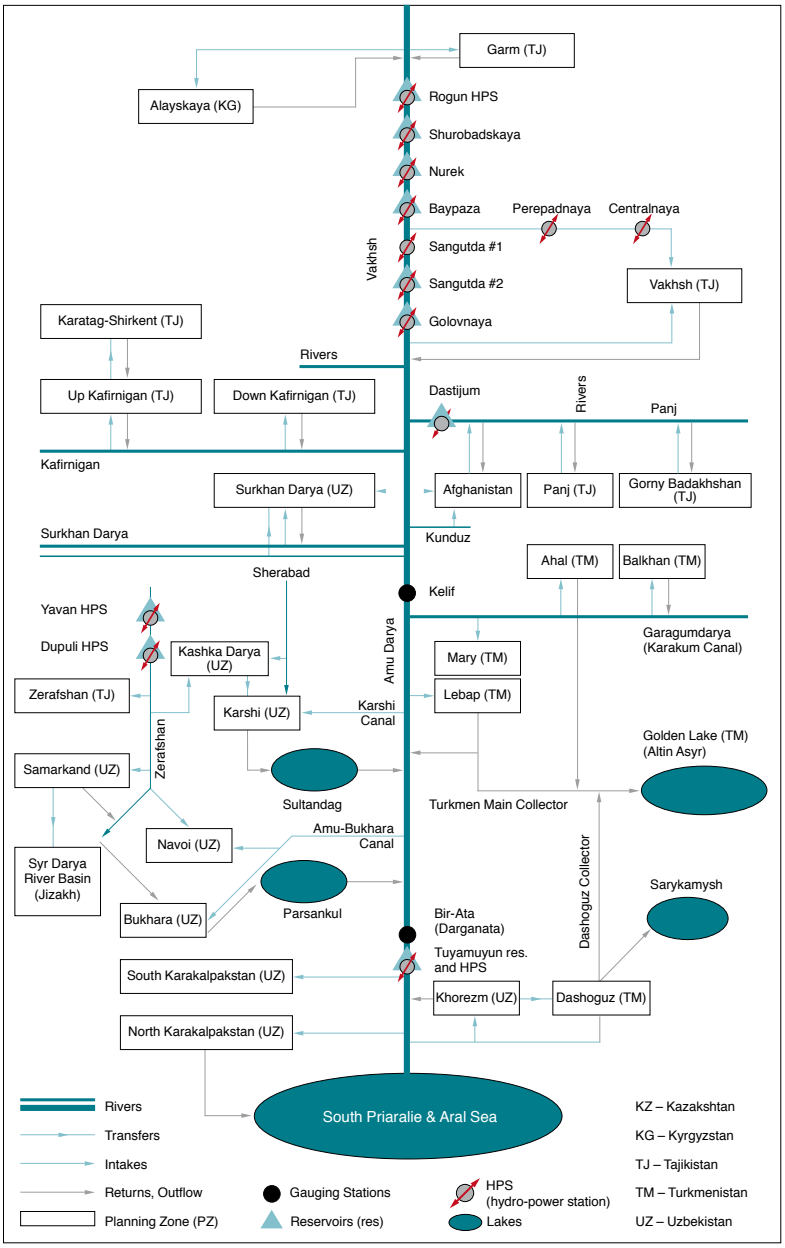
1993–1997	1997–1999	1999–2002	2003–2009*	2009–2012	since 2013
Kazakhstan	Uzbekistan	Turkmenistan	Tajikistan	Kazakhstan	Uzbekistan

* The foreseen move to Kyrgyzstan did not take place due to the political turmoil in 2005.

The linear scheme of the Syr Darya



The linear scheme of the Amu Darya



Too big to succeed: The Syr Darya Agreement

After the subsidised delivery of coal and gas ceased with the end of the Soviet Union and the upstream countries faced a severe energy crisis, Kyrgyzstan and Tajikistan increased their hydropower production. This meant changing the operation mode of the dams. While the water had formerly been discharged in the spring and summer for irrigation during the growing seasons, now a lot of water is discharged in the winter to produce electricity. These different usage interests need to be coordinated.

For the Syr Darya, Kazakhstan, Kyrgyzstan and Uzbekistan signed an «Agreement on the Use of Water and Energy Resources of the Syr Darya Basin» in 1998, joined by Tajikistan in 1999. This agreement established that Kyrgyzstan would discharge water from its reservoirs in the summer for the downstream states of Kazakhstan and Uzbekistan. In exchange, these would deliver fossil fuels to Kyrgyzstan in the winter, so that it would not need to produce hydropower to meet its energy needs. However, the agreement only worked well in some years, while in others the parties did not comply with it. From 2003 onwards, the parties failed to agree on annual protocols. This resulted in irrigation water shortages downstream or energy shortages upstream. Though the riparian countries have managed to prevent worst-case scenarios with bilateral and ad-hoc regulations, these do not provide for long-term planning. A sustainable working mechanism has not been found yet.

One reason for this failed endeavour was the dilemma between the mostly weak positioning of water management organisations on the national level and vis-à-vis national energy agencies operating the hydropower plants, as well as highly politicised regional relations. This makes it difficult to reach and enforce compromises that are beneficial to everyone on a technical level, but do not have the political support they need to function.

The river basin approach

Many endeavours aimed at finding complex region-wide water agreements in Central Asia have failed due to the intricate regional constellation. Therefore, within the framework of the Berlin Process, GIZ pursues the approach of creating exemplary cooperation components in smaller transboundary river basins.

Bilateral cooperation or coordination in river basin planning and management is supported in several small basins and sub-basins. Some concrete examples:

- Data collection and management, including reporting to the national level to provide a proper basis for making informed decisions;
- Development of watershed and land use maps to enable long-term planning;
- Rehabilitation of hydrological monitoring posts and equipment with electronic sensors for reliable data on water flow and withdrawal;
- Rehabilitation of irrigation channels and headworks for better control of water distribution and reduction of water loss;
- Basin-specific scenarios of climate change and its impacts in order to improve adaptation measures and disaster prevention;
- Consultation and information-sharing with water users in order to integrate all stakeholders;
- Establishment of transboundary coordination and cooperation mechanisms.

These measures are aimed at directly benefiting the people in the focus basins. Water loss is reduced so that more water is available. Reliable data and scenarios allow for adapted measures and therefore increase income security. Tens of thousands of people living from agriculture in these basins have profited from these measures. In addition, such measures strengthen the capacities of water agencies and improve the basis for decision-making on the national level and within a regional context. These positive experiences are communicated to the regional level to build up incentives for transboundary cooperation.

Benefits of water cooperation

For most countries in the world, water resources are important for the socio-economic well-being of the population, and are sometimes even of strategic relevance. Therefore, the decision to cooperate over shared water resources is not an easy one for many states. It means that they have to give up part of their sovereignty over the resource and enter into compromises instead of pursuing maximum control. It might involve some additional costs, at least in the short term. This is why many states are reluctant to enter into formal agreements regarding their transboundary waters.

However, experience has shown that cooperation regarding transboundary waters provides many benefits for all parties in the long term.

Transboundary water cooperation:

- reduces the high costs of self-sufficiency policies. Goods like food crops or energy can be produced where the conditions are most favourable and then traded.
- increases water, food and energy security. Joint inter-sectoral management enables the use of synergies, makes countries less vulnerable during dry years, and reduces the threat of conflicting planning between neighbouring countries.
- supports trust building among neighbours. Small projects like bilateral basin commissions for small transboundary rivers can serve as positive examples of mutually beneficial cooperation and develop cooperation from the bottom-up. This also contributes to higher legitimacy of water management decisions among the local population.
- fosters regional stability and development. Regional cooperation on transboundary rivers can set in motion a process of political rapprochement and of cooperation in other fields, strengthening regional stability and development.

Transboundary water cooperation can thereby support social peace, health and economic well-being in all riparian countries with increased benefits for all.

CAPACITY DEVELOPMENT

A prerequisite for sustainable water management

Sustainable water management respects the needs of future generations and the environment, while taking into account social equity and economic efficiency. It is a cross-cutting issue that involves different levels (local, national, and regional) and sectors (agriculture, communal water supply, energy, ecology, etc.). Water experts need to have a comprehensive understanding of all these dimensions and their interrelatedness.

This poses several challenges to the capacities of water professionals in Central Asia:

- During the Soviet Era, water management was organised hierarchically and the water ministries at the level of the individual Republics were only in charge of implementing decisions taken at higher levels. Policy formulation, development of framework laws, and horizontal coordination with other ministries are new tasks that only arose with independence and still remain weakly developed.
- While there was relatively high-level training during the Soviet Era, it was very specialised and restricted to technical and engineering dimensions. Aspects like environmental sustainability, interaction with water users or cross-sectoral coordination were not covered. Today, Integrated Water Resources Management (IWRM) as a process stresses the necessity of participatory, comprehensive, coordinated management. The hitherto existing education and experience of water experts has not prepared them sufficiently for these new tasks.
- Many universities and research institutes are underfunded and unable to provide up-to-date technical and theoretical training, conduct field trips and offer access to current research.

Together, these aspects combine to result in a lack of adequately qualified water experts. In addition, qualified experts or young professionals who studied abroad often leave the poorly paid jobs at state agencies, which in turn suffer from ‹brain drain› and lose even more expertise.Therefore, the Berlin Process unites several approaches to capacity development in Central Asia promoting cross-sectoral and transboundary water management.

The DKU in Almaty was established in 1999 with the objective to train Central Asian students according to German standards.

Training for participants of partner organisations of GIZ on innovative water planning methods.

Training on modelling crop water requirements conducted by the CAWa-programme at the SIC ICWC in Tashkent, Uzbekistan.

- A key element of the Berlin Process on capacity development is the establishment of a regional master course in integrated water management at the German-Kazakh University (DKU) in Almaty. It is implemented by the Free University Berlin. Courses taught by the Free University staff are supplemented by regional experts' classes. The master course's objective is to train specialists from all countries of the region according to European standards and equip them with extensive interdisciplinary skills. The focus lies on interdisciplinary approaches to planning and steering processes, and knowledge on technical as well as cultural, economic, political and environmental topics that have an impact on water management.
- GIZ trains its partners, for example basin organisations, in data management tools, river basin planning and IWRM. GIZ staff members support the direct implementation of the newly-acquired competencies to the benefit of the water users. Capacity development for long-term planning and management is crucial to making the projects sustainable; this process takes place in, with and through the partner institutions.
- In the framework of the CAWa project, the knowledge gained both in terms of the applied methods as well as the project results is transferred to Central Asian and Afghan professionals in short-term training courses, which follow the ‹train-the-trainers› concept. All course materials are made available as e-learning modules to ensure long-term impact.

The capacity development programmes improve cross-sectoral and transboundary cooperation in water management in Central Asia by enhancing expertise and facilitating joint efforts. Region-wide seminars bring together water experts from all the countries and also help to develop and maintain professional networks across boundaries.

Members of the Isfara river basin planning working group in Tajikistan discuss the next steps: initial drafts of GIS maps have already been developed during trainings organised by GIZ.

Kyrgyz participants in a training on Isfara river basin planning organised by GIZ in the city of Batken, Kyrgyzstan.

Using databases, GIS technologies and satellite images: training for members of the Kazakh-Kyrgyz Commission on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas.

DATA MANAGEMENT AND EXCHANGE

A basis for water cooperation

Data on precipitation, weather conditions, water volumes and water withdrawal are a prerequisite for making informed decisions about water allocation and use. For example, comprehensive basin assessments can only be carried out with a proper database on water and land use. Such basin assessments give information on how much water is available and how much is used in specific sectors and areas. These assessments therefore allow for assumptions to be made about future developments and needs, forming the basis for comprehensive basin planning. Exact data is also needed to reduce Central Asia's vulnerability to the risk of water-related natural disasters like floods and mudslides.

After the collapse of the Soviet Union, the existing hydro-meteorological monitoring network degraded substantially, especially in the upstream flow formation zones. The resulting ‹observational gap› hinders research on climate and hydrological change as well as operational tasks in water management such as the seasonal runoff forecast.

In transboundary river basins, the regular and timely exchange of reliable data sets across boundaries is a prerequisite for effective and coordinated transboundary water management. The Scientific Information Centre of the Interstate Commission for Water Coordination (SIC ICWC), located in Tashkent in Uzbekistan, hosts a regional database, the Central Asia Regional Water Information Base (CAREWIB). However, the (already limited) available monitoring data sets in Central Asia are not easily accessible to users from other sectors or from neighbouring countries.

The Berlin Process supports Central Asian research institutions and water agencies in their capacities for data collection, management and exchange.

- In order to further improve the regional database, the CAWa project consortium, in cooperation with the national hydro-meteorological services, has been establishing a new multi-parameter monitoring network with emphasis on the flow formation zone. The data collected by the newly-established monitoring stations is processed and archived in a central data management unit and is accessible for partners from all Central Asian states.

Data collected by researchers of the CAWa project involve measurements of snow accumulation and glacier ice ablation.

- Geoinformation systems (GIS) constitute an important tool for data collection and management, and are used for acquisition, storage, analysis and visualisation of spatial data and related information. In the framework of the CAWa project, a geo-database was built, which is providing spatio-temporal data for Central Asia such as information from satellite images and data from monitoring stations.

Regional workshop of the CAWa project bringing together leading specialists from the Hydrometeorological Services of the Central Asian states.

- GIZ trains its partners in GIS-tools and data management. Staff of local water agencies receive technical support to improve databases and are trained in using remote sensing tools for comprehensive basin analyses and planning. Furthermore, GIZ supported its national partners to establish databases for smaller basins or sub-basins for use at the provincial level. A standard tool adapted to the local conditions was created and put in place in several basins.

Technical training for members of the Kazakh-Kyrgyz Commission on the Rivers Chu and Talas.

These activities directly contribute to the strengthening of transboundary water cooperation:

- The development and application of modern tools for gathering, systematising and analysing operational data will result in better planning and coordination of water management at the operational levels (basin, district and provincial).
- Data gathered at the level of river basins, districts or provinces will provide a reliable database to support political decisions and regional cooperation.
- Increased transparency in the data exchange and dissemination process will build trust between water users on international, national and local levels.

Researchers of the CAWa project collect valuable data on the water cycle in Central Asia in field campaigns and from newly installed monitoring stations.

Two photo cameras integrated into the station at the Abramov Glacier monitor the snow line on the glacier surface and provide valuable information for mass balance estimates. © GFZ / CAIAG

Hydrometeorological monitoring station at the Abramov Glacier in the Alai Mountains. Located at an altitude of 4,100 m, the station monitors among other things air temperature, precipitation, wind and snow.

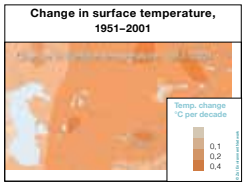
FUTURE CHALLENGES

Climate change, population growth and water deficits

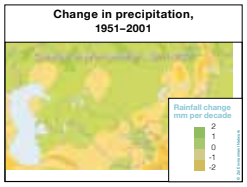
The legacies of past water management are one constraint on water usage in Central Asia. Other constraints will arise from current and future ecological and demographic changes that will put additional pressure on the resource.

Global climate change already affects water availability in Central Asia, and its impact will increase due to:

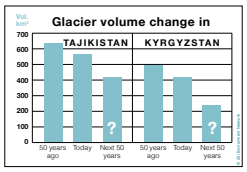
Rising temperatures:
Over the past decades, global warming has led to a rise in surface temperatures in Central Asia. Climate change scenarios for Central Asia indicate that by 2030–2050, temperatures could be 1–3°C higher than today. Rising temperatures will cause an increase in demand for water, as greater quantities are needed for irrigation.

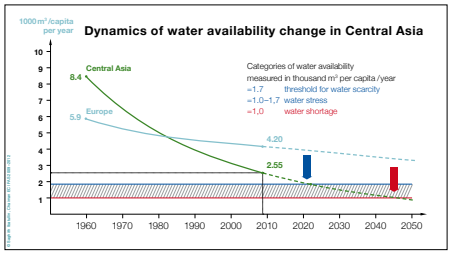


More rainfall variability:
Climate change has altered precipitation patterns and is leading to an increase in extreme weather events causing damage to communities, water infrastructure and crops. Studies indicate that this is resulting in more precipitation in northern parts of Central Asia and less precipitation in the south, where most agricultural areas are located. This is causing water availability to be less predictable and scarcer in some areas.



Increased melting of glaciers:
Since 1950, the glaciers of Tien Shan and Pamir have melted by 14 to 30%. Today's rate of glacier loss in Central Asia is 0.2 to 1% per year. Over the long term, scientists expect that glacial retreat will slightly decrease the water availability in the rivers of Central Asia, as they are partly fed by glaciers.





Water deficits in the next decades will be exacerbated by population growth. With a 1–1.5% growth rate in Central Asia and 3% in Afghanistan, the number of people depending on transboundary rivers is steadily increasing. About one-third of the workforce in the Central Asian states is officially employed in agriculture – and a much larger portion of the population depends on subsistence production. On the other hand, arable land is limited and salinisation has led to land degradation due to decades of (over)irrigation. As a consequence, more people have to live using fewer natural resources.

Climate change makes transboundary water cooperation even more difficult. Rising demand and unstable availability of water require constant exchanging and updating of data, adaptive planning, more measures aimed at water-saving, and adjustments of withdrawal limits. Capable and flexible institutions are essential for addressing these tasks. Also the increase of storage capacities is a tool to cope better with the changing and less predictable water availability.

Changes in climate increase the likelihood of natural disasters, like this mudflow in Aini, Tajikistan.

The Petrov glacier in Kyrgyzstan — due to climate change, the volume of glaciers in Central Asia has decreased, also affecting water availability in rivers.

Infrastructure safety

Much of Central Asia's water management infrastructure was built during the Soviet era and has not been adequately maintained and rehabilitated over the past 20 years. With the economic crisis following independence and shifting responsibilities among state agencies, maintenance work largely ceased and vital repairs were postponed. This led to water losses, hampered efficiency and put the safety of this infrastructure at risk: possible flood events caused by failure of dams or other infrastructure pose a significant threat to lives along the rivers. In March 2010, at least 41 people died and more than 1,000 had to be evacuated when two dams burst in south-eastern Kazakhstan.

As a result of climate change, heavy rainfall followed by floods and mud-slides in summer are more frequent, destroying infrastructure and threatening livelihoods. Prevention measures require additional investment.

Much of the infrastructure is of transboundary significance, such as the big dams on the Naryn and Vakhsh rivers – tributaries to Syr Darya and Amu Darya. At the Chu and Talas rivers, downstream Kazakhstan participates in the costs of renovation and maintenance of upstream facilities in Kyrgyzstan. Such agreements for other infrastructure are barely in place, leaving this important task to be addressed solely by the relatively poorer Kyrgyzstan and Tajikistan.

In the framework of the Berlin Process, GIZ supports technical and institutional measures to ensure the reliable and safe long-term operation of water infrastructure.

- One example is the Ravatkhodja headwork on the Zerafshan river in Uzbekistan, which has been operating for over 70 years. Among other activities, GIZ has provided a mobile diagnostics laboratory and water elevation rods, with which the safety of hydraulic structures can be assessed and monitored. A safety concept has also been developed.
- Around the small Tortgul reservoir in the Isfara basin in southern Kyrgyzstan GIZ is rehabilitating the system of piezometric boreholes. This enables water managers to evaluate the seepage of the dams.

For more than 70 years, the Ravatkhodja headwork on the Zerafshan River in Uzbekistan has been diverting water into two main irrigation channels. Within the Berlin Process, GIZ supports its safe operation. © GIZ archive

In March 2010, the Kyzyl-Agash dam burst after torrential rain and a sudden rise in temperature, which caused early snowmelt and let to enormous water masses in the reservoir. The failure left a trail of devastation.

The Tortgul dam in southern Kyrgyzstan was built in 1970. GIZ supports rehabilitation measures and provides new equipment for reliable information on the safety of the dam.

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