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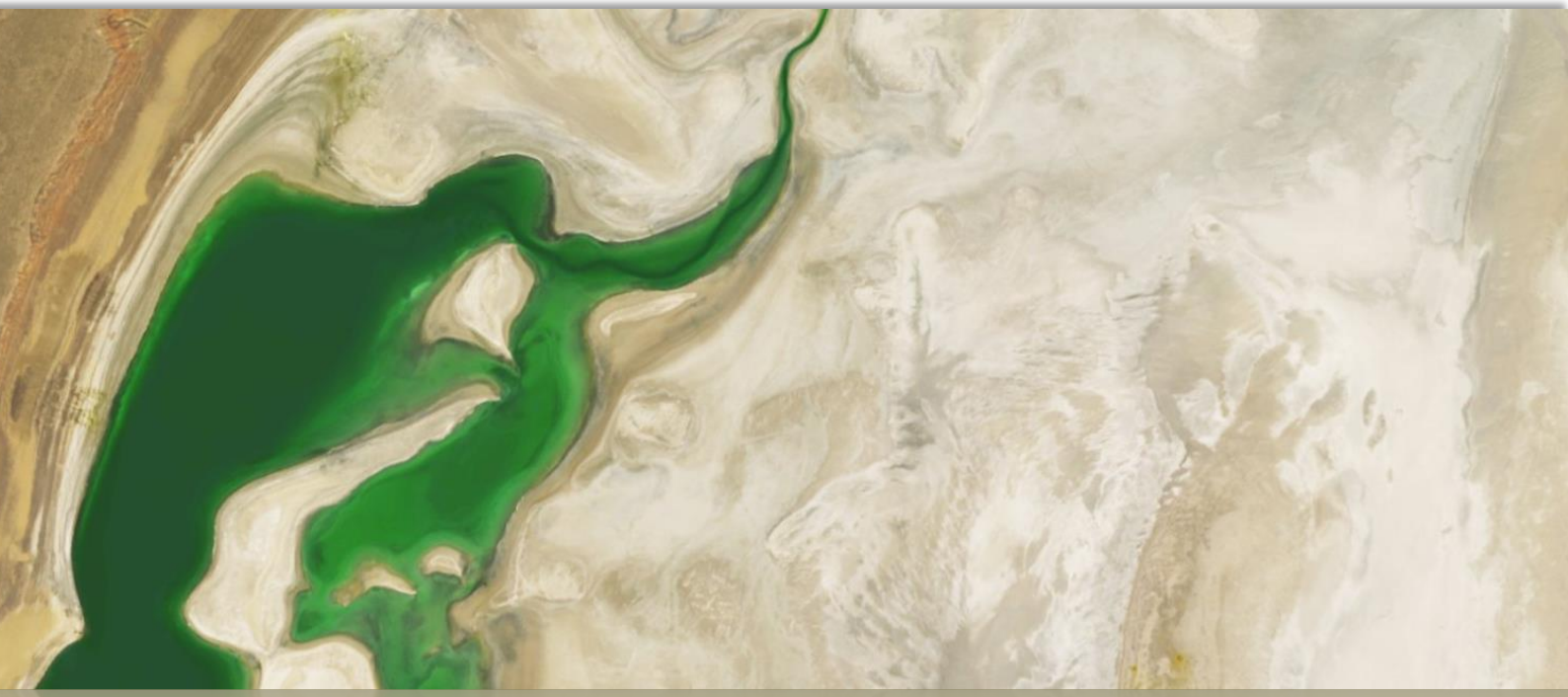
The Aral Sea, Central Asian Countries and Climate Change in the 21st Century



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About the report

The Aral Sea, Central Asian Countries and Climate Change in the 21st Century is a research study that advocates joint solution of environmental and resource problems in transboundary river basins, implementation of multilateral investment projects, enrichment of latest scientific knowledge and upgradation of technical skills. The study argues that cooperation between water management bodies and water-using and water-consuming economic sectors (land-water-energy nexus) is the basis for integrated water resources management. It is important to strengthen cooperation between the hydrometeorological services of the region – at the local, national and regional levels. It argues full-fledged strengthening of the basin authority (at the national and regional level) to maintain sustainability of water resources management and to develop policy coherence to strengthen the national and regional basin authorities – Syr Darya Basin Water Management Associations (BWMA) and Amu Darya BWMA.

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Photo credits

Cover: the Aral Sea from a NASA Landsat 9 satellite imagery, accessed on 12 April 2022 at Landsatlook.usgs.gov.

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Executive Summary

Water resource use in Central Asia is set to increase substantially due to demographic factors, industrial and agricultural development, mainly irrigation. Central Asian countries, primarily in the Aral Sea basin, are notable for their socio-economic development unfolding amidst complete depletion of their water resources, especially water use which exceeds available resources, and this trend will determine the nature of inter-State relations of the countries in the region. It should also be noted that by 2030-2050, the countries of the region will also reach the limits of irrigated land expansion due to limited availability. Despite the depletion of water and irrigation resources in the region, in their national strategies and programs, each country notes increased water use for irrigation and hydropower in the future. Hence, a coordinated regional water policy is required which must seek to balance the water resources use and improve the ecological situation in the region.

Large-scale development of irrigation and other uses of water, particularly hydropower, has changed the water cycle of transboundary rivers in the region and created serious socio-ecological problems such as the drying up of the Aral Sea and destruction of its ecosystem; desertification of vast areas around the Sea, deterioration of water quality and impact on public health; local climate change, etc. However, many aspects of socio-economic development across Central Asian countries are determined by the availability of water resources. Therefore, reaching consensus on inter-state water allocation in transboundary river basins is the overarching objective that requires political will and a comprehensive solution, considering socio-economic and environmental changes and the political situation in the neighboring countries of the region. Rapprochement among the key stakeholders on the joint use of transboundary water resources cannot be considered outside the economic development models of each country and economic cooperation in the region as a whole. Hence, strengthening the trade and economic ties among these countries along with close cooperation on water policy is an important factor for economic integration and should help solve the problem of joint use of transboundary water resources.

The Aral Sea basin countries lying in the arid zone are most exposed to high risks and threats as a result of global and local climate change. Climate warming can be observed throughout Central Asia, and long-term assessments on the basis of the climate scenarios project no increase in water resources in the region. Further, countries in the middle and lower reaches of transboundary rivers will face depletion of available water resources and increased water scarcity as water quality, including groundwater degrades. This will primarily affect the population's access to quality drinking water. Hydrographic regime of surface waters is expected to change significantly due to the accelerated glacier melting and reduced snow cover, accelerated desertification, land degradation and salinization, loss of biodiversity, and increased deforestation. The cumulative negative effects of climate change will increase competition for water among the countries in the region with long-lasting and significant implications for political, food, energy, sanitation, and environmental security in the region. With the increasing frequency of dangerous and extreme hydrometeorological phenomena, such as hail, drought, extremely high or low temperatures, etc., the frequency of natural emergencies is forecasted to rise. These include heavy showers, mudflows, landslides, avalanches, floods, and droughts. Climate change can also pose a threat to the existing ecosystems and biodiversity [Orlovsky N.S. and others, 2019].

Climate change impacts in the region are aggravated by the dried-out Aral Sea which, having lost its role as a climate and geochemical runoff regulator, has turned into a source of aeolian salt transport to the surrounding area. The resulting ecological, social, economic problems require new approaches to irrigation development and water management in the region, especially in the transboundary context [Pankova E.I., 2016]. Hence, practical adaptation measures must be put in place especially in large water-using and water-consuming sectors such as agriculture, hydropower, industry, and public utilities. In these sectors, step-by-step comprehensive reconstruction of water infrastructure is needed, with universal transition to water-saving technologies and waste-water reduction. In the agricultural sector, it is important to promote cultivation of more drought-resistant crop varieties on a larger scale, improve the technical level of engineering irrigation systems and equip them with automated means of water

distribution and monitoring for condition of irrigated lands. In the industrial sector, low-water technologies and water recycling systems need to be implemented. In the public utilities sector, technical condition of water supply and sewerage systems should be improved while reducing their water losses, and new technologies for wastewater treatment should be adopted.

The future water needs of the countries in the region can only be met through a sustainable and efficient use of available water resources and implementation of integrated climate change adaptation measures, strengthening of regional cooperation for joint use and protection of transboundary river basins.

Central Asian states contribute greatly to the achievement of the Sustainable Development Goals (SDGs) in every dimension – environmental, social and economic: the SDG targets are integrated into strategies and policies of the government planning systems of countries in the region. Strengthening cooperation between the national authorities of Central Asian countries and international organizations in water management, water supply and sanitation is an important aspect of ensuring national water security.

Joint solution of environmental and resource problems in transboundary river basins, implementation of multilateral investment projects, development of scientific and technical base and personnel training must become important drivers of sustainable development and expansion of an integration cooperation. Coordination of regimes and rules of operation of hydropower plants with reservoirs, main channels and large pumping stations, construction plans of facilities for different types of transboundary river water resources use and protection, requires joint actions based on integrated water resources management. In doing so, it is fundamental for cooperation in transboundary river basins that water-using states observe the principles of reasonable and equitable use of international watercourses and avoid causing harm to other neighboring states.

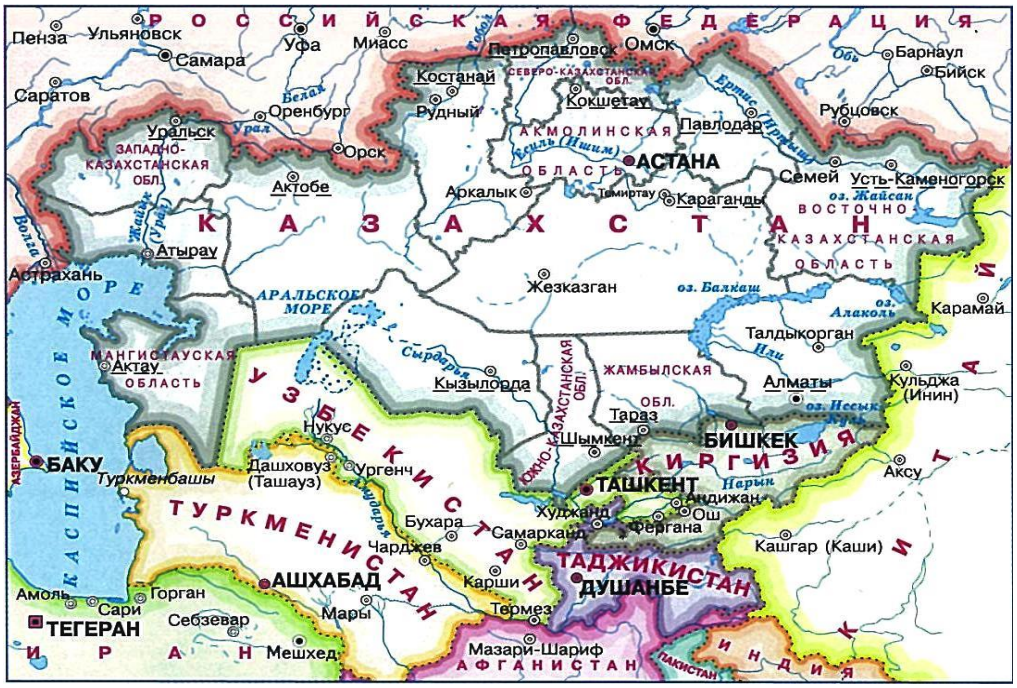
Cooperation between water management bodies and water-using and water-consuming economic sectors (land-water-energy nexus) is the basis for integrated water resources management. It is important to strengthen cooperation between the hydrometeorological services of the region – at the local, national and regional levels. It should be noted that presently, an integral system of water resources management in the countries of the region is still nascent, and its legal development requires harmonization with multiple branches of law relating to environmental protection, economy and finance, construction, education, science, international relations, and national security.

The priority for water strategy and policy is to implement national actions to preserve the water and resource potential of the river systems and their environmental security. In order to implement the basin-wide principle of water resources management, the basin authority should be vested with sufficient powers and functions, have infrastructure to manage water assets (reservoirs, rivers, lakes, groundwater) and physical facilities, be able to automate collection and permanent storage of information base of basin data, etc. Strengthening of the basin authority (at the national and regional levels) will enable maintaining sustainability of water resources in the country irrespective of the multiple reorganizations of superior entities (ministries, committees). In this regard, it is necessary to develop a policy to strengthen the national and regional basin authorities, particularly Syr Darya Basin Water Management Associations (BWMA) and Amu Darya BWMA.

Introduction

In 1991, Central Asia emerged as a geopolitical space comprising Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan after the collapse of the Soviet Union. The historical and geographical name that formerly characterized these states, "Central Asia and Kazakhstan" or Turkestan, is also widely used in the academic world [USSR AS, 1968; Kastelskaya Z.D., 1980]. The modern designation of the region's post-Soviet states – Central Asia – has also become commonly used to refer to the region's role in international politics and the world economy. However, it is also necessary to distinguish, from the point of view of geographical science, another Central Asia – a broader region that includes, in addition to the above-mentioned states, Mongolia, the western part of China (Xinjiang), and Afghanistan [Zvyagelskaya I.D., 2009]. In this way, the notion of Central Asia and what states in the region it includes depends on the issue at hand and its subject matter. In our case, Central Asia refers to the region of former Turkestan, which means the post-Soviet states of Central Asia [Jandossova Z.K., 2005].

Figure 1-1



Source: World Atlas, 2017.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

The region occupies a vast undrained area within the confines of the closed Aral-Caspian basin, and this peculiarity predetermines a special regime of rivers, extremely susceptible to the impact of economic activity and climate change. Natural and geographical conditions of the region determine the special nature of formation of river flow within the river basin, while political and economic conditions determine its use [Volkhonsky B.M., 2014].

Until the 1960s, the condition of the Aral Sea and its feeding rivers Syr Darya and Amu Darya was characterized as stable. Then, over a very short period of time, the dramatically increasing anthropogenic impact on their condition caused by non-recoverable water diversion for irrigation purposes led to the exhaustion of the two rivers' compensating capacities and the drop of water level and volume in the Aral Sea. The desiccation of the Aral Sea, formerly one of the world's largest reservoirs, has reached such a degree of degradation extending far below the original level of the former sea – 53 m – and beyond, that led to catastrophic desertification of a huge area in the region. The deltas of the

two great rivers of Central Asia have almost completely dried up [SIC ICWC, 2001; Dukhovny V.A., Joop de Schutter, 2003; Dukhovny V.A., 2020]. As a result, anthropogenic activity has led to a large-scale desiccation of the Aral Sea in just 30 years unparalleled in world history for a water body of this class.

In an arid climate, the consequences of non-recoverable diversion of the Syr Darya and Amu Darya river flow, extensive farming with high water consumption, had an extremely negative impact not only on the natural environment of the region, but also on the economy and living conditions of the population and their migration [Burnakov E., 2002; Ivanov D.V., 2013]. The impact of the drying sea has spread to all components of the natural environment and is increasingly shifting from downstream to midstream, manifesting itself in a sharp deterioration of irrigated land, swamping and salinization, declining crop yields and living standards of the population, and the quality of their drinking water supply. This poses a serious threat to public health not only in the lower reaches of the Amu Darya and Syr Darya rivers, but also in their middle and upper reaches [Elpiner L.I., 2002].

The social and environmental consequences of the extreme use of the water resources of the Aral Sea have been ignored [Kulpin E.S., 2007]. Poorly treated or untreated municipal and industrial wastewater, and drainage water often containing heavy metal salts and other highly toxic ingredients, is discharged into the Amu Darya and Syr Darya rivers and their tributaries because of the lack of any environmental and sanitary restrictions [Elpiner L.I., 2002].

Unfortunately, the problem of the Aral Sea is not and optimization of the required investments. Addressing the issues of cross-border water use and protection of river basins from pollution and depletion, and adaptation to climate change, and thus ensuring sustainable water use for the future and the economic development prospects of each country depends on the nature of regional cooperation [Sehring J., 2012].

After Central Asian countries gained independence and sovereignty, they faced serious environmental problems that required enormous efforts and resources to solve. These problems were difficult not only because they encompassed the entire country and neighboring states, but also because underlying causes were stonewalled for many years at the Soviet Union level, there was a lack of accessible and reliable information, many materials are still classified [Novikova, 2019].

After the collapse of the USSR, all decisions adopted at the Soviet Union level lost their force. The consequences of such a crisis could not be addressed by the country on its own so international assistance and joint efforts of the Central Asian states were required, first of all, to settle water relations problems in the region. In this regard, the Conference of Heads held on 26 March 1993 in Kyzylorda established such regional institutions as ICAS (Interstate Council for the Aral Sea) and IFAS (International Fund for Saving the Aral Sea) [Narbayev M.T., 2010; IFAS EC, 2021].

Transformation of the Aral Sea and the Aralkum desert that emerged in its place, as well as the natural environment of the Aral Sea region, due to the drop in sea level and contraction of its water surface, is characterized by changes in the Aral Sea region climate and defined as arid