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Ecosystem management in Balkhash Lake basin as a model of SDG localization in Kazakhstan and Central Asia region[1]

Balkhash-Alakol basin, a common example of unsustainable management in Kazakhstan, was offered as a model of **problems transformation into opportunities**.

The basin represents the territory with the total area of 413 thousand km^2 (bigger than Great Britain, Holland, Switzerland and Belgium together), 45 000 of small and medium rivers, 12 types of ecosystems (from glaciers to deserts), conservation areas and Special Protected Natural Areas – 3000 km^2, farmlands – 12,600 million ha, planted area – 1,300 million ha, pastures – 10,400 million ha, 6000 of water basins and impoundments, more than 50 thousand tons of fish per year – this is the capacity of the basin, rich extractable and other resources.

At the beginning of 90-s, Balkhash lake (the 13th biggest lake in the world) could suffer the same destiny as Aral Sea just in a few years – with the launch of Kapchagay hydro-electric power station and the construction of impoundment. However, in 1992, Kazakhstan State Committee for Water Resources took an ultimate decision to stop filling the impoundment as the water reached the critical mark (341 m above the sea level) – and the lake began to restore[2].

The basin is mainly an agrarian region (up to 90% of water consumption in the basin), but it also has significant hydroelectric power stations, mining and processing enterprises. For the moment, experts discuss plans on the construction of Balkhash Atomic Power Station or Heat Power Plant. However, the estimates show that energy efficiency and renewable energy sources, which have very significant capacity in this region, can also be considered as an alternative option, since they do not threaten ecological sustainability of the ecosystem. The region holds a leading position in the production of paper and cellulose pulp (60% of production in the country). In addition, this basin is remarkable for rapid development of food and pharmaceutical industries.

According to McKinsey estimation (2012), **water deficit in the basin will amount to 1.6 billion cubic meters** in 2030 as a result of all current (normal) development measures. Unless this deficit is eliminated, it will inevitably cause the degradation of the entire ecosystem and the reduction of water supply. This deficit may also increase due to the changes in the regime of glacial runoff - **up to 1.9** billion cubic meters.

When considering possible scenarios for eliminating water shortages with minimal economic costs, the following **two main options were taken into account**:

A) More efficient consumption of water and provision of water resources for increased water demand in 2030 with the help of cost curve.

B) The common shift of economy and economic activities towards less water-intensive production (in this case, towards low water-use crops) with the help of crops added value analysis.

A) Cost curve

The figure below shows the cost curve for Balkhash-Alakol basin. It contains more than 40 analyzed solutions, which can increase the available water resources or reduce the demand for them in agriculture, industry and municipal water supply. Each tool was evaluated: the horizontal axis shows the amount of savings in million m3 of water and the vertical axis shows the costs

[1] Based on "Balkhash Lake Preservation Plan", Bulat K.Yessekin, E. Kamenev, V.V. Grigoruk, V.V. Sadomskiy, V.K. Ten, 2009, and the reports of RK Ministry for Environment and Natural Resources together with McKinsey, 2012-2013

[2] "Water Resources of Kazakhstan", 2004, Prof. Kipshakbayev N.K. (Chairman of National Water Partnership, Minister of Kazakhstan Water Industry (1990-1995)

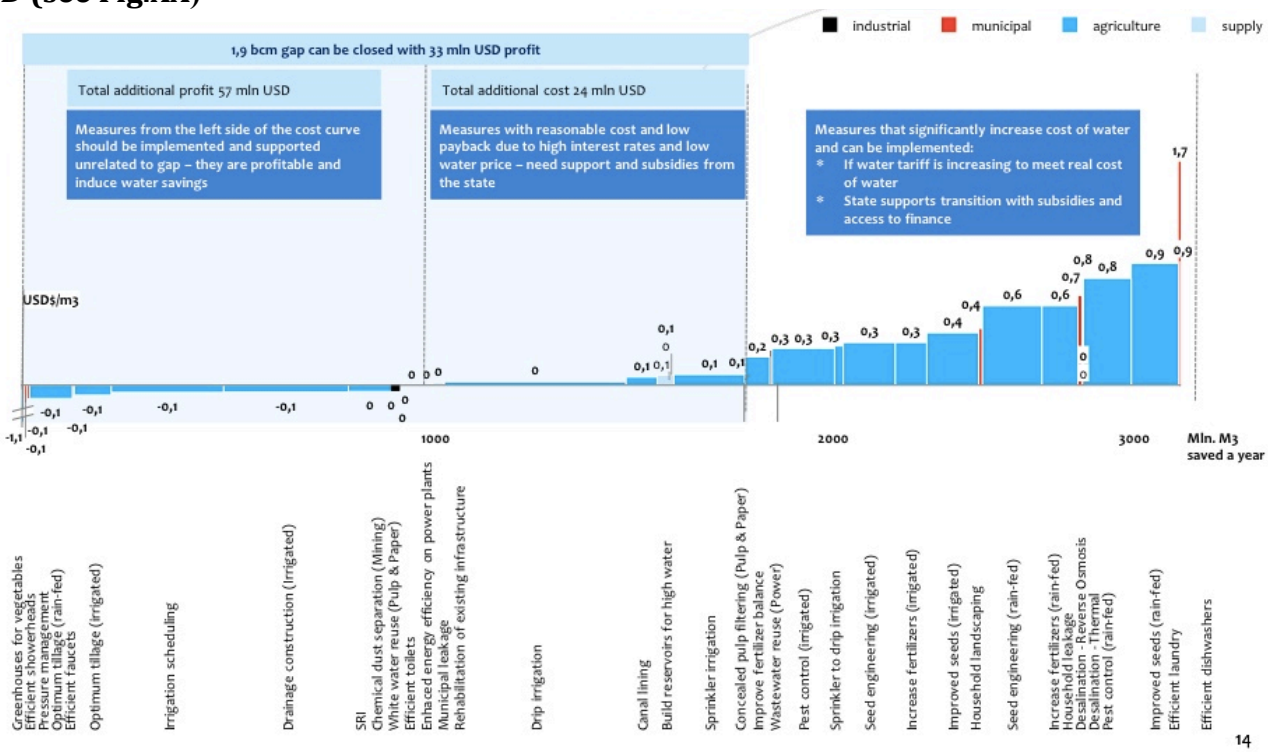
(annualized capital and operating costs less any benefits, such as additional productivity or lower production costs) in dollars per million m3. These decisions are presented in the order of increased costs.

This analysis leads to the following important conclusions:

Until 2030, the Government of Kazakhstan has the opportunity to prevent the growing ecosystem degradation and water shortage of 1.9 billion m3 by means of available solutions on rational consumption of water resources of the basin. Adoption of the proposed measures will bring a net benefit (not cost) of 35 million USD. In order to release 1 more billion m3, the proposed measures turn out to be profitable - with a net profit ("negative cost") of 55 million USD; as to the remaining 0.9 billion m3 - the shortage can be eliminated for 20 million USD.

Most measures relate to improving the efficiency of water consumption in agriculture. A number of measures are beneficial as they increase crop capacity and incomes of population; they reduce costs and access to electric power and other operating costs. Agricultural "revolution" will require introducing a wide range of advanced irrigation methods. The most obvious of them are updating drainage and channel systems (18%); introduction of drip irrigation (26%); improvement of irrigation patterns, including by means of planning methods and irrigation management (16%).

Fig. 24. In 2030 gap of 1.9 bcm can be economically covered with profit of 33 mln USD (see Fig.XX)



Measures on the improvement of efficiency in industry and public sector account for 10-15%, which corresponds to their share in the total consumption of water resources. This effect is mainly achieved by increasing the efficiency, processing and reuse of water in chemical industry and pulp production, as well as the adoption of standards for more efficient plumbing and household appliances.

Measures to increase water availability will require more investment; however, they may bring a long-term effect. First of all, it is necessary to restore the existing infrastructure and reservoirs to store flood waters, which, herewith, do not violate river regimes for fish farming and biodiversity.

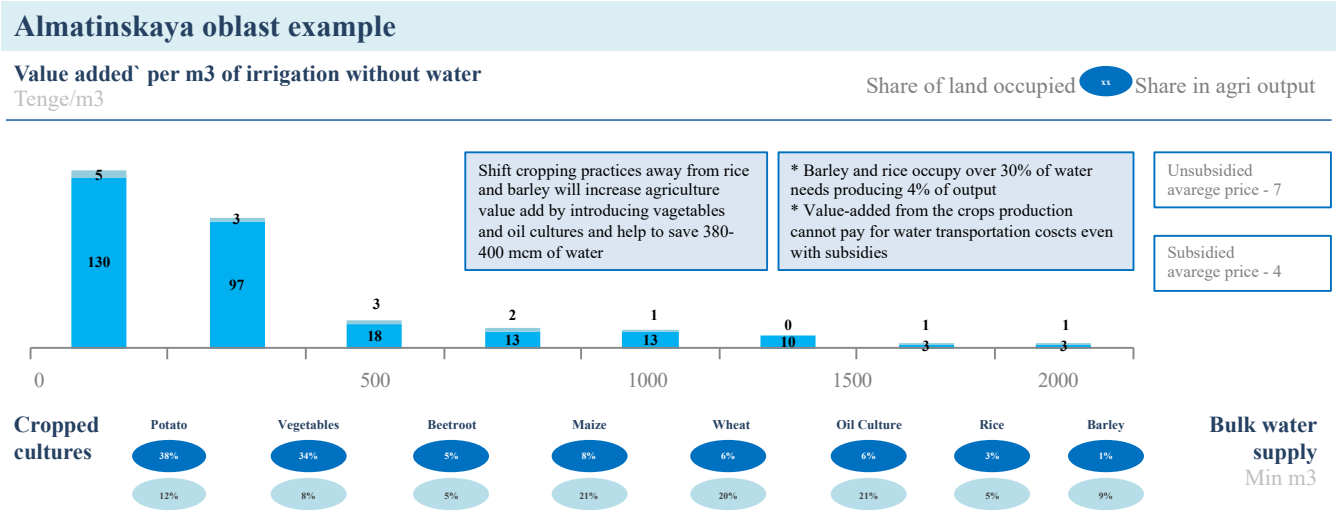
B) Changing the composition of crops - analysis of possibility to change the composition of crops in favor of crops with higher added value

The pyramid of crops added value of Almaty region shows the following:

- value added from the production of rice and barley in this area cannot cover the cost of water even considering subsidies;
- the program addresses at most 15% of irrigated lands in Almaty region;
- reduction of rice cultivation areas and other water-absorbing crops by 80-90% (up to 1.3-1.5 thousand ha) and their replacement with vegetables, oil-bearing and feed crops with low water consumption, which provides additional profit as well.

At the same time, the program on changing the composition of crops in favor of high added value and climatic conditions appropriateness will contribute to reducing water consumption by 350-400 million m3.

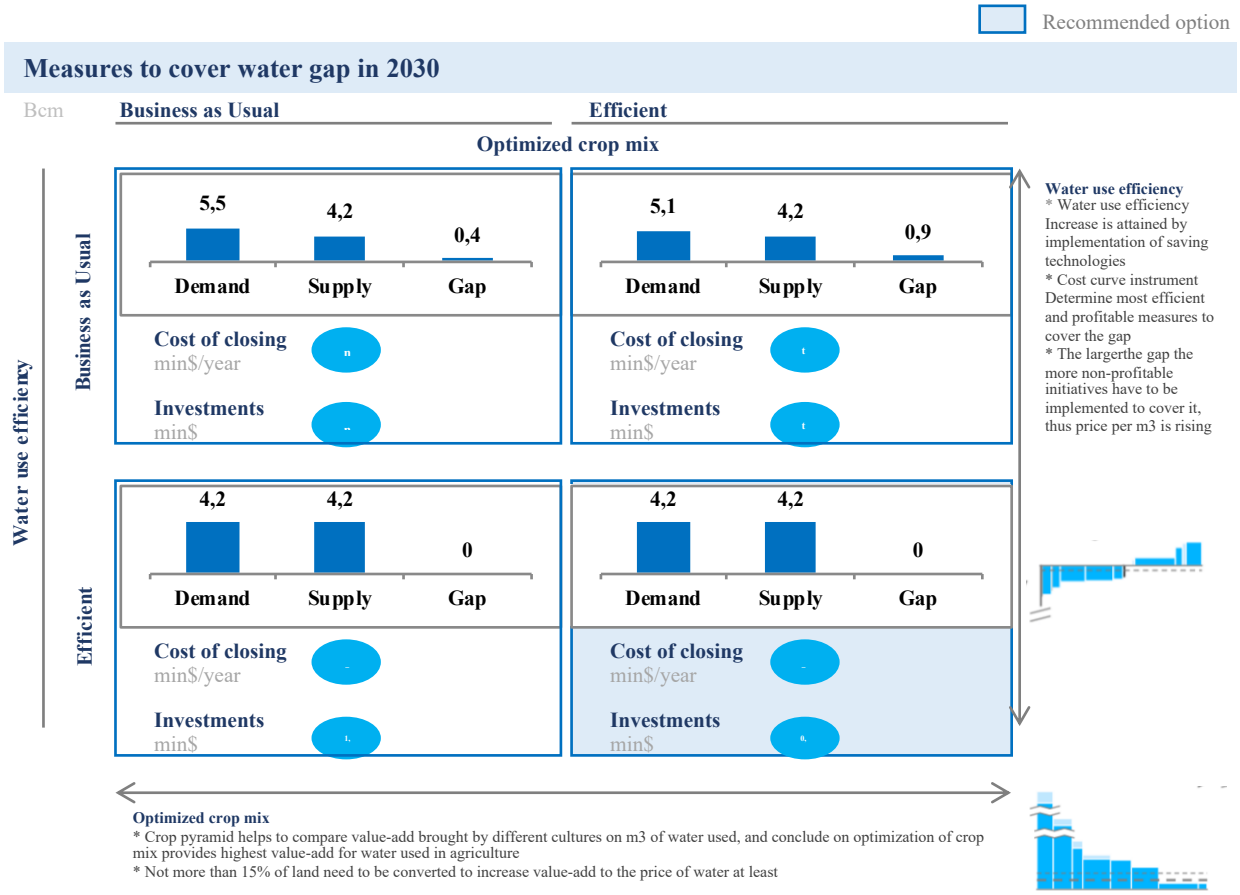
Substituting barley and rice with high-value added and low water-consuming crops will help to obtain 380-400 mcm. (see Fig. 25)



The program can contribute to farmers' welfare and regional development. Changing the composition of crops will require costs associated with land restoration (high salinity of the soil due to lack of drainage), large-scale reorganization of irrigation infrastructure. It is necessary to increase the attractiveness and competitiveness of the proposed "new" crops by providing incentives for the construction of storage and processing facilities, as well as access to domestic and export markets.

Subsidies for the production of water-intensive rice and cotton amount to at least 25-30 million USD per year in Kazakhstan. These funds can also be used to create incentives and implement large-scale projects to support changes in production and consumption. Operating costs can be covered by farmers themselves, since the transition to vegetable, oilseed and feed crops entails significantly higher incomes.

The use of more efficient technologies for the use of water resources will allow not only to close the water deficit in the Balkhash-Alakol basin, but also bring a profit of $ 33 million, and in combination with a change in the composition of crops sown, profits can grow to about $ 57 million. USD /year (see Fig. 26).



Finally, it is possible **to combine both approaches – to increase efficiency and to change the composition of crops**. At the same time, the shortage, which needs to be eliminated by way of measures obtained from the cost curve, is less by 0.4 billion m3 than in case of unchanged crop composition. Thus, it is possible to choose a set of measures, which will be more cost-effective for the basin.

Key Balkhash-Alakol basin conclusions:

- ecosystem of the basin can be preserved subject to targeted actions of Kazakhstan Government (special goal-oriented program and law);
- water deficit can be eliminated; moreover, this can be done with profits;
- essential part of investment comes back due to the increase of productivity/decrease of costs for water and other operating costs.

The program of sustainable development of the basin should have a common general goal - preservation of ecosystem of the basin - as the main condition for preventing the growth of conflicts, support of sustainable economic activity and social development with the following quantitative goals and indicators[3]:

General goal of the Program: ensure that the lake level is not lower than 341m (Baltic System) – as the indicator of keeping balance between the inflow and water evaporation. This goal is divided into the following three goals:

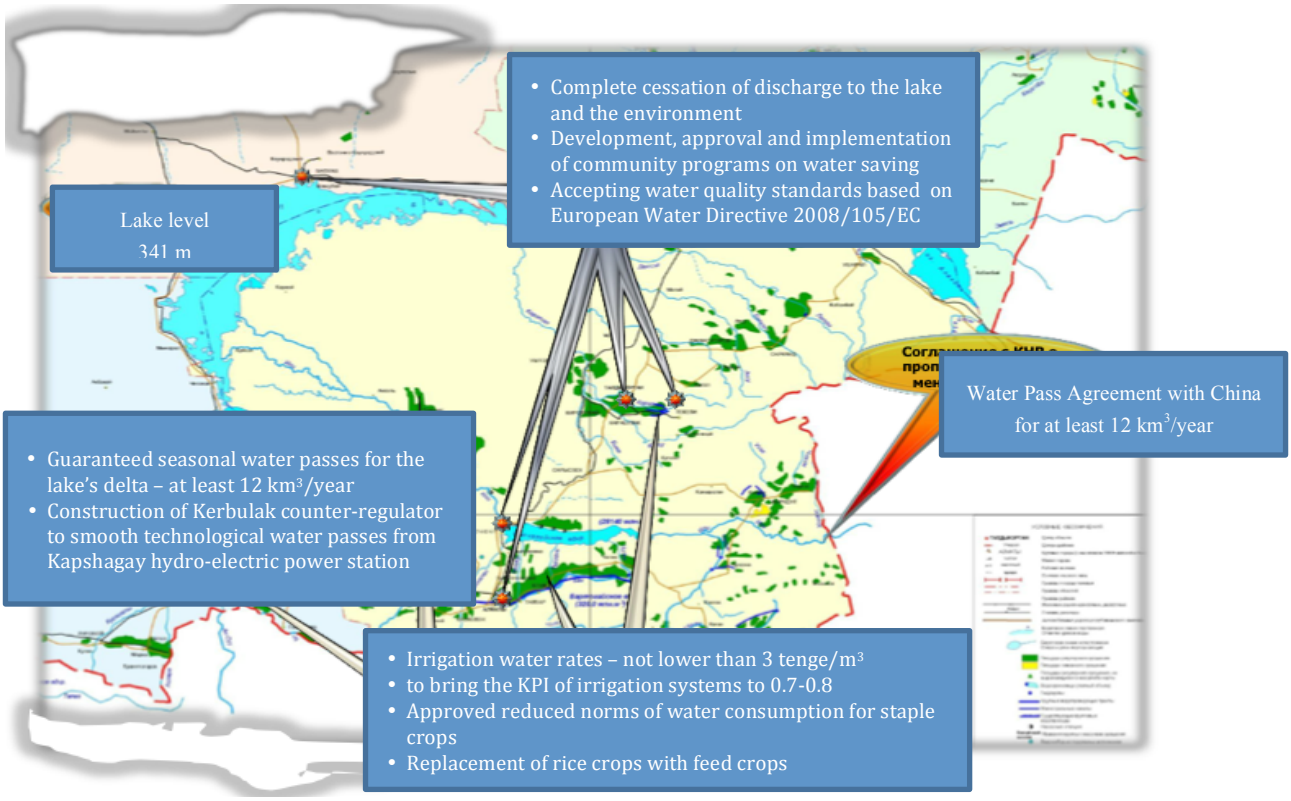
- **Goal 1.1.** Agreement with China for water withdrawal – at least 12 km^3/year;
- **Goal 1.2**. Water savings to provide internal surface flow – at least 25 km^3;
- **Goal 1.3.** Seasonal delta water resources release (not less than for evaporation) – 14.5 km^3.

[3] Bulat Yessekin "Green Economy as a tool for protection of the Balkhash Lake ecosystem". Panel speaker, 6-th Asia and the Pacific Ministerial Conference on Environment and Development, 2010

Each goal can be achieved by target measures taken in other sectors: agriculture and municipal infrastructure, power, industry and others with the following indicators:

- 1.2.1. Substitution of rice crops – at least 1.8 thousand ha (needs separate action plan with the support of farmers in production structure transformation);
- 1.2.2. Complete cessation of polluted discharge (technologies, regulative, economic and other tools);
- 1.2.3. Water saving programs in all sectors, reduction of total consumption of water in Almaty and other populated areas – from 250-500 to 100-150 l/day/person;
- 1.2.4. Rates for irrigation water – not less than 5 tenge/m^3;
- 1.2.5. KPI of irrigation systems 0,9 (0,4-0,5 today);
- 1.2.6. Water consumption norms – to decrease twice at least;
- 1.2.7. Creation of comprehensive integrated database;
- 1.3.1. Construction of Kerbulak counter-regulator after Kapchagay hydro-electric power station to increase its efficiency and ensure ecological discharges;
- 1.3.2. Basin Counsil status promotion;
- 1.3.3. Transit to a new water basins classification based on European Water Directive 2008/105/EC and others.

A set of all interlinked goals and indicators will form the basis for a long-term green action program to support sustainable development goals in the basin, including employment, environmental sustainability and health, education and partnership.



What are next practical steps?

Creation of working bodies is the primary and necessary condition to start preparation and implementation of the program. Successful international experience is associated with the creation of basin management in various forms. IWRM plan of Kazakhstan is proposed to adopt management in the form of Basin Social Corporation, which is suitable for its conditions.

Basin Social Corporation - as an open joint-stock company with participation of the state - compensates for main shortcomings of water management in Kazakhstan and Central Asia:

- fills the niche between state, business, science and NGOs (by the experience of EC, USA and etc.);
- ensures partnership and involvement of population and all water consumers, private sector and international organizations in the development of the region;
- enables to solve the issues of coordination and inter-sectoral cooperation;
- has no restrictions to create well-developed management infrastructure (by way of dams and hydro-electric power plants, fisheries, irrigation, tourism and etc.);
- assures focus on general and long-term benefits – not only on water distribution;
- independent in application of any types of financing (revenue from the activity and service fees, grants and loans, etc.);
- solves transboundary issues with regard to the interests of all parties – "transfers problems into benefits";
- does not exclude but complements state and ministerial programs, control and monitoring.

An important difference is that the activities of this social corporation are focused on the integration of social and commercial effects. At the same time, the long-term goals remain top-priority and the management mechanisms restrain the drive to maximize profits by way of social and environmental potential destruction.

The model allows going beyond the traditional choice: "agriculture, energy or environment?" and opens up new perspectives for the state, population and business. The model creates a new form of spatial planning and ecosystem management, it provides governments with innovative solutions based on ecosystem approach, principles of sustainable development and green economy, in order to take control of the issues connected with growing water deficit and dependence on climate changes, and to improve the quality of human life and environmental sustainability at the same time.

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Dr. Bulat K. Yessekin is a well-known manager and expert in environmental, climate change, water and sustainable development policies in Central Asia and CIS. His environmental activities began at the local level in Karaganda, the industrial center of Kazakhstan, then he was invited to the Hydromet central office in Almaty and two years later - to the newly created Ministry of Environment. There, he was actively involved in the creation of a national system of environmental protection, development and implementation in Kazakhstan of environmental legislation, the water code, and economic tools. In 1991-1993 he worked as a head of state department on environmental control of Kazakhstan. In 1993-1997 he worked as the chair of environmental committee in Alma-Ata city, the former capital of Kazakhstan, with responsibilities for environmental policy at the local level. In 1997 he started international carrier as the Team leader of the World Bank project and UNDP for the first National Environmental Action Plan (NEAP), resulted by development and implementation of 30 projects with the total budget more than 700M USD. At the same time, Bulat made a key contribution to the joint decisions of the Central Asian countries on the development of the Central Asian Regional Environmental Action Plan (REAP) and the creation of CAREC. In 1998

Bulat worked at the National Ecological Center with creation of mechanisms for implementation and coordination of all MEAs at the national level. During the UNFCCC Kyoto protocol development (1997-2000) he initiated Kazakhstan's proposal on voluntary quantitative obligations and entry into UNFCCC Annex 1. Since 1998 he is a UN national focal point on sustainable development on behalf of Kazakhstan. In 2000 Dr. Yessekin was selected by the five Central Asian states, EU and UNDP for establishment the Regional Environmental Centre for Central Asia (CAREC). He acted as the first Executive Director of this organization till 2007. During preparation to RIO+10 and RIO+20 Bulat worked as a team leader on development of the national position, reports and proposals, including the Green Bridge Partnership program with its adoption by the ESCAP ministerial conferences in 2010, Pan-European environmental conference in 2011, and the RIO+20 Summit in 2012. In 2001-2007 he coordinated the preparation of the regional position, reports and proposals on behalf of the states of Central Asia (CA Initiative, Invitation to Partnership, CA progress review on implementation of the Agenda -21. Bulat has over 15 years experience on implementation of international projects in Central Asia and CIS region. His education includes Polytechnic institute in Karaganda (Kazakhstan), Hydro meteorological institute in Saint-Petersburg (Russia) and PhD on environmental protection. Dr. Yessekin acted more than 18 years as the member of Bureau of the UNECE Committee on Environmental Policy on behalf of Kazakhstan (1998-2016); in the high-level Asia and the Pacific Forum on environment and development (2000-2004); steering committee of the Caspian Environmental Program (1998-2000), the Global Water Partnership Organization (2014-2016), the Regional Council on water partnership for Central Asia, Caucasus and Mongolia (since 2003); the National Council on sustainable development of Kazakhstan (2006-2015), NGO Eco-Forum bureau of Kazakhstan (since 2014), Green Economy expert council (since 2012), Steering Committee of the LEAD International (since 2017) and others professional organizations and networks at the global, regional and national levels. Since 2011 he is working as a senior expert in the projects related to the Central Asian Regional Environmental Action Plan (REAP), Aral Sea Basin program (ASBP), IFAS and ICSD's capacity building, Public-Private Partnership management in transboundary basins, Balkhash Lake ecosystem management, Ural river transboundary cooperation. He has more than 50 publications on environmental governance, ecosystem and water management, IWRM and sustainable development, public participation, green economy and climate change.