POLICY BRIEF: ADAPTING TO CLIMATE CHANGE IN MOST VULNERABLE SECTORS OF CENTRAL ASIA: *WATER AND AGRICULTURE*

Regional Environmental Centre for Central Asia (CAREC)
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INTRODUCTION

Five countries of Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, located in the heart of the Eurasian continent, are characterized by arid climate conditions. The currently occurring climate change phenomena such as increasing air temperature, strong drought and dry winds, have an impact on balance of water resources, soil conditions, crop yields, pasture productivity, conditions of natural ecosystems and human health, etc. Thus, the average air temperature in the region has increased by 1-2°C for a 100 year period and the forecast proposes its growth by 3-6°C by a year 2085 [1].

CURRENT TRENDS AND IMPACTS OF CLIMATE CHANGE IN CENTRAL ASIA

The climate in the Central Asian countries has a common regional feature - high continentality, characterized by wide range of air temperature fluctuation within a year and scarcity of precipitation. The northern part of the territory of Central Asia is represented by steppe landscapes, the central and southern parts – by semi-desert and desert landscapes.

According to the instrumental observations, the average annual temperature across each country has been increased as indicated below:

- 0.29°C per each decade in Uzbekistan (1950-2005);
- 0.26°C per each decade in Kazakhstan (1936-2005);
- 0.18°C per each decade in Turkmenistan (1961-1995);
- 0.10°C per each decade in Tajikistan (1940-2005);
- 0.08°C per each decade in Kyrgyzstan (1883-2005).

The current climate variability can be observed in intensification of natural disasters: floods on the one hand and sustained droughts - on the other; strengthening activity of mudflow and landslide; increase in the number of days with extremely high temperatures and rainless days The consequences of climate change in the long-term perspective include: loss of agricultural land; deforestation; desertification; degradation of glaciers and permafrost; redistribution of precipitationchanges in river flow; ecosystem degradation and evapotranspiration and evaporation.

WHAT ARE THE KEY FINDINGS IN CENTRAL ASIAN REGION IN THE ISSUE OF THE ONGOING CLIMATE CHANGE?

For the countries of Central Asia, located in the arid zone, water resources and dependency on them for the agricultural sector, hydropower, as well as risks of natural disasters and public health is considered as sectors most vulnerable to climate change. At national level, the work on strategy development and action plan for adaptation to climate change should become a priority task in Central Asia. Adaptation to climate change shall be incorporated into the strategic plans

of ministries and agencies, plans for regional cooperation and national plans for implementation of international conventions and agreements.


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To adapt to very limited water resources and agriculture to increasing aridity conditions, the measures ensuring capacity building, research and application of appropriate technologies, exchange of knowledge and best available practices shall be implemented at all levels (regional, national and local). For example:

- the sharing of water conservation technologies shall be applied at the local level;
- the economic assessment of damage caused by climate change and incorporation of adaptation into economic sectors shall be the issues solved at the national level; and
- partnership enhancement and establishment of national preventive actions plan that may synergistically mitigate the impact of climate risks should become the issues of the regional level.

Adaptation to climate change shall not be treated as "one-time" short-term event. It is a permanent, ongoing, long-term process integrated into all levels of planning.Consolidation of Central Asian countries in adaptation to climate change (ACC) shall help to overcome the fragmentation and duplication in measures undertaken and strengthen the capacity of each country.

THE CONSEQUENCES OF CLIMATE CHANGE IN CENTRAL ASIA AND ADAPTATION ISSUES

Many countries are already experiencing the effects of climate change and pay the cost for it from economic and social viewpoints. The water system in Central Asia has trans-boundary nature and therefore the water resources are considered as the basic resource ensuring various aspects of national and regional security. The water is used by all sectors of the economy of the region and therefore the increase in water scarcity, synergistically stressed by climate change, could lead to social conflict [2, 3]. It should be noted on the special role of water resources in the energy security of Central Asia and also the uneven distribution pattern of the share ofhydropower over the countries. For example, in Tajikistan and Kyrgyzstan, the share of hydropower in the energy consumption pattern exceeds 90%, demonstrating strong dependence of their economies on the availability and usage of water in the hydropower industry. Tajikistan and Kyrgyzstan, where a main flow of the Aral Sea (80%) is formed, are interested in the use of water for hydroelectric power generation while the downstream countries - Kazakhstan, Turkmenistan and Uzbekistan need water for irrigation. The upstream countries

discharge maximum water in the winter time when power is in high demand, while downstream countries need maximum discharge in the summer season for agricultural development needs. Therefore, any changes that affect water resources in Central Asia have a high multiplier effect on various socio-economic aspects of development across the region.


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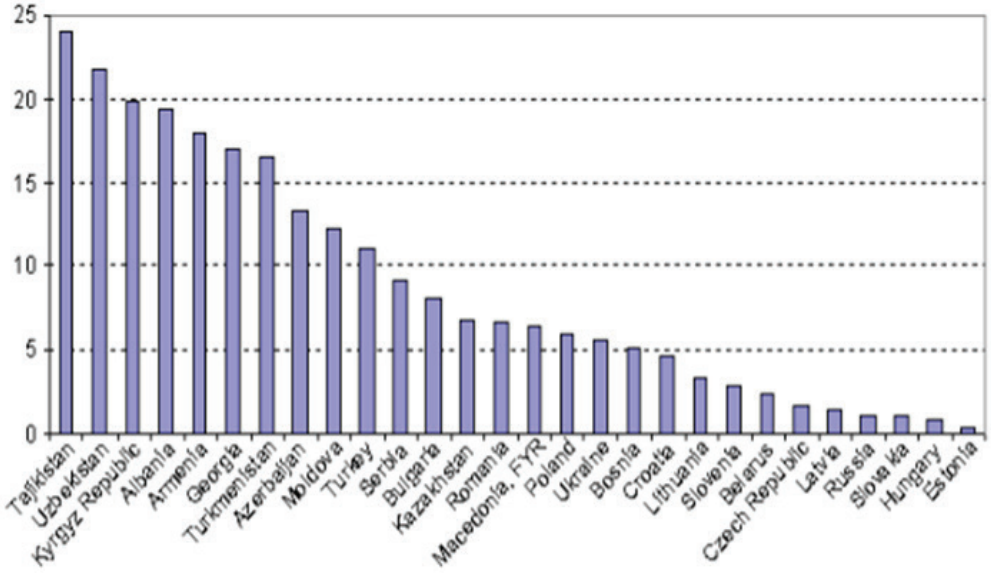
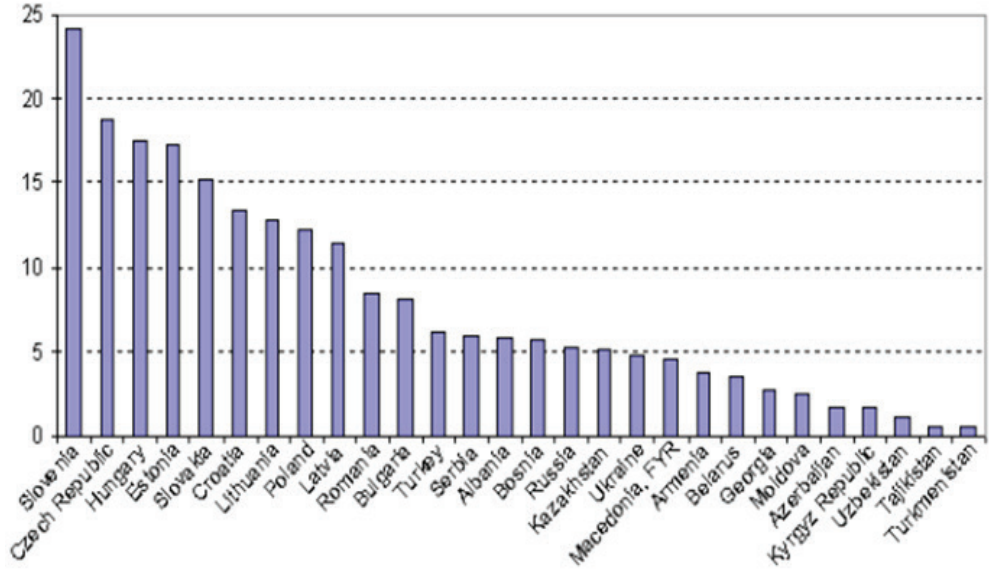
For the countries of Central Asia agriculture is a very important sector of the economy constituting up to 30% in the GDP. It provides employment to nearly half of the population of the region and productive agriculture is considered as the basis of food security in each country of the region. In the second half of the 20th century, the area of irrigated land has increased significantly, and the per capita consumption of water per 1 hectare increased by 40%. Defragmentation and imperfect irrigation systems led to significant infiltration and ineffective use of water resources [4].

One of the signs of climate change in the region is the increased risk of emergency situations: high winds, floods and flooding, dam failure and drought. The development of forecasting and early warningof natural disasters system, as well as the system for evaluation of possible damage (risk assessment) is the important issues facilitating decision-making on adaptation and mitigation of vulnerability caused by CC risks.

In the CA the adaptation problems are characterized by its complexity and versatility due to diversification in nature and climatic conditions across the region. Characteristics of vulnerability considerably differ from one territory to the other, but all the countries of Central Asia are equally vulnerable to climate change. In 2009, the World Bank has conducted a study on thevulnerabilityto climate change inthe countries of Europe and Central Asia. Graphs 1 and 2 revealed the high vulnerability and low adaptive capacity for all countries of Central Asia [5].



Graph1: Ranking of countries as per index of vulnerability to climate change
Source: Fay, Marianne and Hrishi Patel. 2008. A simple index of vulnerability to climate change".



Graph 2: Index of adaptive capacity to climate change for Europe and Central Asia
Source: Fay, Marianne and Hrishi Patel. 2008. A simple index of vulnerability to climate change.

The Central Asian countries are now striving for sustainable development of their resources. According to expert estimations, water resources and agriculture shall be the sectors most dependent on climatic risks. In this connection the issue of adaptation has been becoming a priority task. It is necessary to determine the ways to ensure preventive adaptation to reduce vulnerability to climate change of all sectors of the economy and society. The work on the ACC will require more data collection on all components ofthe climate system. These data are necessary for governments andvarious sectors of the economy to assess vulnerability to climate change and climate change consequences as well as for implementing mitigation and adaptation action plans.

In any adaptation policy climate change shall be considered as one, out of the many other factors, stressing the water resources and consequently all other water-consuming sectors of economy. Adaptation strategy shall include measures to be taken at all stages of the adaptation process: monitoring and early warning of climate risks, prevention, improvingstability, preparedness, response and rehabilitation. The priority shall rather be given to risks prevention and vulnerability to reduce the effects of CC in terms of the economy and population, than to elimination of consequences of emergency and crisis situations. It is necessary to ensure that adaptation measures are cost-effective, environmentally sustainableand socially acceptable. Prioritization of measures should be based on the results of assessments in respect of vulnerability, costs and benefits. It shall also incorporate development objectives, views of stakeholders and available resources. Review of the current adaptation measures in terms of their benefits, risks, costs, possible side effects and uncertainties shall be made as a first step.

CURRENT MECHANISMS AND ACTIONS ON ADAPTATION TO CLIMATE CHANGE

All Central Asian countries are the parties to the Framework Convention on Climate Change (UNFCCC). One of the commitments of the member states is the adoption and implementation of the national programmes for adaptation to climate change. As part of this commitment the issue on adaptation to climate change constitutes one of the sections of the National Communications UNFCCC.

- In Kazakhstan, in 2011 a National Concept for adaptation to climate change has been drawn out and approved. It is reported that the National Strategy and Action Plan for ACC shall be designed by 2013.

- In Kyrgyzstan, the preparation of the National Strategy for adapting to climate change has been conducted by the State Agency of Environmental Protection and Forestry under the assistance of four ministries: agriculture and amelioration, emergency, healthcare and energy.

- The Center for the Study of climate change has been established by the Tajikistan Government and operates in the State Enterprise of Hydrometeorology under the State Committee for environmental protection. The Center is engaged in policy planning, implementation of respective projects and participation in international negotiations on climate change. The pilot programme on adaptation to climate change has been launched in 2010. The issues of climate change risks have been incorporated in the Third Poverty Reduction Strategy (PRS) 2010-2012.

- In Turkmenistan the National Strategy of on CC has been approved on 15th of June, 2012 by the Presidential Decree No. 12366. The document contains a section: "The main directions and sectors to adapt to climate change". It is also reported that the country profile review and the analysis of existing and potential practices to be employed in future on adaptation to climate change, have been prepared in Turkmenistan.

- Adaptation to climate change is included in the strategic plans of the Republic of Uzbekistan.The country is preparing the third National Communication to the UNFCCC.The report shall serve a basis for the proposals to the National Programme (Strategy) on climate change. During 2012, a number of events on ACC has been conducted in Uzbekistan which underlined the necessity to work out the Strategy on ACC.

The achievement of sustainable management of water resources in Central Asia shall be based on the employment of methodological and practical measures including assessment of the current condition and identification of future trends in terms of water resources of the region with due consideration of climate change. The need for a common, modern water management system in Central Asia requires the establishment and development of cooperation mechanism based on an integrated approach.Thus, the1998 Agreement between the Governments of the Republic of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan on the use of water and energy resources of the Syrdarya river basin regulates relationship on supply of water and energy resources. Theoretically, this mechanism may be used by States as an adaptation tool for decreasing water resources due to climate change [3].

Adapting to climate change is a multi-level process. The activities at the local level aimed to reduce the vulnerability of the agriculture- recognized as the most vulnerable sector to CC, is considered as one of the adaptation process components. The study and exchange of knowledge and practices on water and land use, which meet the adaptation criteria, shall be another important component in the development of ACC mechanisms and action plans. The Central Asian countries have already gained experience through implementation of projects on adaptation of agriculture to increased drought and scarcity of irrigation water which can be further helpful for the implementation and development of policies[6-8].

GAPS IN ADAPTATION AND RECOMMENDATIONS

Despite the fact that the Central Asian countries are working on the implementation of the UNFCCC, the gaps still remain and the search for solutions to prevent and reduce the economic losses due to increased drought and scarcity of water resources is prevalent. To address adaptation to climate change in the region it is necessary to take measures aimed at enhancement of coordination, overcoming of fragmentation and duplication and consolidating of the efforts of all parties nvolved, i.e. government agencies, local authorities, research institutions, farmers, managers and professionals of agricultural entities, international institutions and non-governmental organizations of the Central Asian countries.

Since water is a vital necessity for the people living in the Central Asian countries, the main purpose of water management strategies in the light of climate change shall be the regulation of balance of interests of countries concerned between the needs of water use, in particular, the environment, hydropower and irrigation farming [3].

A multi-sectoral approach shall be employed to attain effective adaptation to climate change, including that of at trans-boundary level to prevent possible conflicts between different sectors, and to account possible compromising options that shall synergistically effect on both adaptation and mitigation of CC impact. Implementation of strategies for adapting to climate change will allow the Central Asian countries to avoid the losses associated with the risks of climate change while implementing the medium-and long-term development programmes at the national and regional levels. The adaptation activity should be focused on the following main directions:

- public involvement in the process of adapting to climate change;
- ensuring cross-sectoral integration in adapting to climate change;
- improving the legal bases of adaptation to climate change;
- organising trans-boundary cooperation on adaptation to climate change.

Water allocation and water use are identified as the gaps in adaptation policy of the water sector. In agriculture 90% of water use relates to unjustified expansion of irrigated farming, deteriorated irrigation systems and inadequate technologies, cultivation of water-intensive crops (rice, cotton) in the arid climate conditions. Adaptation to expected changes of water resources should have the following priorities at national and sub-national levels:

- introduction of water saving technologies in agricultural production, industrial and domestic sectors;
- implementation and institutional support for IWRM;
- water flow control and arrangement of water reserves in reservoirs;
- increase the share of groundwater in water use pattern;
- development of water users incentives ensuring more efficient use of available resources through introduction of water tariff system.

The agricultural sector in all five Central Asian countries is closely linked to the priorities of the state. According to the experts' estimation, about 70% of the potential damage caused by unfavorable weather and climatic conditions pertains to agricultural production. Adapting to climate risks in the "agricultural sector" shall include:

- rehabilitation of irrigation systems;
- application of water-saving technologies (drip irrigation, irrigation recharge, estuary irrigation, furrow irrigation options, etc.);
- shift from water-intensive to drought-resistant crops;
- introduction of advanced technology in irrigated and rain-fed agriculture;
- expansion of pastoral areas through irrigation and rational water use; and
- increase livestock forage through arrangement of cultivated hay land.

In the last few decades the area prone to drought in the Central Asian have increased and led to increased poverty, reduced food security and grown migration. Hence, regional priority should be focused on drought risk management. A comprehensive drought risk reduction approach shall be adopted at both the regional and local levels. It shall involve monitoring of the process, prevention and preparedness action plans.

The sector of **emergencies** is also treated as vulnerable to climate change. The increase in air temperature leads to intensive melting of glaciers, increase in flooding water and can lead to disastrous consequences. This

The following activities shall increase resilience to climate risks and reduce the threat of natural disasters:

- preliminary assessment of possible impacts and losses caused by natural disasters;
- cessation of logging and overgrazing of mountain forests, slope stabilization and erosion control;
- construction of slide protective structures, flood control hydraulic structures;
- improvement of CC risk monitoring and early warning system;
- strengthening the capacity building of regional network of meteorological services of CA countries;
- introduction of low-water technology and water recycling systems in industry and public utilities;
- wastewater use; and
- reducing the share of hydropower through shifting to use of nuclear, solar and wind energy.

To identify innovative methods of adaptation it is recommended to support the exchange of information and knowledge through a variety of networks, including APAN. It is necessary to expand education for sustainable development, the exchange of knowledge, actions and best available practices in adaptation policies carried out in the region. Through sharing information, countries and sectors can more reliably estimate the vulnerability factors, especially in the context of trans-boundary basin. Priorities in the **socio-economic** sector shall involve the following measures:

- strengthening of education for sustainable development, sharing knowledge, actions and best available practices on adaptation policies carried out in the region;
- development and implementation of climate risk insurance methodologies;
- promotion of international agreements on water regulation in the light of upcoming climate change;
- strengthening of technical and legal basis of international organizations; and
- establishment of regional information network and improvement of knowledge and skills on adaptation to climate change.

In relation to Kyrgyzstan and Tajikistan it shall also apply to **hydropower** development plans. In fact, the mandatory consideration of expected climate changes in the design of various types of long-term plans and programmes, etc. both at the national and regional levels shall be judged as adaptation actions. Since there are uncertainties in climate risks, adaptation measures need to be flexible to ensure maximum benefits under various conditions. If conditions are changed or become different from expected ones, this approach will allow to simultaneously adjusting the measures.

The most important and difficult task for policy makers is to create an environment that creates opportunities for adaptation to climate change at all levels. As climate change creates a new situation, it is necessary to assess the political, legal and institutional arrangements and adjust them to the adaptation to climate change. At the same time, it is recommended to employ the experience gained from the activity of already implemented or on-going programmes, suitable for adaptation to climate variability. Reasonable and sustainable policy at the local, national and trans-boundary levels shall be designed taking into account new conditions that are inherently unstable and volatile. Governments shall take full advantage of available multilateral funding mechanisms for adaptation to climate change. The main mechanisms supporting adaptation are special adaptation fund under the auspices of the GEF, the Adaptation Fund under the Kyoto Protocol, Official Development Assistance (ODA), "Kazyna" Sustainable Development Fund, Small Business support Fund, Soft bank lending initiative.

Mechanisms for financing of adaptation strategies shall be developed involving internal (governmental and private) and external resources as well as resources of insurance companies. Improving of water supply system shall be of high priority in allocation of the resources because reliable water supply should become a strategic issue of state regulation ensuring food, social, economic and energy security. New forms of financing for adaptation measures shall be identified such as insurance index and payments for ecosystem services (PES). PES mechanism represents a very interesting and innovative approach to mutually beneficial cooperation amongst the ecosystem's users, which is now employed as one of the instruments in implementation of various agreements, including strategies, conventions.

CONCLUSIONS

The **major conclusions** are:

1. For the countries of Central Asia, located in the arid zone, water resources and dependent on them agricultural sector, hydropower, as well as risks of natural disasters and public health are considered as sectors most vulnerable to climate change.
2. Adaptation to climate change shall not be treated as "one-time" short-term event.At national level, the work on strategy development and action plan for adaptation to climate change should become a priority task in Central Asia. Adaptation to climate change shall be incorporated into the strategic plans of ministries and agencies and plans for regional cooperation.
3. To adapt to increasing aridity conditions, the measures ensuring capacity building, research and application of appropriate technologies, exchange of knowledge and best available practices shall be implemented at all levels (regional, national and local).
4. Consolidation of Central Asian countries in adaptation to climate change (ACC) shall help to overcome the fragmentation and duplication in measures undertaken and strengthen the capacity of each country.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The impact of climate change on the economy of the Central Asian countries threatens sustainable development, economic growth, poverty reduction, health of people and ecosystems, thereby undermining the potential in achieving the Millennium Development Goals. How, the adaptation measures to climate risks in countries are limited to projects implemented at the local level. But all Central Asian countries have already gained great and valuable experience on adaptation methodologies and techniques. Exchange of information between countries and sectors, is vital for ensuring efficient and effective adaptation to climate change. Data collection, including socio-economic information should cover all aspects of the most vulnerable sectors. Early warning systems are essential to ensure preparedness in the event of extreme weather events. They should be designed at the transboundary level.

Crucial role in the implementation of effective adaptation shall pertain to the institutional capacity at all levels, from local to transboundary. Work on the ACC must be supported by adequate climate and hydrological information systems

The states should assist each other in building capacity. Importance of the transfer of knowledge related to capacity building through education and training in formal, informal and casual environment shall not underestimated in terms of trans-boundary issues related to climate change. Education and information sharing strategy should be designed and implemented in compliance with the needs of target groups, taking into account such factors as age, social role and level of literacy. This approach can help people to understand the necessity to consider the adaptation and mitigation issues in making important decisions, such as construction of buildings in areas prone to risk of floods and/or application of climate-proofing methods in agriculture, construction, etc.


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Policy-makers should seek to establish an effective communication system at different levels, involving all stakeholders - individuals, local authorities, stakeholders from relevant sectors and policy-makers at the international level. Various levels of governance shall communicate and render support to each other through, for example, the creation of consultation mechanisms at national and transboundary levels. The joint bodies should have the mandate, capacity and means enabling them to perform the functions on development and coordination of strategies for adaptation to climate change.

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