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Projected impacts of climate change on hydrology, water resource use and adaptation needs for the Chu and Talas cross-border rivers basin, Central Asia

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The observed long-term trends, variability and projections of future climate and hydrology of the Chu and Talas transboundary rivers basin were analysed using a common approach for Kazakhstan and Kyrgyzstan parts of the basin. Historical, current and forecasted demands and main uses of water in the basin were elaborated by the joint effort of both countries. Such cooperative approach combining scientific data, water practitioners' outlook with decision making needs allowed the first time to produce a comprehensive assessment of climate change impacts on water resources in the Chu-Talas transboundary rivers basin, identify future needs and develop the initial set of adaptation measures and recommendations.

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Climate change projections, including air temperatures and rainfall in the 21st century were determined with a spatial resolution 0.5 degrees based on the integration of 15 climate change model outputs (derived from IPCC's 4th Assessment Report, and partially 5th Assessment Report) combined with locally-designed hydrology and glacier models.

A significant increase in surface air temperatures by 3-6°C may be expected in the basin area, especially in summer and autumn. This change is likely to be accompanied by rainfall increase during the cold season and a decrease in the warm half of the year. As a result, a deterioration of moisture conditions during the summer-autumn period is possible. Furthermore, milder winters and hotter summers can be expected. Mountains will likely receive more liquid precipitation, than snow, while the area and volume of glaciers may significantly reduce.

Projected changes in climate and glaciers have implications for river hydrology and different sectors of the economy dependent on water use. Assessment of agricultural sector vulnerability, which is the key water user in the basin, led to identification of the potential adaptation measures and discussion with relevant national and river basin authorities and the major stakeholders. Proposed adaptation measures range from technical – such as rehabilitation of irrigation systems to reduce water losses, modernize water reservoirs and adjust river regulation to environmental flow needs, changing land use and crop diversification – to policy and finance measures, including revision of subsidies, economic consideration of ecosystem services, etc.

Next steps include a more detailed assessment of economics, effectiveness and feasibility of the initially proposed adaptation measures and additional research.