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Coping with changing water resources: The case of the Syr Darya river basin in Central Asia

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ABSTRACT

This paper discusses how climatic-hydrological and socio-political developments will affect water allocation in the Syr Darya river basin and which adaptation measures will be needed to cope with changing water resources. In view of the geo-political complexity, climate-driven changes in water availability are of particular importance in this region. Water shortages during summer will become more frequent as precipitation is expected to further decrease and glacial meltwater releases will decrease in the long-term due to reduced glacier volume. Being the main valve to the entire Syr Darya river system, the Toktogul reservoir in Kyrgyzstan could take over, at least partly, the role of glaciers as seasonal water redistributors, thus allowing the generation of energy in winter – benefiting upstream countries – and irrigation for large-scale agriculture in summer – benefiting downstream countries. To date, however, there is no regional consensus on a balanced reservoir management, which currently favours irrigation according to past Soviet priorities. Moreover, the perception of water as a 'national concern' in Central Asia discourages efforts towards cooperation between states at the regional level. So far, climate change adaptation has focused on technical rather than institutional solutions. We suggest that policy-relevant adaptation measures should include consistent data collection and dissemination, cross-sectoral collaboration, promotion of national responsibility and initiative, and agreeing on a regional strategy.

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1. Introduction

1.1. Geographical, hydrological and climatic setting

Water takes on special importance in Central Asia: covering more than four million square kilometres, the post-Soviet states of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan make up an area that is larger in size than India, Pakistan, and Bangladesh combined, and is home to roughly 60 million people. The majority of water feeding the two main rivers of the region, the Amu Darya and the Syr Darya, is formed from glacier- and snowmelt in the high Pamir and Tien Shan ranges in Kyrgyzstan and Tajikistan (Fig. 1). The Syr Darya river is formed by two tributaries originating in Kyrgyzstan, the Naryn River and the Kara Darya river. As it flows towards the Aral Sea, the Syr Darya river provides freshwater and water for irrigation to Uzbekistan, Tajikistan and Kazakhstan (Barnett et al., 2005; Immerzeel et al., 2010; Kaser et al., 2010).

In view of its high complexity and interdependence, climate-driven changes in water availability are of particular importance for the Syr Darya basin. Substantial changes are expected to occur in the amount and seasonality of precipitation, with a likely increase in winter and decrease in summer (IPCC, 2007). This will put even more importance on the buffering effect of glaciers, which release additional water during dry summers and thus compensate for rain shortfalls. In the future, however, this buffering of glaciers will likely undergo a substantial change and reduced glacier volume will eventually result in a decrease of glacier-fed summer runoff (Braun and Hagg, 2009; Sorg et al., 2012). Water shortages during summer are thus likely to be caused by two exacerbating factors – less precipitation and less glacial meltwater. Implications are also expected for runoff from snowmelt, as snowcover duration is probably continuing to decrease (Aizen et al., 1997) and snowmelt will occur earlier in the year (Khalsa and Aizen, 2008). These expected changes call for appropriate adaptation measures (EDB, 2009; Perelet, 2010).

1.2. Complexities of the geo-political context

Historical legacies and the regional political context are of particular relevance in the Syr Darya basin. Agriculture was initially made possible by the Soviet administration in the early 20th century in Central Asia through the development of intensive irrigation systems to fuel larger-scale cotton cultivation. By the 1960s, the traditional belief in inexhaustible Central Asian water resources had diminished as river flows and ground water reserves were depleted and water and soil quality degraded (Klötzli, 1997).

In order for the Soviet Union to become self-sufficient, priority for water allocation was given to the cotton production in the Uzbek Soviet Socialist Republic (SSR) and to rice production in the Kazakh SSR, with the Kyrgyz SSR designated as water supplier. Major investments were made in the construction of dams, reservoirs, irrigation canals and other structures to promote and manage the transfer of water from its source in the Kyrgyz mountains to the main growing areas in the Uzbek and Kazakh SSRs. The administrative borders of the Central Asian Republics did not match the natural hydrological borders of the Syr Darya basin and were disregarded in the construction process of irrigation canals and dams. The costs of water management within the upstream SSRs were paid for or subsidised from Soviet central funds and the upstream republics received benefits such as the provision of cheap fuel, electricity and food supplies (Kemelova and Zhalkubaev, 2003; Klötzli, 1997; Hodgson, 2010; ICG, 2002).

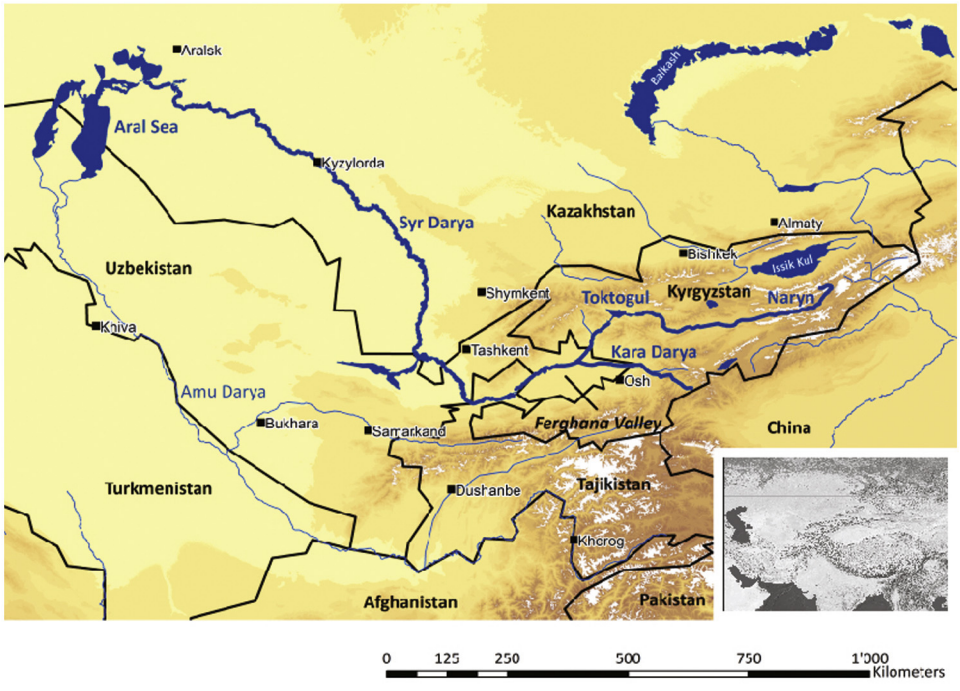

Fig. 1 – Hydro-political map of Central Asia.