

More water from fast melting glaciers in the Tien Shan – A blessing or a curse for agriculture?

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Key words

Glacier melting, climate change, irrigated agriculture, Tien Shan, Central Asia, Kyrgyzstan

Abstract

Glaciers play an important role for agriculture in the semi-arid areas of Central Asia given the fact that river flow is considerably supplied by glacier- and snowmelt in summer when water demand for irrigation is at its peak. The scientific material for the present contribution stems from an article recently accepted by the international journal 'Climatic Change' with the title 'Tracing Glacier Wastage in the Northern Tien Shan (Kyrgyzstan / Central Asia) over the Last 40 Years' written by Peter Niederer, Viktor Bilenko, Natasha Ershova, Hans Hurni, Sergeji Yerokhin, and Daniel Maselli. The investigations made in a representative watershed of the Northern Tien Shan mountain range in Kyrgyzstan (see Figure 1) for the period 1963-2000 show a clear trend in glacier retreat. During this short time period glaciers lost 28% of their area with an apparent acceleration of wastage since the 1980s. The most affected glaciers are those smaller than half a square kilometre; while they decreased by only 9.1% from 1963 to 1986, they lost 41.5% of their surface between 1986 and 2000.

Glacier water and agriculture

Freshwater and agriculture are closely interlinked in Kyrgyzstan where 94% of the available freshwater is used for agricultural purposes (Worldbank, 2005). While glacier melting has been pervasive on a global scale during the last century, Central Asia has been suffering from a particularly large retreat of glacial ice (Arendt et al. 2002).

It seems evident, that the high mountain glaciers in Central Asia are very sensitive to the process of global warming and that this is a serious threat for the 'permanent' fresh water resources of the entire region. If the current annual rate of decrease is maintained, the glaciers in the region investigated may well shrink to half of their current surface by the middle of the 21st century. Given the rapid glacier melting and given the importance of the agricultural sector for the national

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economies, this retreat could become a serious socio-political challenge in Central Asia already in the near future. The impressive decrease especially of small glaciers is thus an alarming fact, as small glaciers indicate warming trends more clearly than large ones (Kääb et al. 2002). The main reason for the melting is a constant increase in mean annual and summer air temperatures as well as a decrease in summer precipitation (Voloshina & Kang 1995). Since summer precipitation in Central Asia plays a crucial role in annual glacier mass balance, this combined effect amplifies the negative impact on glaciers (Zichu et al. 1999).

Paradox of melting glaciers and political responsibility

Freshwater scarcity could thus become a growing concern in the region once the glacier mass will have diminished under a critical threshold leading to rapid river flow reduction. This is particularly true during the dry summer period when glacier water plays a vital role for agricultural production in many areas where irrigation is essential. Moreover, the increased need of water for the growing high populated urban and peri-urban areas may soon add to the (future) competition over (by then presumably much more) scarce water resources and challenge the highland-lowland relationship by further marginalizing remote rural areas.

Currently however the fast melting glaciers are contributing to a continued increase in river flow which creates a paradox for many users who don't automatically establish a link between more water and less glaciers. For most of them living in the vicinity of mountains such as the Chu Valley, the amount of river water currently increases or remains stable at a high level. It is therefore no surprise that little or no efforts are made to effectively reduce water consumption or to save or harvest water. Simultaneously investing in irrigated agriculture appears to be economically promising and the surface needing irrigation water thus continuously increases while water may become a contested and scarce resource already in not too far a future. While this increase in water flow may thus appear as a blessing for today's users it may turn into a curse for the next generation already if no appropriate measures are taken. This alarming fact calls for a rapid political response and challenges the social responsibility of the current leaders in Kyrgyzstan and its neighbour countries. It would appear meaningful and wise to develop mechanisms for saving and harvesting water already now while this resource is still abundant in order to avoid major shortcomings which may trigger both hardship for people as well as different types of tensions and conflicts.



Figure 1. Subdivision of the Tien Shan mountain range in W Western, I Inner, N Northern, and C Central Tien Shan (dotted lines). Study area as black rectangle.

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References

- Arendt, A., Echelmeyer K., Harrison W., Lingle G., and Valentine V.: 2002, 'Rapid wastage of Alaska Glaciers and their contribution to rising sea level', *Science*, 297(5580), 382–386.
- Kääb, A., Paul F., Maisch M., Hoelzle M., and Haeberle W.: 2002, 'The new remote sensing derived Swiss glacier inventory: II. First results', *Annals of Glaciology*, 34, 362–366.

Voloshina, A. P., and Kang X.: 1995, 'Climat vysokogornoi zony (The climate of high mountain regions), in Tien-Shan Glaciers (Oledenenie Tyan Shanya)', edited by M. Dyurgerov, C. Liu, Z. Xie, Publishing House VINITI, Moscow, 233, 43–59.

World Bank: 2005, 'World Development Indicators: Table 3.5. Freshwater'. Available at: www.worldbank.org. Accessed 24 November 2005.

Zichu, X., Jiankang H., Chaohai L., and Sciyin L.: 1999, 'Measurement and estimative models of glacier mass balance in China', *Geografiska Annaler* 81A(4), 791–796.