Sustainable Water Management in the Selenga-Baikal Basin

Integrated Environmental Assessment for a Transboundary Watershed with Multiple Stressors

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Project Profile

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Lake Baikal

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Helmholtz Centre for Environmental Research

ГЕОГРАФИЧЕСКИЙ ФАКУЛЬТЕТ
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Associated partners are the Mongolian Academy of Sciences (Institutes of Geograpy and Geoecology), the Russian Academy of Sciences (Institute of Water Problems, the Joint Russian-Mongolian Complex Biological Expedition) and the Center for Environmental Systems Research of Kassel University, Germany.

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1. Introduction

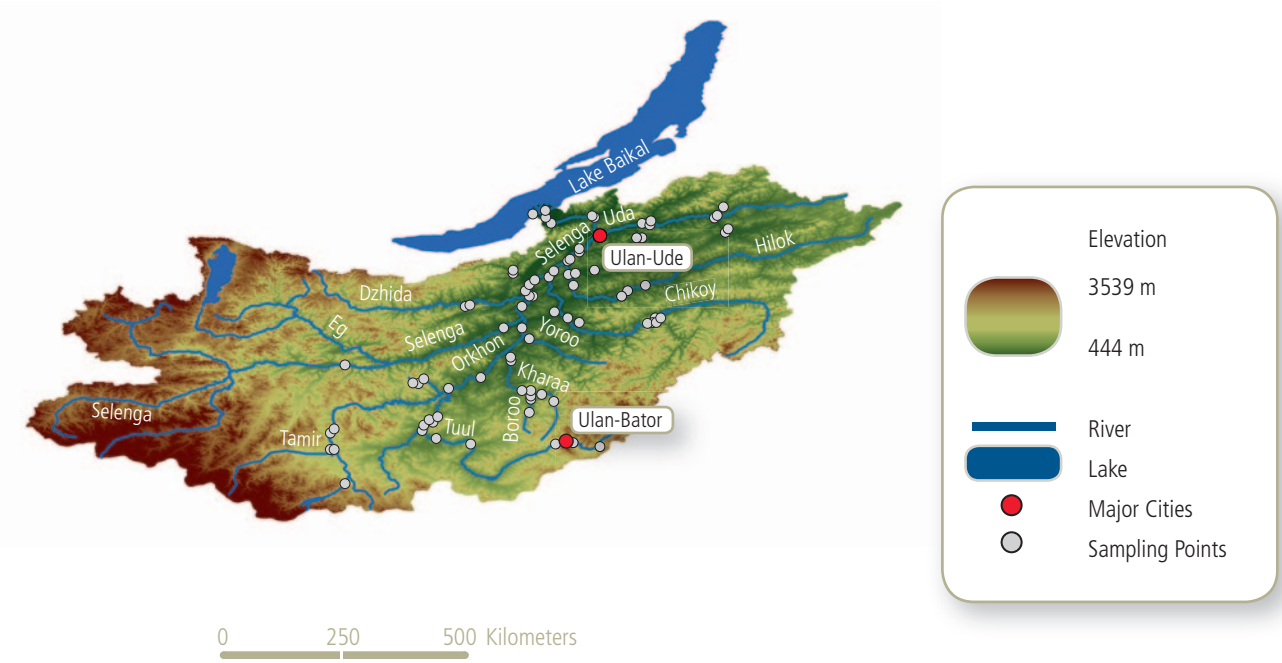
As the deepest and oldest lake in the world, Lake Baikal features a unique ecosystem which was declared a world natural heritage site by the United Nations in 1996. The lake's most important artery is the Selenga River, which crosses the northern half of Mongolia and then flows into Southern Siberia. The Selenga and its tributaries drain an area of about 450.000 km² which encompasses several high mountain ranges and vast areas of steppe and taiga.

Because of the remoteness of the region, environmental data on stream flow dynamics and water contamination have been very scarce until recently. Two research teams – one Russian-Mongolian (see section 2), one German-Mongolian (see section 3) – which had started out independently from each other therefore decided to join forces. The goal of their ongoing cooperation is the integration of research findings to an improved scientific basis and monitoring concept for water resources management in the Selenga-Baikal region.

Steppe in the Orkhon River Valley, Mongolia

2. Hydrochemical Monitoring in the Selenga-Baikal Basin

In 2010, a research team comprising scientists from Lomonosov Moscow State University, the Baikal Institute of Nature Management (Ulan Ude) and the Russian-Mongolian Biological Expedition initiated a multi-disciplinary environmental monitoring based on field surveys which were carried out every summer in both the Russian and the Mongolian parts of the Selenga River Basin. At more than 150 locations, data were collected to characterize stream hydrology, sediment budgets, geochemical changes and pollution sources, as well as downstream environmental and socio-economic impacts.



Rapid urbanization, deforestation, open gold- and other metal-mining activities that are typical for this part of Central Asia were found to have a profound impact on discharge, suspended sediment load and water quality of the Selenga River. Another important conclusion of the project is the important role of channel storage in pollutant delivery to Lake Baikal, which could be altered after the planned construction of dams, reservoirs, and other engineering structures in the upper parts of the Selenga River.

3. Planning IWRM in the Kharaa River Model Region

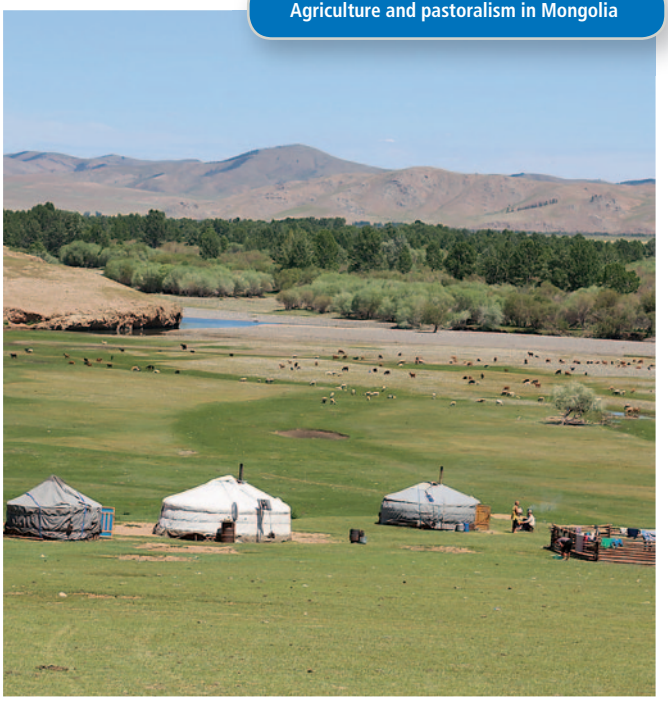
Deficient industrial...

Since 2006, a German-Mongolian research team has been establishing the scientific basis and worked towards the implementation of an IWRM for the Kharaa River Basin in Mongolia (see www.iwrm-momo.de). Although of moderate size (15.000 km²), the Kharaa River Basin can be considered a small-scale model for the much larger Selenga-Baikal watershed.

On the regional level, changes in the hydrological cycle are closely linked to climate and land use changes. Moreover, a rising water consumption which results from urbanization, changing lifestyles and the intensification of agricultural and mining activities means that already scarce water resources are subject to increasing pressure. The project identified key stressors and their effects on water quality and aquatic ecosystems. Moreover, technical solutions were developed to address some of the most relevant challenges related to water supply, sanitation and waste water disposal. In the future, the project's findings will be used to support the development of a science-based river basin management.

... and urban waste water management

Mining – a key source of water pollution



Agriculture and pastoralism in Mongolia

4. A Monitoring Concept for the Selenga-Baikal Basin

The findings of synoptic monitoring in the Selenga-Baikal Basin and intensive monitoring in the Kharaa River Basin lead to the conclusion that environmental and socioeconomic conditions, as well as stressors are similar at both scales. Therefore, the meso-scale catchment of the Kharaa River appears to be a suitable model region to investigate processes occurring in the much larger Selenga-Baikal Basin. Based on the integration of all existing data, a future cooperation between partners from Mongolia, Russia and Germany aims at the harmonization of monitoring efforts, ultimately leading towards a monitoring concept for the entire Selenga-Baikal Basin. The designation of a representative model region with a more intensive monitoring is sensible because the remoteness and difficult accessibility of some parts of the Selenga-Baikal Basin. Moreover, for a currently data-scarce region, a monitoring concept is a necessary prerequisite for the future development of an integrated water resources management.

Discharge Measurement

International Selenga Baikal expedition team visiting monitoring station in the headwater zone

5. Selected Publications

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MALSY, M.; HEINEN, M.; AUS DER BEEK, T. & FLÖRKE, M. (2013): Water recourses and socio-economic development in a water scarce region on the example of Mongolia. GeoÖko 34(1-2):27-49.

PFEIFFER, M.; BATBAYAR, G.; HOFMANN, J.; SIEGFRIED, K.; KARTHE, D. & HAHN-TOMER, S. (2014): Investigating arsenic (As) occurrence and sources in ground, surface, waste and drinking water in northern Mongolia. Environmental Earth Sciences. doi: 10.1007/s12665-013-3029-0

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