Environmental state of aquatic systems in the Selenga River basin

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The transboundary river system of Selenga is the biggest tributary of Lake Baikal (about 50 % of the total inflow) which is the largest freshwater reservoir in the world. It originates in the mountainous part of Mongolia and then drains into Russia. There are numerous industries and agricultural activities within the Selenga drainage basin that affect the environmental state of the river aquatic system. The main source of industrial waste in the Republic of Buryatia (Russia) is mining and in Mongolia it is mainly gold mining. Our study aimed to determine the present pollutant levels and main features of their spatial distribution in water, suspended matter, bottom sediments and water plants in the Selenga basin. The results are based on materials of the 2011 (July-August) field campaign carried out both in Russian and Mongolian part of the basin.

The study revealed rather high levels of dissolved Fe, Al, Mn, Zn, Cu and Mo in the Selenga River water which often are higher than maximum permissible concentrations for water fishery in Russia. In Russian part of the basin most contrast distribution is found for W and Mo, which is caused by mineral deposits in this area. The study showed that Mo and Zn migrate mainly in dissolved form, since more than 70% of Fe, Al, and Mn are bound to the suspended solids. Suspended sediments in general are enriched by As, Cd and Pb in relation to the lithosphere averages. Compared to the background values rather high contents of Mo, Cd, and Mn were found in suspended matter of Selenga lower Ulan-Ude town.

Transboundary transport of heavy metals from Mongolia is going both in dissolved and suspended forms. From Mongolia in diluted form Selenga brings a significant amount of Al, Fe, Mn, Zn, Cu and Mo. Suspended solids are slightly enriched with Pb, Cu, and Mn, in higher concentration - Mo.

The study of the Selenga River delta allowed determining biogeochemical specialization of the region: aquatic plants accumulate Mn, Fe, Cu, Cd, and to a lesser extent Zn. Plant species which are the most important for the biomonitoring were identified: Phragmites australis, Ceratophyllum demersum, different pondweeds (Potamogeton pectinatus, Potamogeton crispus, Potamogeton friesii), Myriophyllum spicatum, Batrachium trichophyllum. Among them some species are characterized by a group concentration of heavy metals: pondweeds (Mn, Fe, Cu), Myriophyllum spicatum (Fe, Mn, Cu), Batrachium trichophyllum (Cu, Fe, Mn, Zn). Hornwort (Ceratophyllum demersum) is a concentrator of Mn.