Human impacts on Water and Sediment Quality of Selenga River system

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Selenga River Basin

- Major tributary of Lake Baikal (the largest freshwater reservoir in the world)
- It originates in the mountainous part of Mongolia (2/3 of the basin area) and then drains into Russia
- Jointly with Angara and Enisey rivers it forms the longest river network in Eurasia
- Selenga River contributes about 50% of the total water inflow into Baikal (29 km³/year)
- Annual sediment load in the delta – 2.7 million ton
Human impacts

- agricultural activities (grazing, row crop agriculture)
- forestry
- industrial activities
- urban waste waters
- mining (coal, ore, gold)
Aims of research

1. To create a data bank on contemporary hydrological and environmental conditions of the Selenga basin rivers

2. Hot spots assessment

3. Assessment of contamination spreading along the transboundary Selenga river

4. Status and modeling of watershed reaction on human impact
Study area

Russian Federation

Mongolia
Flow measurements

Suspended and bed load measurements

Vertical compose suspended sediments determination

Geochemical survey

River valley tacheometrical survey
Field campaign 2011 (high water period)

Orkhon river (May 2007)

Orkhon river (July 2011 – period of field campaign)
Remote sensing information data base

The imageries in total: 73
Date of remote sensing:
4th June – 21st September, 2011
Date of field campaign:

Tuul river, date 07.27.2011,
satellite SPOT-4
Hot spots assessment

\[ Z_c = \Sigma K_c - (n-1), \quad n - \text{elements amount} \quad (K_c > 1.0) \]

\[ K_c = \frac{C_{\text{city}}}{C_{\text{natural}}} \]
Suspended sediment concentration assessment
Mo and As in bottom sediments

Clarke Mo – 1.1 mg/kg, Clarke As – 1.7 mg/kg.
AS in bottom sediments

Russian Federation

Mongolia

Clarke As – 1,7 mg/kg
Hg in bottom sediments

Russian Federation

Mongolia

Clarke Hg – 0,083 mg/kg

Modonkul river below wolfram-molybdenic mining

Boroo river below gold mining

Hg in bottom sediments, mg/kg

Below clarke

Above clarke

0,00000 - 0,04800
0,04801 - 0,06200
0,06201 - 0,08300
0,08301 - 0,09000
0,09001 - 1,10000

Kilometers
Upstreams, Mongolia, Russia

Selenga delta, Russia

Lake Baikal, Russia
Sediment budget (July – August, 2011)
Cities

Land use

Mining

Pollution sources

Sediment budget

Heavy metal budget

Organic matter spreading

Biogenic contamination

Baikal lake status

River flow
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Thank you for the attention