Floods in Mongolia

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Content of the presentation

- *Introduction*
- *Flood causes, magnitude and frequency*
- *Flood changes*
- *Event study (some example)*
- *Problems and perspectives*

Introduction

Mongolia is arid and semi-arid country with annual average precipitation of 224 mm and from which 90.1 per cent evaporates, only 9.9 per cent forms surface runoff, partially recharging into ground water aquifers

Quick rise of water level due to short-duration highly intense rainfall or long-duration low intensity snow melting and overflowing river bank and inandating surrouding area can be define as **floods** (Handbook for Hydrology).

A Disaster is a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources (UN/ISDR, 2004)

Flood causes, magnitude and frequency

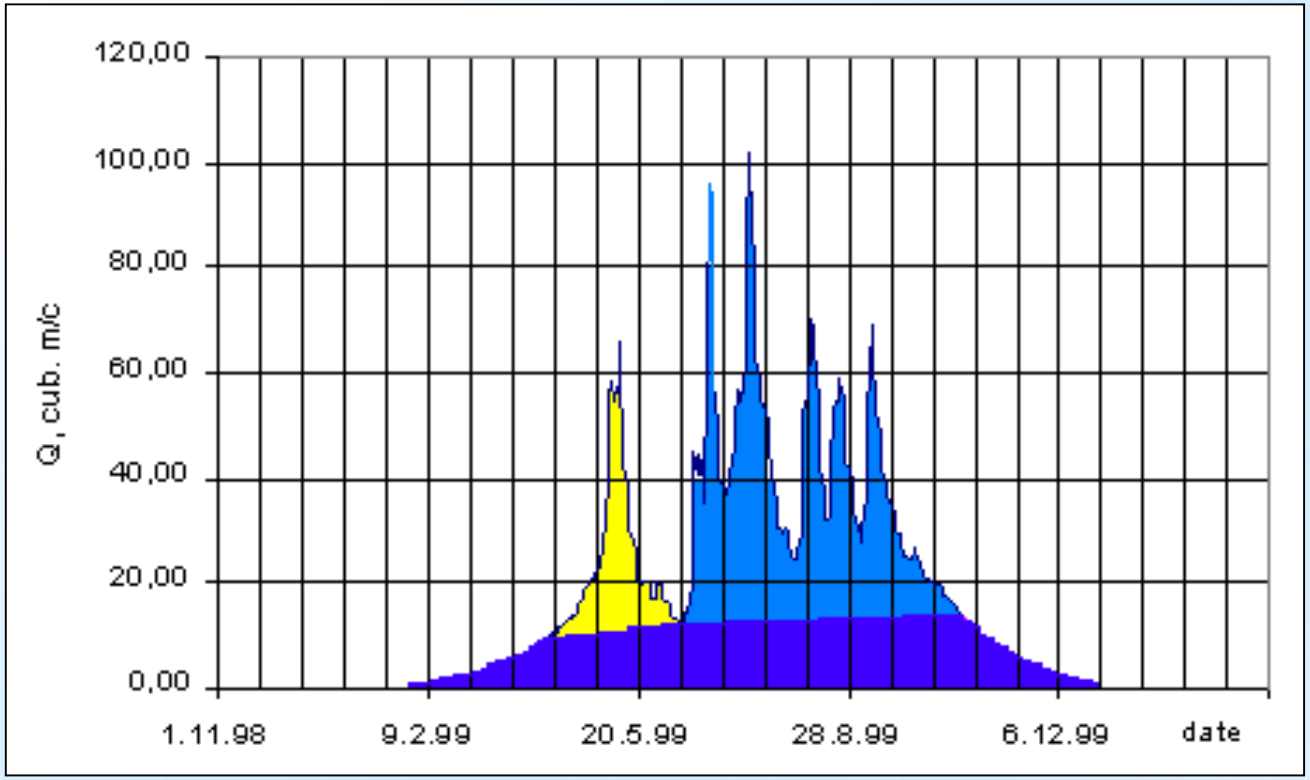
In Mongolia, depending on natural and climatic conditions can be identified there are 3 types of floods.

a. Rise of water level and over bank flow in relatively long period due to snow and ice melting is called **spring or snow melting flood.**

b. Quick rise of water level and over bank flow caused by intensive rainfall is called **rainfall flood.**

c. Finally **flash flood**- high intensive turbulent flow with rocks and sediment and other surface materials due to heavy rain along the steep dry beds and small rivers.

Floods in Mongolia



Yellow is spring flood,

Light blue is rainfall flood

Typical flow hydrograph of Mongolian rivers (river Tuul-Ulaanbaatar, after G.Davaa)

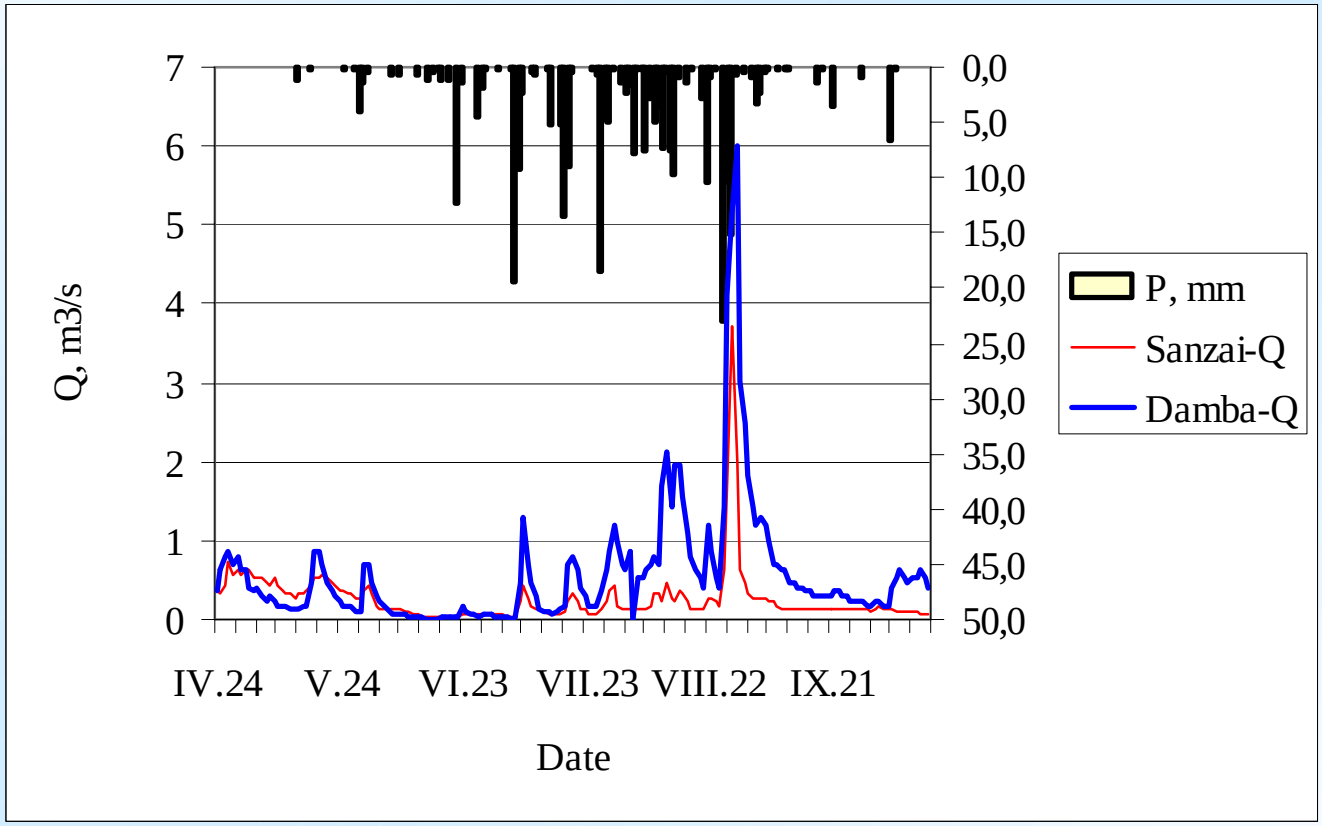
Floods in Mongolia

Spring flood starts from mid of April till end of May in most area of Mongolia and about 20-60 percent of annual runoff forms during the spring flood depending geographical location.

In Mongolia most of annual runoff up to 70-80 percent forms during **rainfall floods** in summer period. Rainfall floods occurs when daily rainfall exceeds 40-110 mm. Rainfall starts from mid of June till mid of September and has several peaks.

Hill slope, soil and sediment, intensity of rain, urbanization are key factors for **flash flood**

Runoff has clear response to rainfall amount and intensity in most rivers, especially in small river basins



Floods in Mongolia

Spring or floods due to snow and ice melting may reach **300-400** cumec while rainfall floods along the Selenge river 1971-1973 produced flood discharge up to **2000-4000 cumecs**.

One biggest rainfall flood in modern era is rainfall flood in 1966 in the Tuul river basin. On10-11th of July 1966, in Ulaanbaatar area have recorded daily rainfall as 103.5 mm which was about 43 percent of total annual precipitation. Flood water velocity have reached 4-5 m/sec, flood discharge **was 1700 cumec** and water level have rised **up to 151 cm for within 1 day**. Relatively big loss of human life and properties (disruption of socio-economic functioning and international help)

Another example of flash flood also in Ulaanbaatar city. In 15th of August of 1982, was very high intensive rain which gave **44 mm (84 % percent of monthly sum) rain for just 20 minutes.** Due to this intensive rain there were flash floods along the 42 dry beds and small rivers around the Ulaanbaatar city, mainly from northern side and as consequences of the flood several tens of people dead and property losses to the Ulaanbaatar city's citizenship.

Floods in Mongolia

Historically mentioned that in 1613, 1623, 1695, 1696, 1701, 1715, 1716, 1830, 1838 and 1868 years in Mongolia have occurred several high (D.Tsedevsuren,1987). For example in 1869 was high floods along the Selenge river and due this flood the water level of Baikal level has rise by 2 meters.

Since systematic and permanent observation for river water regime, in 1966-67, 1971, 1974, 1976, 1982, 1984-1986 years have occurred several huge floods along the Selenge, Delgermuren, Onon, Orkhon, Tuul, Kharaa and Eroo (N. Dashdeleg, 1987). As for recent years-1988, 1989, 1993-94 was high flow years.

Changes

Concerning ***spring floods*** due to snow and ice melting has tendency to occur earlier in comparison to previous years (5-20 days earlier) and became longer

In case of ***rainfall flood***, duration is shortening by2-3 days and intensity has increased (G.Davaa, 2005)

Percentage of heavy rainfall in the warm period sum is increased by 18 % (L.Natsagdorj, 2005)

Research studies on evapotranspiration show that in last 60 years, evapotranspiration is increased by 3.2-10.3 % in steppe and Gobi region and 10.2-15.0% in mountain and forest-steppe regions (L.Natsagdorj, 2004).

Due to the change of land surface (soil and pasture degradation, deforestation, vegetation cover etc) **intensity and amount of direct surface runoff has increased**

Event study

Flash flood which occurred in 18th of July of 2003 in Ulaanbaatar

Cause of flood-heavy intensive rainfall

Rainfall has started at 15:15 and after about 10 minutes intesity of rainfall much increased and became heavy rainfall. Total amount of rainfall within about 3 hours which recorded at Takhilt meteo. station was 22.7 mm and 54 mm at University meteo. station.

Estimated flash flood discharge

Estimated flash flood discharge along the several dry beds in northern part of Ulaanbaatar city (catchment area varies from 10 to 25 km^2) varies from 8.0-17.5 m^3/sec and flow velocity reached 1.5-2.0 m/sec

Flood damage

10 person dead, about 2 km paved road destroyed. 3 cars, 276 fence and gers seriously damaged and 30 families totally lost shelter. Total flood dsicharge is estimated to be 332 million tugrik (290 000 USD)

Flash flood along the dry bed in Ulaanbaatar

Floods in Mongolia

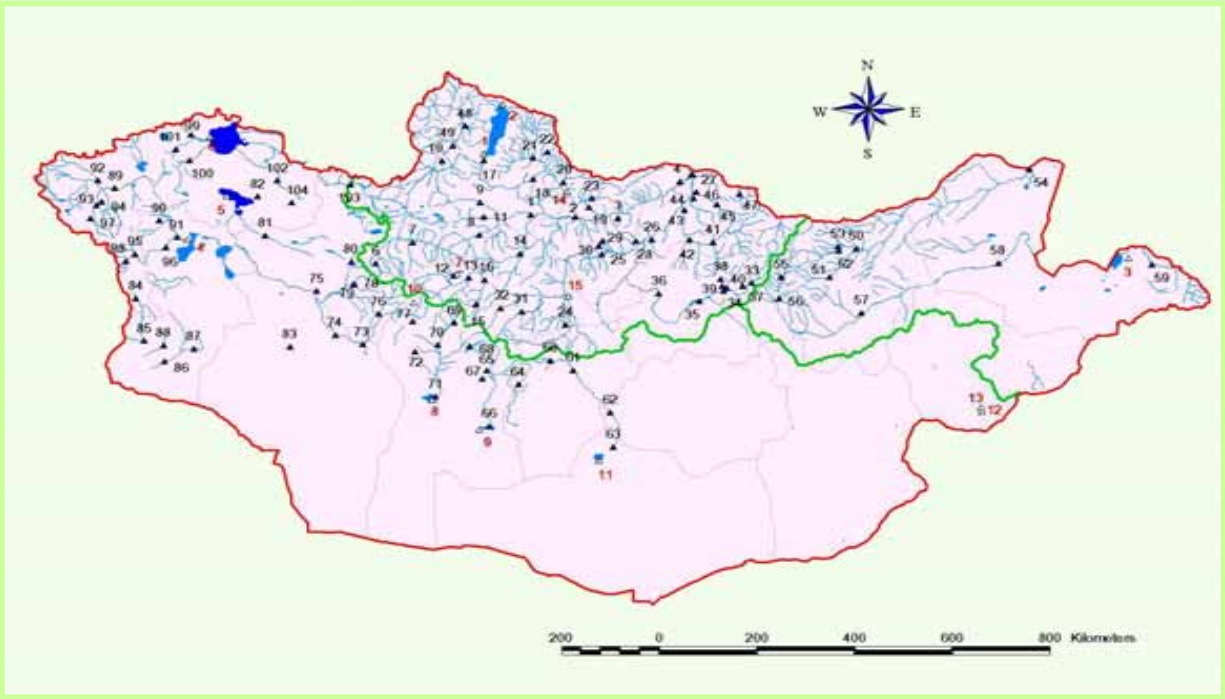
Heavy flood water washes fence, other properties

Saving people's life and damaged flashing ger

Problems and perspecives

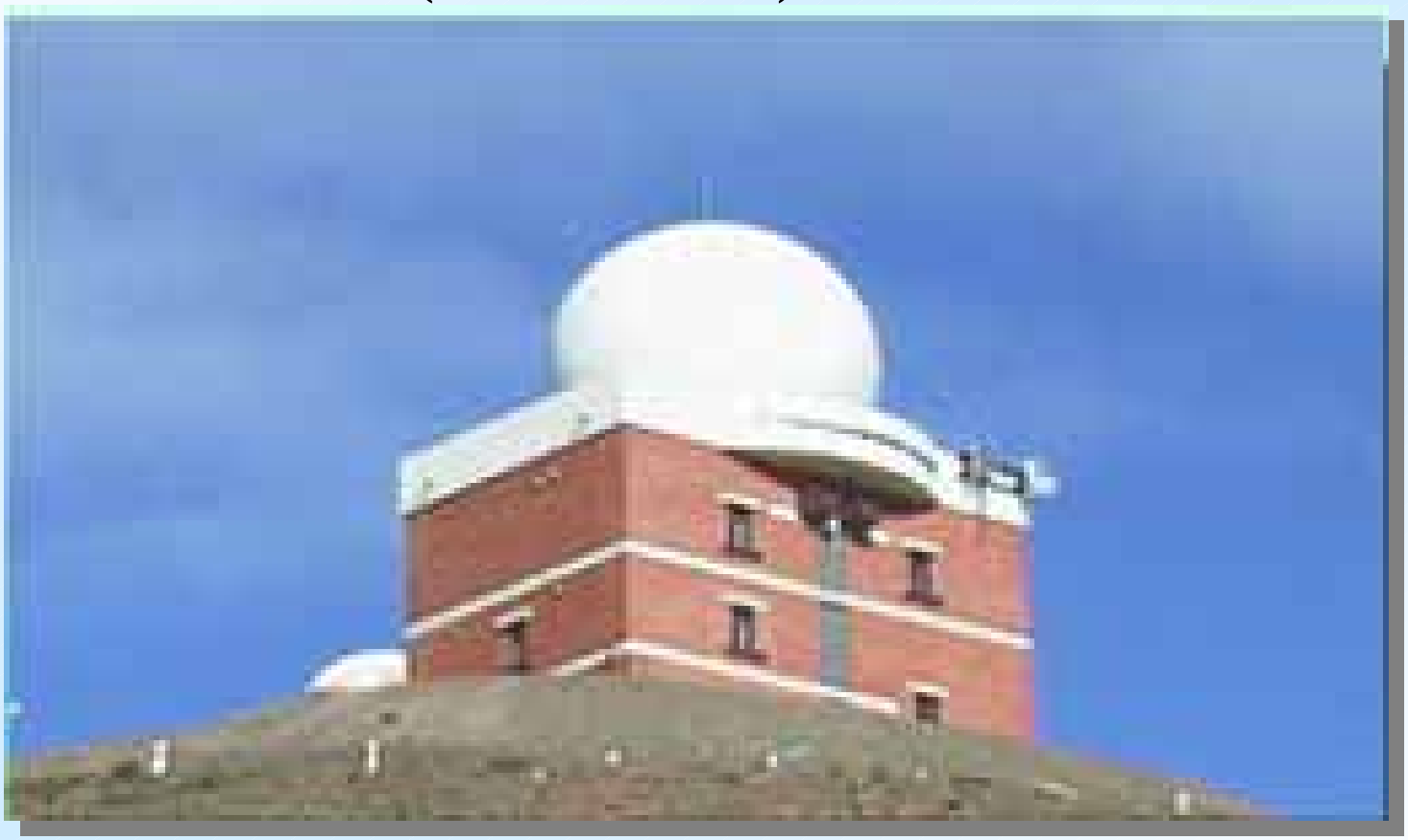
Need to improve density of gauging sites in upper basins of rivers where forms main runoff portion and falls more rainfall,

At the moment, in Mongolia, we have 126 hydrological gauging stations and only about 50 of them transmitting operational data for flood control



Floods in Mongolia

For flood control especially for flash flood control need to develop radar based system with application of satellite, GIS data and rainfall-runoff models (radar network)



The radar station (by JICA, 2002) Doppler type located at top of Morin uul hill (near Ulaanbaatar International Airport, H= 1506 m).

Problems to be continued

Need to continue research studies on impacts of climate change to the water resources and regime, methods and models for flood forecasting estimation etc

Development of the national climate risk management strategy of Mongolia with three components as Early warning system, Preparadness and Adaptation

International cooperation: capacity building, experiences and knowledge, data sharing

Thank you very much