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Ground water governance in Mongolia

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Topics

- Basic Natural conditions
- Water resources
- Water governance
- Case study: water resources in SGR

Mongolia



a vast territory bordering 2 big countries, shares water resources with some of them such as Russia and China. These resources are of two types:

in the north, they are superficial and are formed by the waters of the high mountain ranges, and

in the south; there is groundwater, made up of fossil water layers in Gobi. The waters in the north can only be considered interesting during rainy periods as water is carried to downstream to the Baikal Lake.

At the Khentii mountain range in the East, the water flows from head water to China. Mongolia has an extreme continental climate with long, cold winter and short summers.

Basic environmental condition

In Mongolia, all natural zones such as high mountains, valleys between the mountain ranges, wide steppe, desert and semi-desert zones are combined. Ecologically, Mongolia occupies a critical transition zone in Central Asia: great Siberian taiga, the Central Asian steppe, the high Altai mountains and the Gobi desert.

SOUTHERN PART

- Mezozoic sedimentary rock
- Precipitation 50-100 mm/ year
- Discharge of spring $Q=0.03-21$ l/ s
- Well specific yields 0.1-6.0 l/ s
- TDS 500-600mg/ l, and more 1500 mg/l

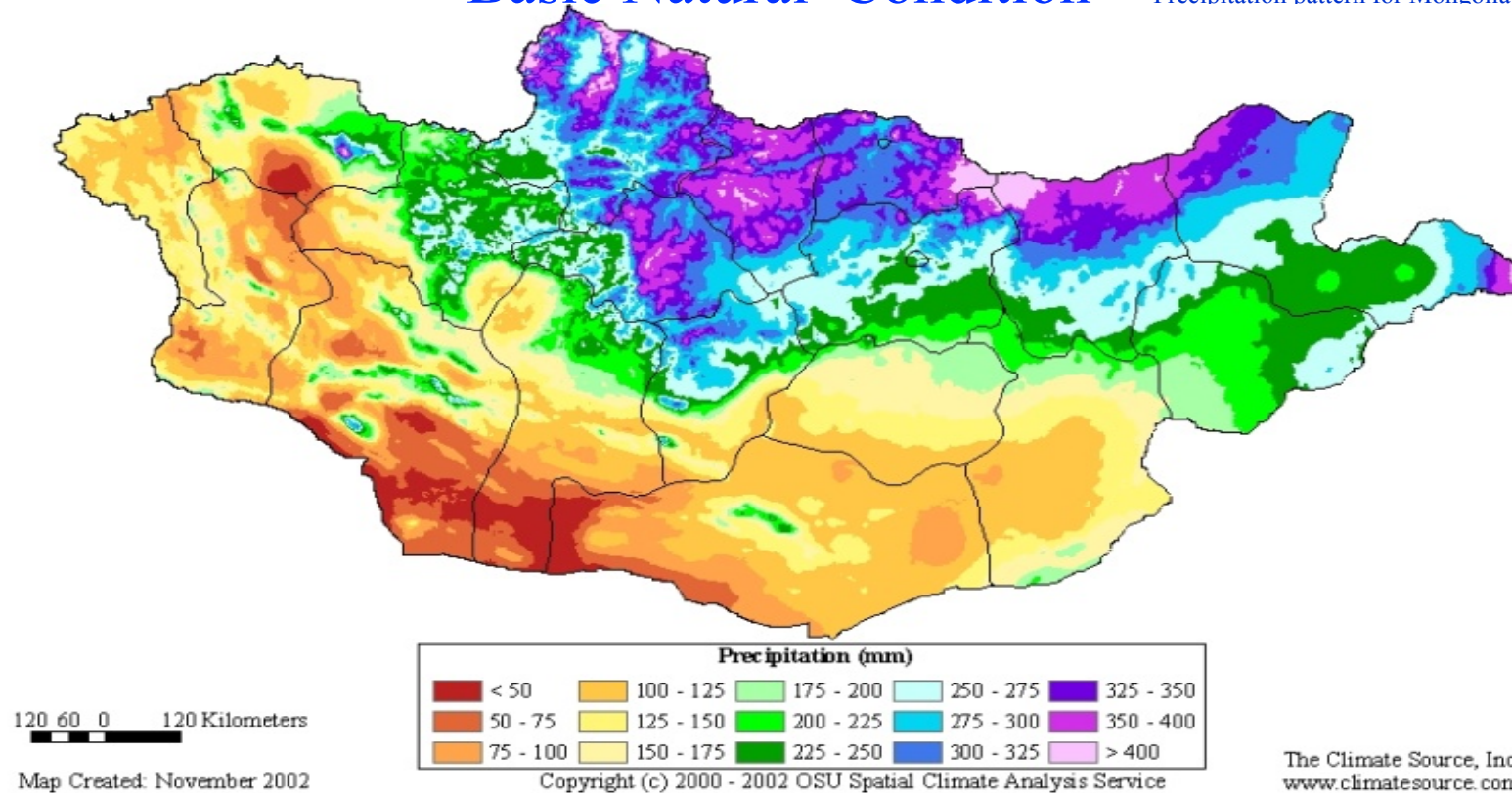
NORTHERN PART

- From Archezoic to Cenozoic magmatic
- metamorphic and sedimentary rock
- Precipitation 400mm/ year
- Discharge of spring $Q=0.2-50$ l/s sometimes $Q=100$ l/ s
- Well specific yields $q=0.2-30$ l/ s
- TDS 200 mg/ l



Basic Natural Condition

Precipitation pattern for Mongolia

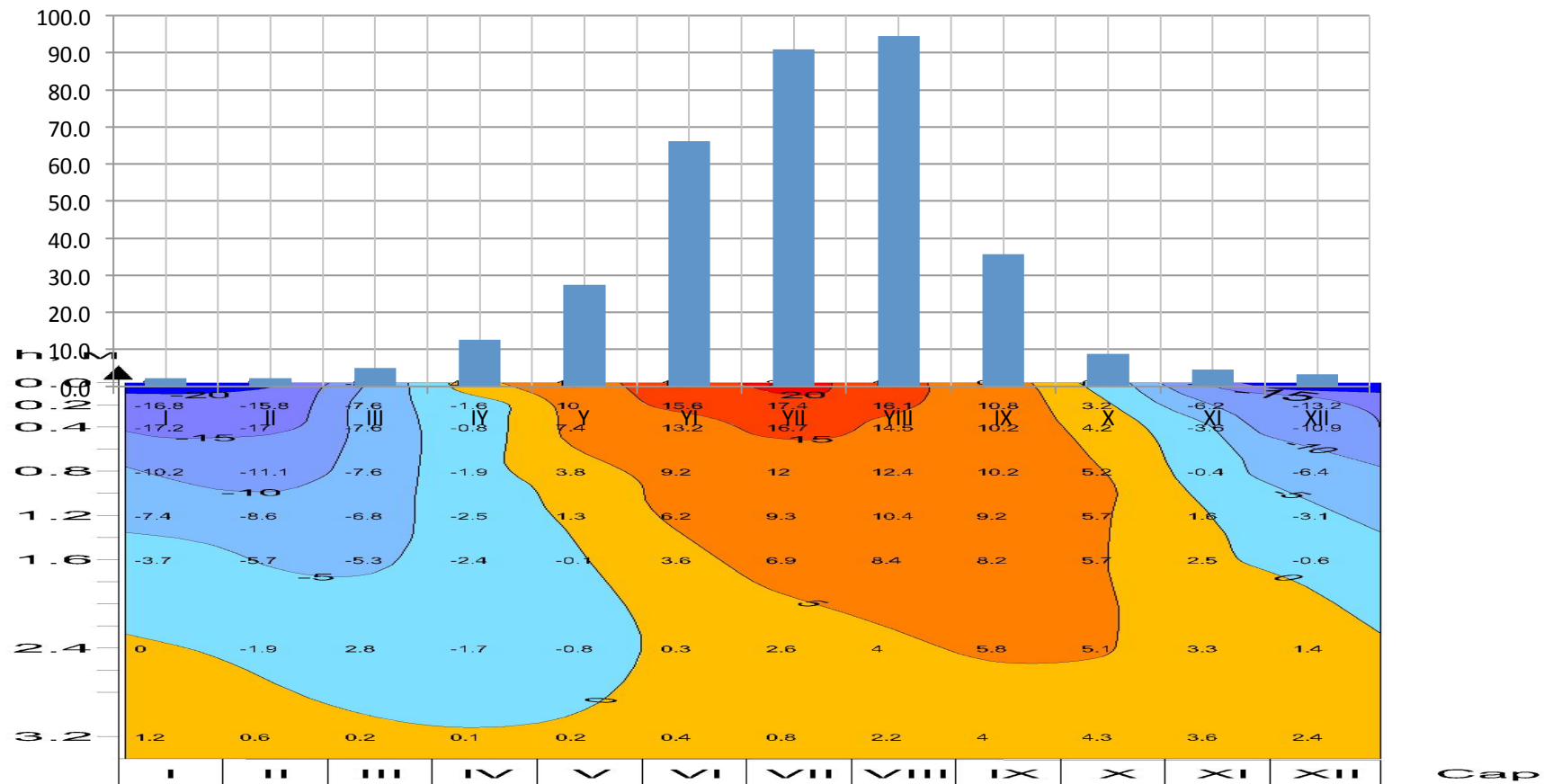


The annual precipitation is so low, 3-6 times lower than global annual. In M, generally precipitation decreasing from North to South Gobi Desert.

Rainfall is highest in North and lowest in SGR. Some regions of Gobi, desert some times receive no precipitation at all.

Basic Natural Condition: Precipitation and soil temperature

Average by mounts 1988-2009, ii



Rainfall in Mongolia concentrated/85-90%/ in the summer months an most rainfalls during summer, so deviation from the season –defendant flux can cause floods or droughts.

Basic Natural Condition



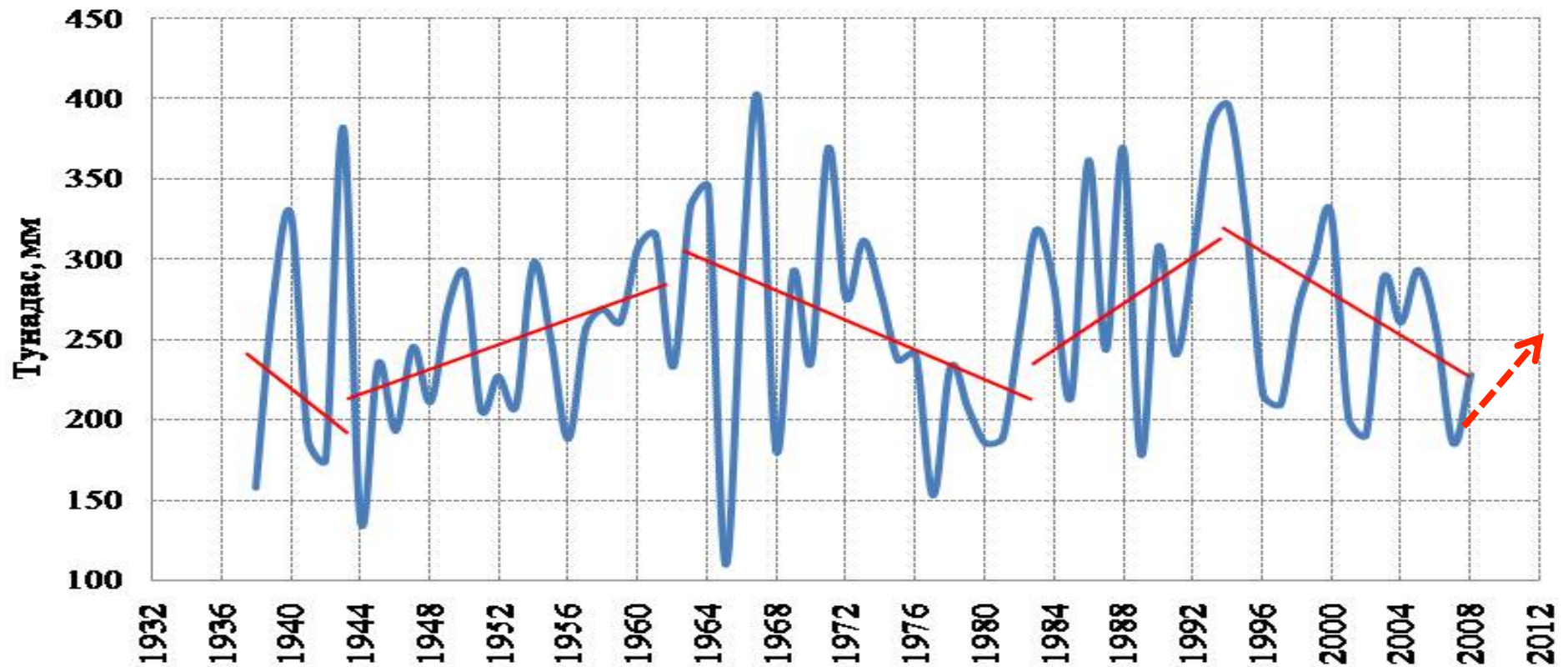
The invitation of gods of water is expressed in the phrase:

We are inviting the caring heaven, the gods of waters, the gods of eight directions and earth, who take care of all living being and Rain

Respect for nature is alive in the ritual of the Ovoo.

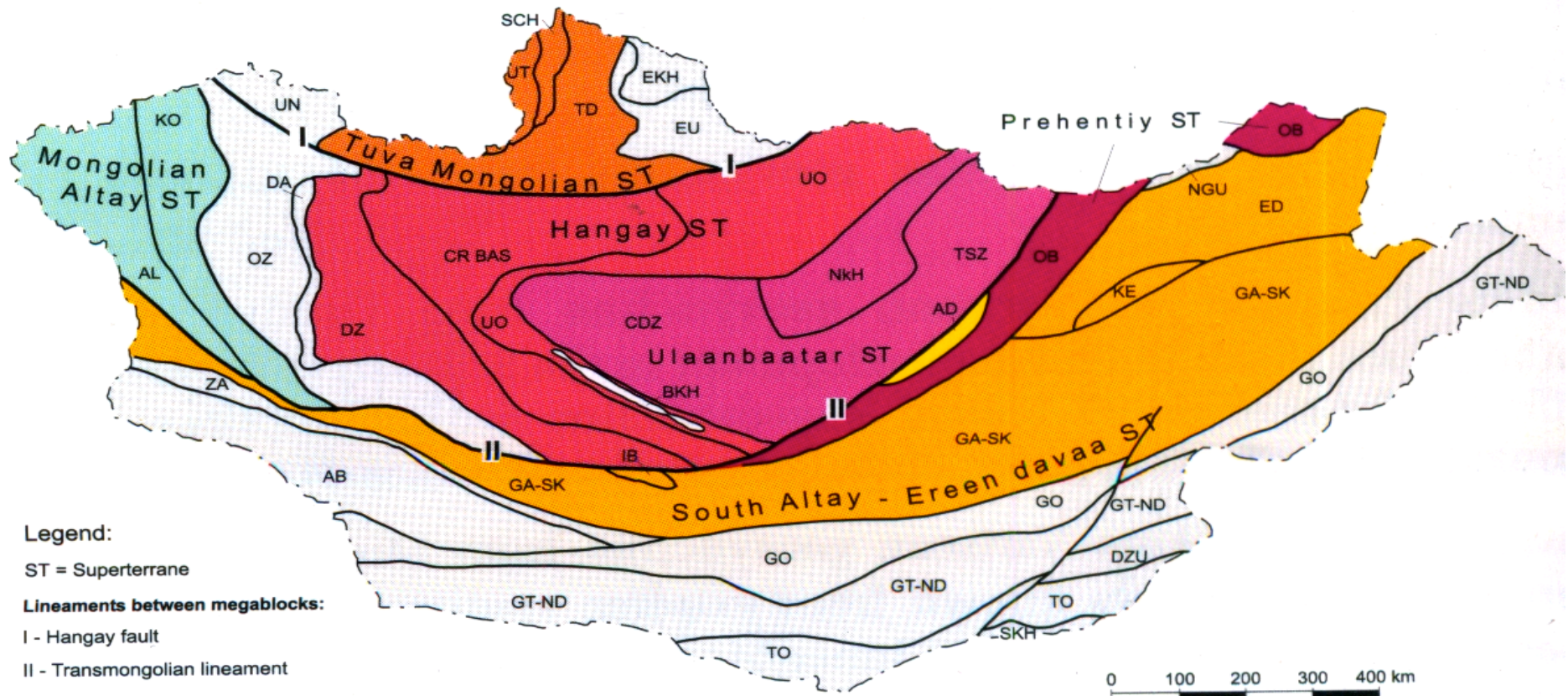
When worshiping the land and water Mongols address the head of waters using respectful titles such as lord mountain, Queen Tuul river, Golden mountain etc.

Basic Natural Condition: Precipitation and Water Circle



Last water circle/1996-2007/ was very hard for Mongolia. Since 1960 the frequency of drought and desertification has increased. Springs, Oasis and ground water wells are currently drying up and ground water table of the Steppe and Gobi desert in Mongolia is dropping. Dry&wet

Basic Natural Condition: Regional Geology and Tectonic. fault



Legend:

ST = Superterrane

Lineaments between megablocks:

I - Hangay fault

II - Transmongolian lineament

Terranes within the megablocks

Northern megablock:

UT - Ulaan taiga
SCH - Shishig,
TD - Tes-Darhad
UN - Uvs nuur
EU - Eg-Uur
EKH - Eastern Hövsgöl

Middle megablock

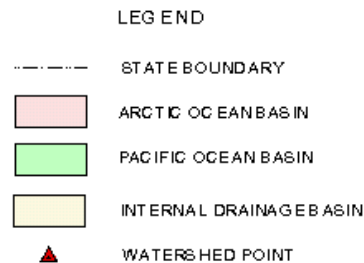
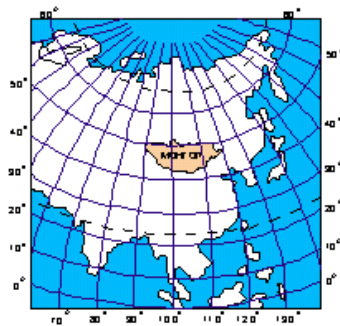
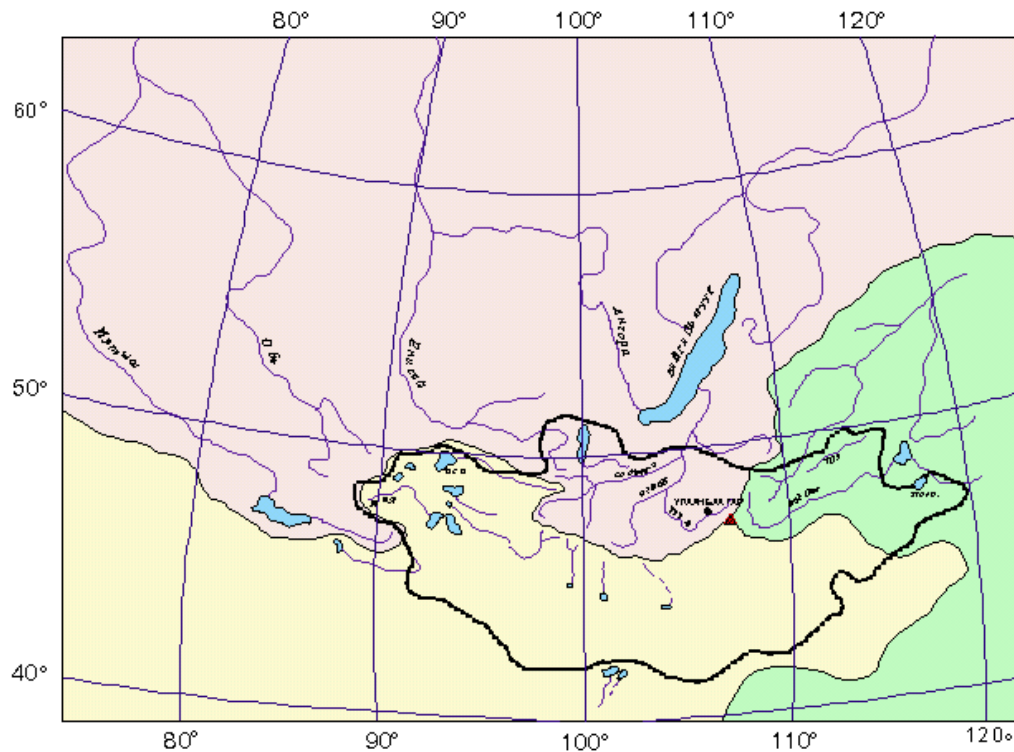
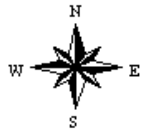
(CR BAS = Lower Precambrian crystalline basement)

DZ - Zavhan
DA - Dariv
UO - Ulziit-Orhon
OZ - Lakes
BKH - Bayanhongor
KO - Hovd
AL - Altay
NKH - Northern Hentiy
CDZ - Tsetserleg-Zuunmod

Southern megablock:

AD - Adatsag
OB - Ongi-Baly
NGU - Northern Gobi-Ulziit
ED - Ereen davaa
KE - Herlen
IB - Ih Bogd
GA-SK - Gobi Altay-South Herlen

ZA - Trans-Altay
AB - Ay Bogd
GO - Gobi
GT-ND - Gobi-Tyanshan-Nuhet-davaa
DZU - Zamin uud
TO - Totoshany
SKH - Solinheer



Water resources

Basin	Area of Mongolia (%)	Surface Water Resources (km ³)
Northern Arctic Ocean	20.5	16.9
Pacific Ocean	11.5	13.9
Central Asian Internal DB	68.0	3.8
TOTAL	100	34.6

Mongolia has limited water resources . Only one source of surface and ground water is precipitation.

The most part (about 65.4%) of water resources are formed on 30% of whole territory in Mongolia.

Ground Water Renewable resources of Mongolia are limited. Consequently, main part of Ground Water Exploitable Resources and Ground Water reserves are fossil and vulnerable.

The total GW resources is estimated as 6.07 km³/ year.

Water resources: Surface water

- All Mongolian Rivers freeze, most of them for 140 to 180 days each year, with ice to depths of 80 to 120 cm. In the low lying plain areas rivers thaw in April but in the mountain regions not until mid-May. As a result, Mongolia is heavy reliant on ground water, and this resource is of particularly great economic significance to the country.

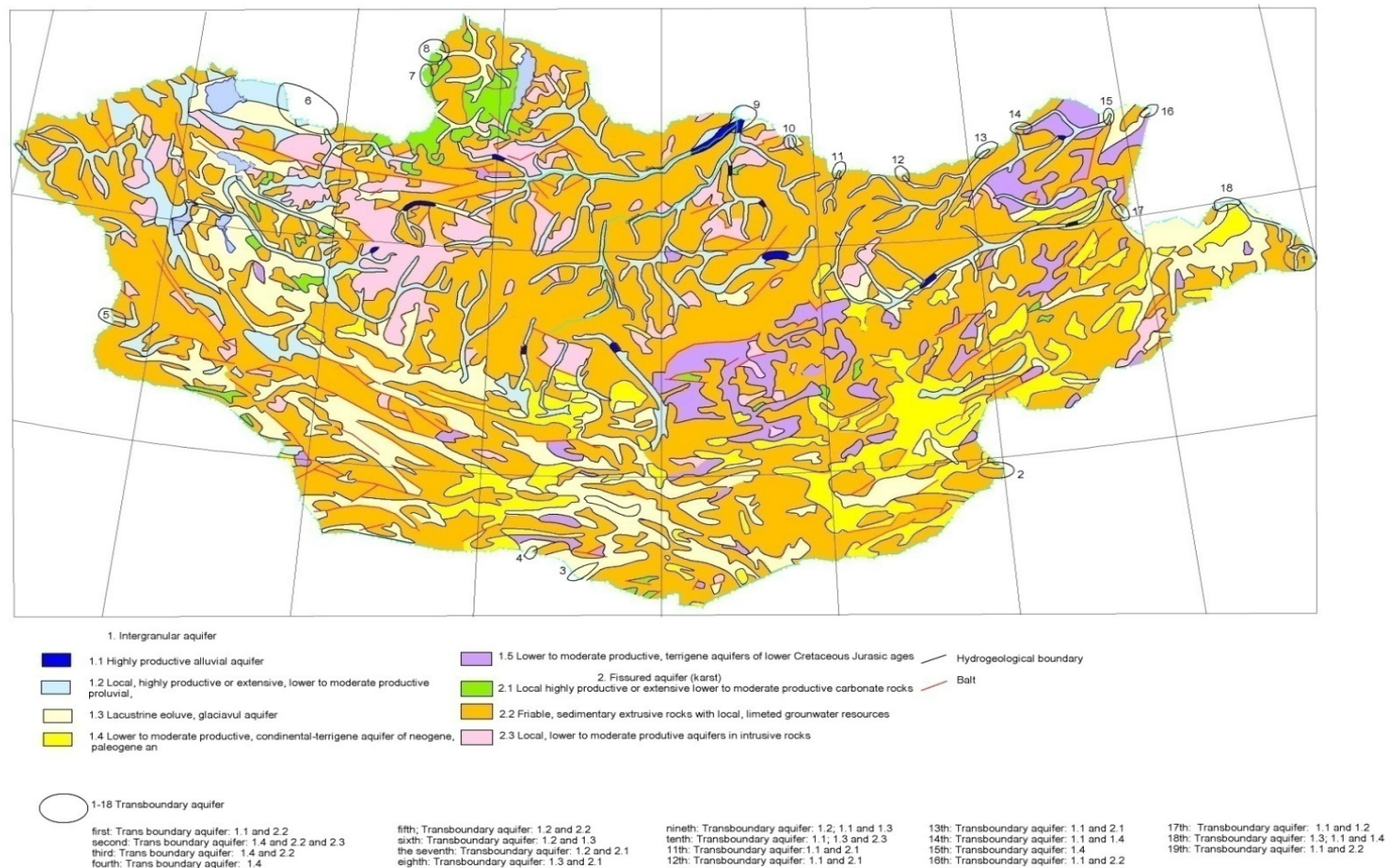


Water resources: **Mongolia is ground water dependence**

- Depending on the natural condition surface water resources in Mongolia during end of autumn, winter and spring due to the extreme climatic condition land cover is frozen to a depth of approximately 3.5m and rivers are frozen for up to 7 months of a year. permafrost and seasonal freezing and droughts limit use of water resources in Mongolia. snow
- **Groundwater is the main source of water for household and drinking use, watering points for animal husbandry and industrial consumption in Mongolia for the majority of the year, while surface water is the preferred source during the short summer period.**
- Due to the mountainous conditions, almost all rain-fed rivers run to the Arctic and Pacific Ocean basin and most of the surface runoff (~70%) flows out of the country, while a small portion flows into the Central Asian Internal Drainage Basin within Mongolia.
- **All human activity in Mongolia relies on GW because about 10% of Mongolian Water consumption is originated from surface water sources, while 90% from ground water.**
- The Gobi Desert and Steppe zones, cover 68 percent of the total territory of Mongolia. In these areas, rivers and streams with permanent flow are very rare and using only GW
- Rural water supply of Mongolia is mainly from individual herder wells and deep wells. These aquifers are main source of water for rural purposes. In Mongolia using about 50000 wells many types for water supply animal husbandry.

Scarcity of water resources is one of the big problem in Mongolia, especially in Gobi Region.

- mining



In the territory of Mongolia distributed mainly 4 types of aquifers such as alluvial loose sediment aquifers with high water bearing capacity located in the big valleys of rivers, colluvial sediment aquifers with moderate water bearing capacity, Neogen sand, Upper Quaternary sand, sandy loam, lower Quaternary sand, conglomerate, coal bearing lenses aquifers, karst, fractured rock aquifers and bedrocks.

Water resources : Groundwater Recharge

- GW recharge and balance changed depend on climatic condition, almost from precipitation in Mongolia. The groundwater aquifer with more capacity locate only in larger river basin's valley and extreme sparse and no recharge aquifers with early age dominate in the dry Gobi steppe zone of Mongolia. Shallow GW consists mainly of granular aquifers in river beds and depressions and recharged from infiltration by rain fall. Low annual rainfall (50-100mm) limits recharge from rainfall. The recharge of water resources consist only precipitation (Institute of Water Policy 1996). In dry region has aquifers at serious depths 4-350m. In Gobi and Steppe dry area of Mongolia GW is fossil, the abstraction potential depends on the extend of lowering of the GW table during a certain period time
- Recharge in the region comes from rain water which percolates in the upper aquifers and discharged to springs; feeds vegetation, ponds or temporary lakes; or is abstracted by shallow wells. A small portion percolates to the deep aquifers. The deep aquifers are the permeable rock sections from which GW can be abstracted. In the deep aquifers located only fossil water with age 1000-35000 years old.
- little recharge to shallow aquifers (0,5-1 mm/year) in Mongolian Gobi desert
- Average residence time of Kherlen (9.36), Tuul (8,46) river and in shallow river valley groundwater in Khangai up to 24 years old. In certain areas in the Dundgobi province, however, 35000-years or older groundwater has been found. Age of groundwater greatly differs by region: Dornod province 1000 years .

Water governance in Mongolia: History and development

History water/GW management back to 1938, established department of water use and began to create dug wells in counter side for watering animal husbandry .

Prior to 1990, Mongolia had clearly defined strategies and policies on water resources development and management. From 1938 to 1986, the Ministry of Water Economy was solely responsible for implementing water sector policies.

Since 1990, after the privatization of many organizations, water resource management responsibilities have been split between the seven ministries.

- Ministry of Nature and Environment (MNE),

- Ministry of Food and Agriculture (agricultural water supply),

- Ministry of Construction and Urban Development (municipal water supply and waste water),

- Ministry of Health (water hygiene),

- Ministry of Energy (hydro energy), and,

- Ministry of Defense, and professional Inspection Agency(control).

Water governance in Mongolia: Old system

- The first law on water use named Law on Wells.
 - The water economy structure was divided into 3 parts of levels: governmental, functional (aimag water economy departments) and soum service groups.
 - Provinces and soums have not made laws, they are can do some rules for implementation government law in the there territory, but there are responsible to give licenses for water resources use
- Herders and farmers able to construct dug wells
hydraulic constructions within their soum area
- At the beginning of the transition to a market economy (1986), the Ministry of Water Economy was abolished and all aimag water management departments were privatized.

Water governance in Mongolia: Present system for water management

➤ The Ministry of Environment and Green Development have the major responsibilities for water resource management. Ministry has divisions for water governance.

- However, no way to coordinate with other government organizations such as the MFA and MCUD has been legally defined.
- The approaches used for developing policies are not coherent and or inclusive of each ministry.

➤ The river basin management concept. Based on the current water law, river basin councils and directions were established for the Tuul and Khovd Rivers, although there is clear legal basis for financial sustainability and authority of the council by the new law on Water.

➤ **Expected new structure for water governance in Mongolia...**

Water governance in Mongolia: Laws and legislations

- Although the year 2011 was declared by the Government as the “Year of water policy renovations” and in the frame of program parliament of Mongolia approved group laws related water.
- Recent Main Water Policy Documents are:
- Water law/2012/
- Law of payment for pollution/2012/
- Law of payment for mineral resources(water) use. 2012
- Law on EIA /2012/
- National Water Program (approved in 2010 by Parliament)
- National Security Concepts / adopted in 2010 by Parliament/
- Law of water supply and waste water treatment for cities and town/2010/
- Action Plan of National Water Program (approved in 2010 by Cabinet)
- MDG based National Development Program /2004/

Case study: SGR, Major users of water in arid region

- Mining industry is developing very fast, especially in Arid Gobi region as is policy of Mongolian government. Despite the increasing reliance on GW resources in the Gobi Region were not surface water, have not been well investigated. Many foreign companies working to develop Gold, Copper and Coal mines in Desert Gobi, although this is dependant on sourcing sufficient water supplies. The GWR are limited and require careful management as they oldest in the world fossil water in the world, according to the isotope analyze GW in the South Gobi region is 35000-42000 yeas old, it means recharge rate is so low. A better understanding of ground water system is also required and more research to ensure that resources are not exploited beyond self renewable levels.
- It is not clear that there is sufficient water in the South Gobi region to sustain all of the potential sources of demand.
- The availability of water in South Gobi region may constrain the region's development potential. Despite several studies undertaken since the 1960s the extent of water resources in the area is not well-known.
- Every company has studied an area of roughly 100 km radius centered on mining site, and has identified three deep aquifers with sufficient volumes of water to meet the mine's needs.
- Ivanhoe mines Co. ltd's investment plans suggest a demand for water ranging from 37 -60 million liters per day, as the mine's production volume increases. It is planned to extract water from the Gunii Khooloi aquifer, over a period of 25-30 years...we don't believe it. GW, however, is not infinite, it must be used wisely.
- Due to lack of Financing, mining water source investigation will be held by private companies and specialized committee will revise it.

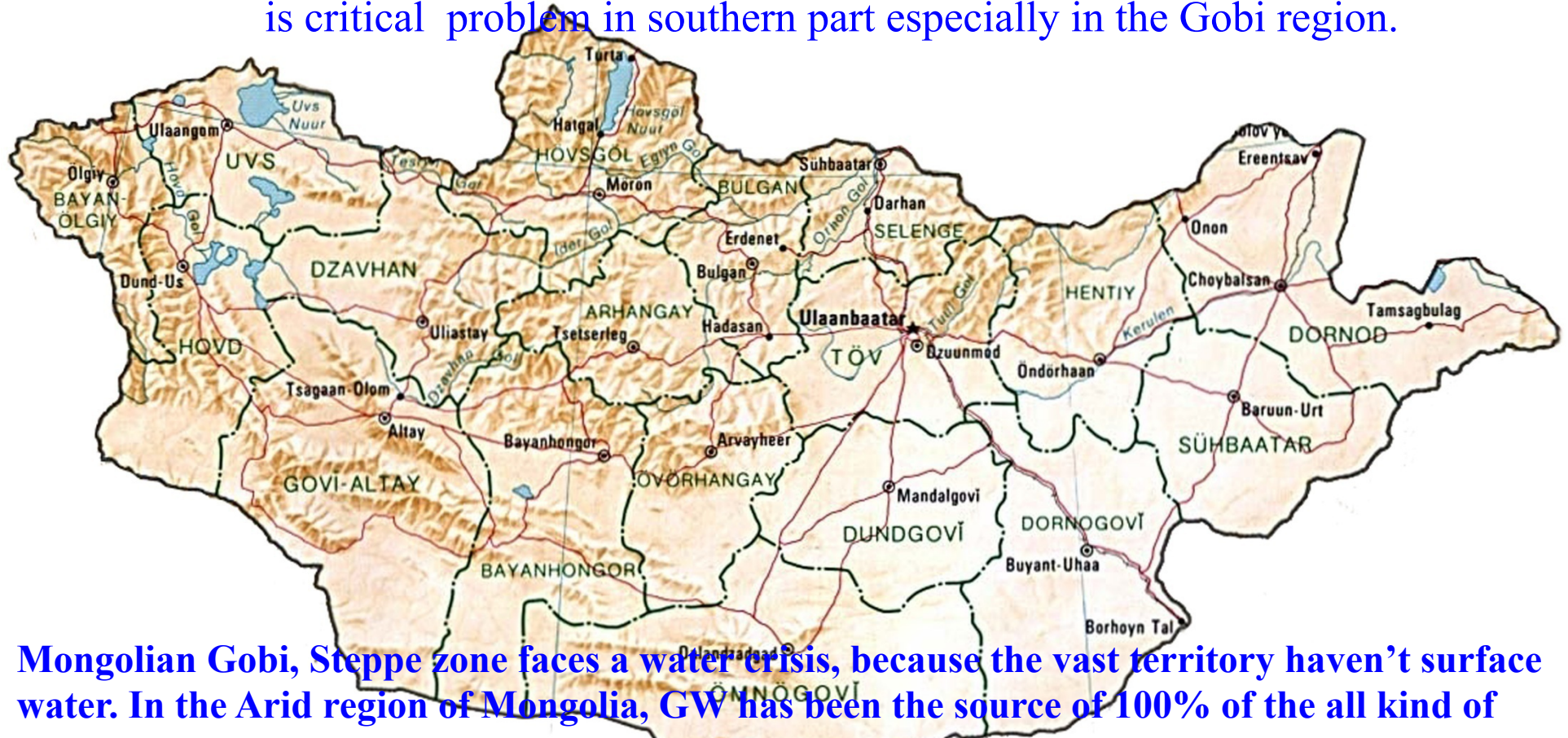
- The Institute of Geo-ecology, which is under the Mongolian Academy of Sciences, conducts water resource inventories, analysis and planning at both national and River Basin level. In the 70-90-ies we compiled databases, comprehensive maps and atlases of all major GW river basins of whole Mongolia. We are currently making a detailed inventory of the River Basins. We are conduct all GW related works, monitoring and assessments.
We are cooperating with UNESCO, IAEA and also KEI, Korea in the frame of NISD on GW

UNESCO Chair program on Sustainable GW M in Mongolia

- Since 2008, we started to implement UNESCO Chair project on Sustainable Groundwater Management of Mongolia. According to frame work of this project we expanded the groundwater monitoring network along the Tuul river basin.
Institute off Geocology & University of Tsukuba, Ibaraki, Japan. Prof. Tanaka Tadashi
- The purpose of the UNESCO Chair activities are to promote an integrated system of research, training and documentation in the field of groundwater management. It will serve as a means of facilitating collaboration between high-level, internationally recognized researchers and teaching staff of the university and other institutions in Mongolia and Japan and neighboring East Asian countries .
- The research /education, training, conference meeting and documentation activities conducted in 2008-2011.

Case study: SGR, Water supply mining industry

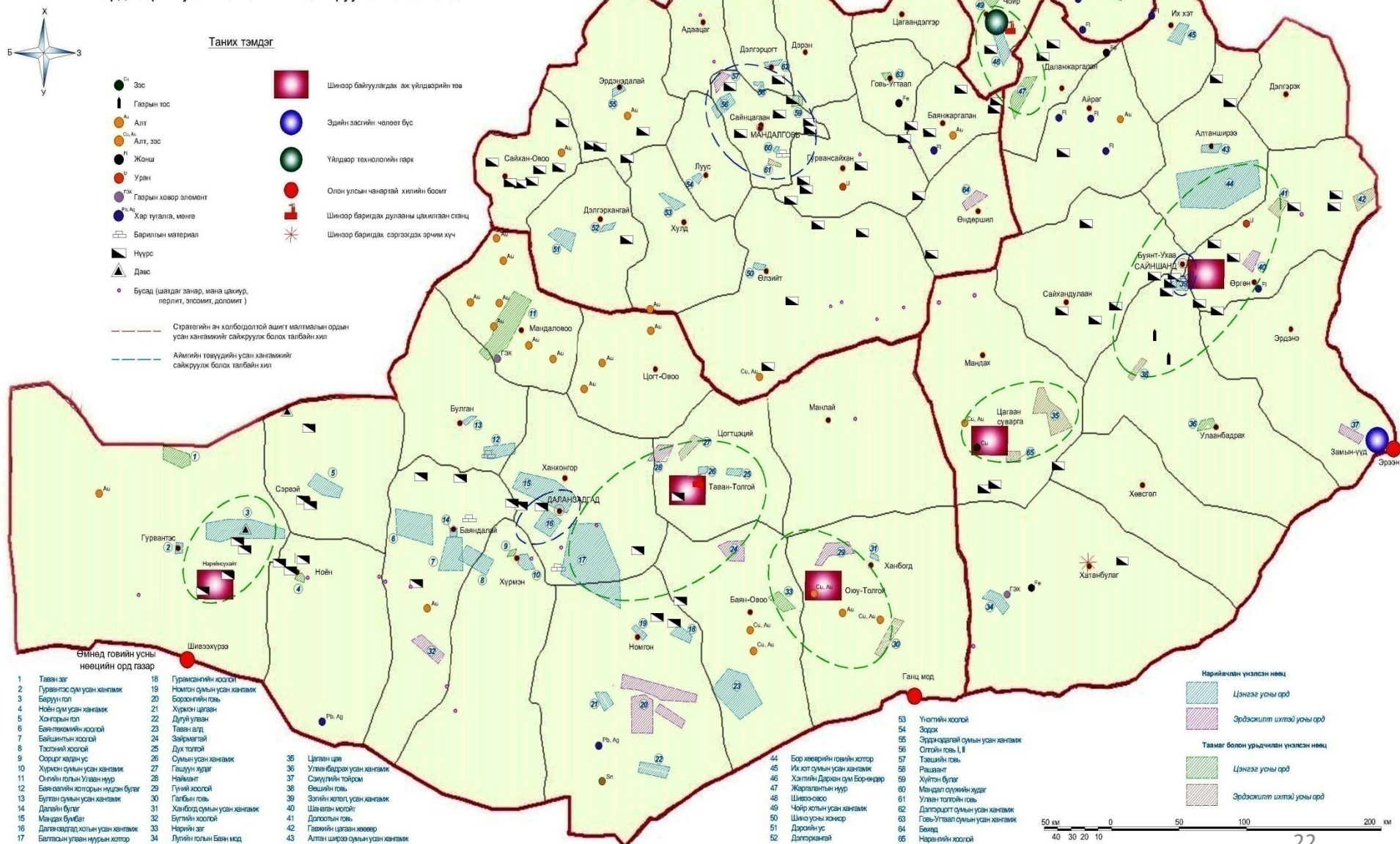
is critical problem in southern part especially in the Gobi region.



Mongolian Gobi, Steppe zone faces a water crisis, because the vast territory haven't surface water. In the Arid region of Mongolia, GW has been the source of 100% of the all kind of consumption. In SGR by effect mining activity good Q aquifers are depleting due to over exploration. The uneven distribution of water resources became a reason of water scarcity in Gobi region, where discovered mineral resources. For the water supply of mining industry in this region should be used ground fossil water.

Case study; The South Gobi Region

Өмнөд говийн бүсийн стратегийн ач холбогдолтой ашигт малтмалын орд газрын усан хангамжийг сайжруулах төлөвлөгөө



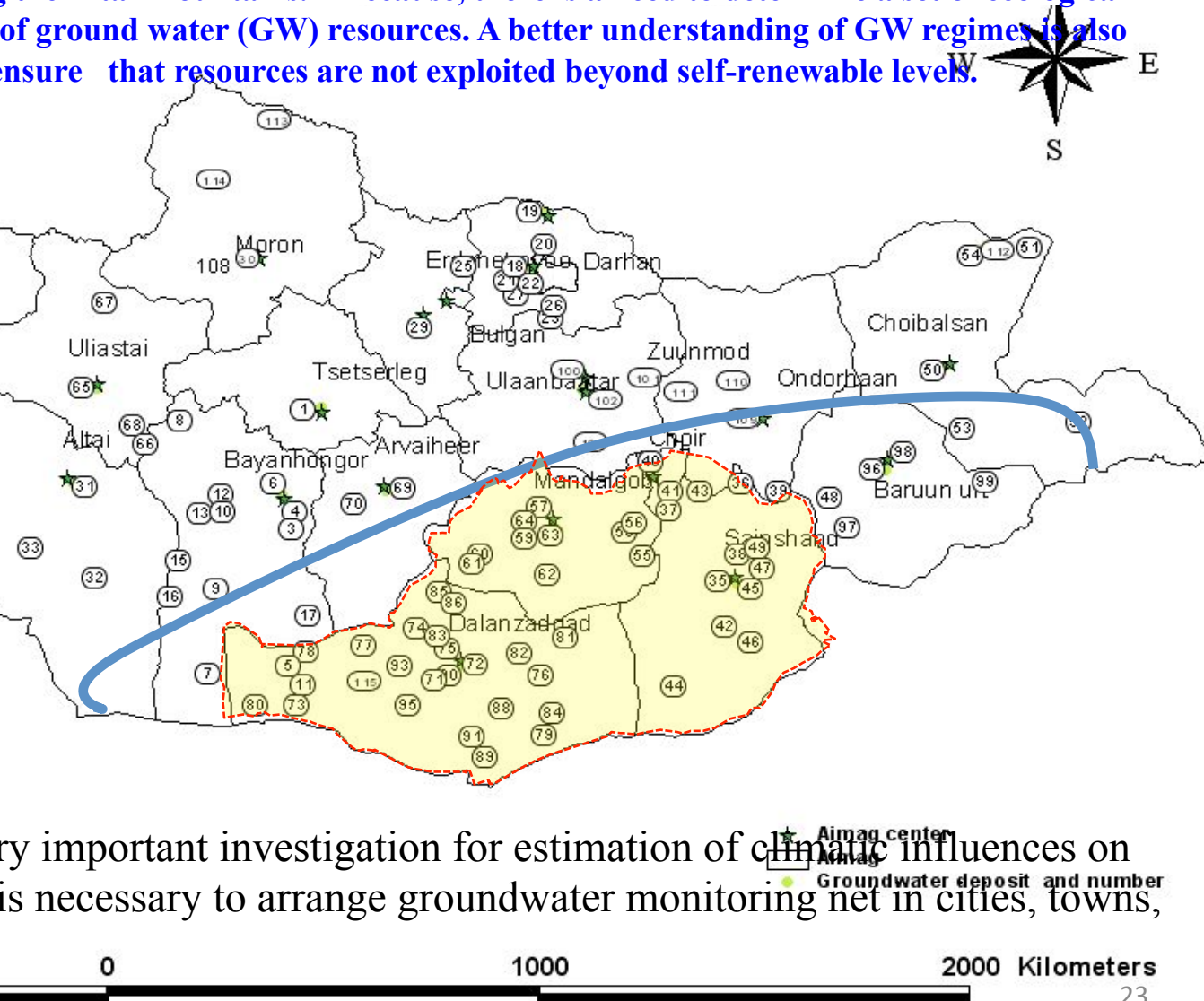
Case study: SGR, Fossil water and Recharge time

Geological structures of the SGR are geological array and basins where no hydraulic linkage and divided in broken deep and local tectonics in along the Altai Mountains. Because, there is a need to determine a set of ecological criteria for guiding the safe use of ground water (GW) resources. A better understanding of GW regimes is also required and more research to ensure that resources are not exploited beyond self-renewable levels.

Since, Mongolia adopted a free market system of economy and the economical structure changed, the mining industry has developed quickly.

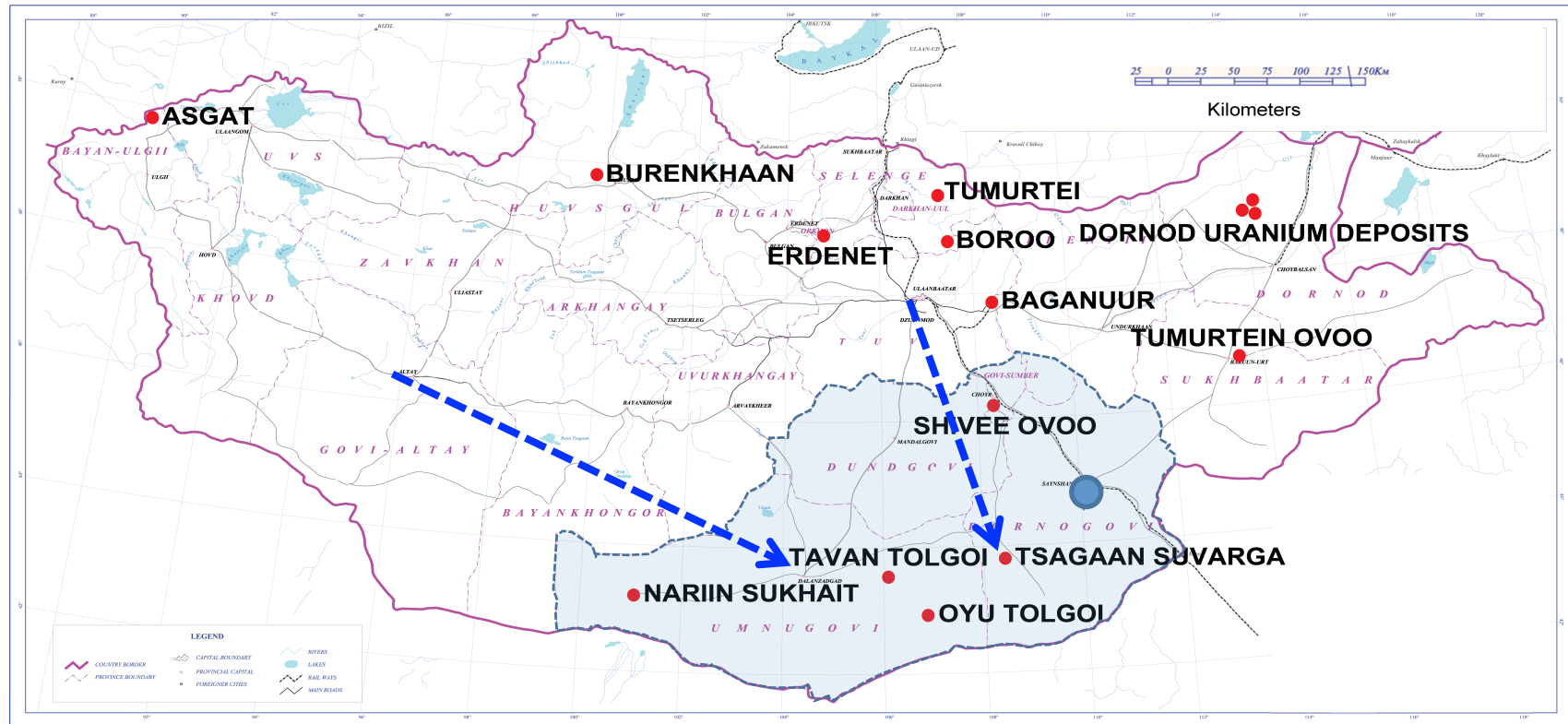
Very irregular distribution of groundwater resources in Mongolia is requested a few stepped hydrogeological studies, including reconnaissance and detail mapping; prospecting, exploiting exploration, geophysical, regime observation and so.

Groundwater regime is very important investigation for estimation of climatic influences on groundwater resources. It is necessary to arrange groundwater monitoring net in cities, towns, and mining sites.



Case study: SGR Mining development medium –term target program

In 2007, in accordance with a decree number 27 of parliament, name of 39 strategic objects(deposits) in the whole area. From these, in primarily 3 coals, gold and copper mining are decided to use in the SGR



- addition, Mongolian government passed a resolution on the Shainshand Industrial complex in order to develop Mongol's heavy metal industry. Master plan for the development project for this complex has been completed. Initially, Energy plant, cooking coal and a chemical plant will be built . It is estimated an average 11.8mln tons of water will be used by the complex, and for now it will be provided from ground water reserve.
- Possible sustainable alternative sources of supply could involve piping water 400-600 km from rivers to the north.

Conclusion

- Effective access and provision of water supplies for all Mongolians need to be addressed to increase the national average of 20liters challenges is not resolved. Water consumed by Ger area residents is limited to 5-8 liters, which is 2.5-4 times less than the internationally accepted norm of 20 liters per person per day. We need to develop the daily usage of water for person per day until 20 l/day (which indicated in Millennium Development Goals)
- Water resources is limited. It is very difficult to found GW in the SGR and Permafrost area in north.
- Herders participation is needed to develop local ground water governance at the province and soum level
- A consolidated water governance/management structure is to be established under the Prime ministers auspices; There needs to be improved inter-agency coordination and synergy and ensure greater participation of relevant line ministries in water sector management aspects.
- . How to keep economic structure in the SGR after mining exploitation?
We need to do ecological limitation for use of fossil water.
- Lack of research work, survey and investigation to solve water supply in the SGR

Thank you for your attention

