# Kherlen River the Lifeline of the Eastern Steppe

**by Eugene Simonov, Rivers without Boundaries**

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Rivers without Boundaries Coalition continues documenting and analyzing transboundary basins of Dauria not well known by the international community. New report is focusing on water resources management in Kherlen\Kelulun River transboundary basin to promote climate adaptation, ecosystem-based river basin management approach, strategic environmental assessment of development options related in water management in transboundary river basins of Dauria. Kherlen was selected as extreme example of discrepancy between development plans, ecosystem health requirements and cyclical availability of water resources. Report shows that even in comparison with adjacent Ulz and Khalkh transboundary basin, the Kherlen has more acute and immediate water management and ecosystem conservation problems. Recommendations presented in the report are relevant to integrated river basin management in other river basins of Dauria.

Report preparation are other activities were included into the second phase of "Dauria Going Dry" Project supported by UNECE, that reflect multifaceted research on ecosystem-based river management and climate adaptation undertaken in the Dauria International Protected Area and wider Dauria Steppe.

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# KHERLEN (KELULUN) RIVER AND ADJACENT RIVER BASINS IN DAURIA


Kherlen River valley is a green buffer between greener steppe and forest-steppe grasslands to the north and waterless expances of Gobi to the south.

Source: Google Earth

# EXECUTIVE SUMMARY

**Dry salt lake in Dornod Province of Mongolia ( by V.Kiriliuk)**

# Part I. Scarce waters – high ecological values

### 1. Management of Mongolia's scarce waters.

Mongolia has much less water resources than any other country of continental East Asia and those resources require careful protection and management. Rapid and uncontrolled expansion of water-intensive activities such as mining, export oriented thermal power plants, coal-to-gas convers plants may severely threaten precious sources, unless water resources allocation is deliberately limited by implementing rigorously defined environmental norms and by fully protecting community rights and access to clean and safe water. Other nations with water stressed regions, most notably Mexico, South Africa, Australia, China and the USA, have recently made drastic adjustments in water allocation to safeguard environmental flows. Mongolia still can avoid crisis  securing environmental  flows before too much water is allocated to human use.

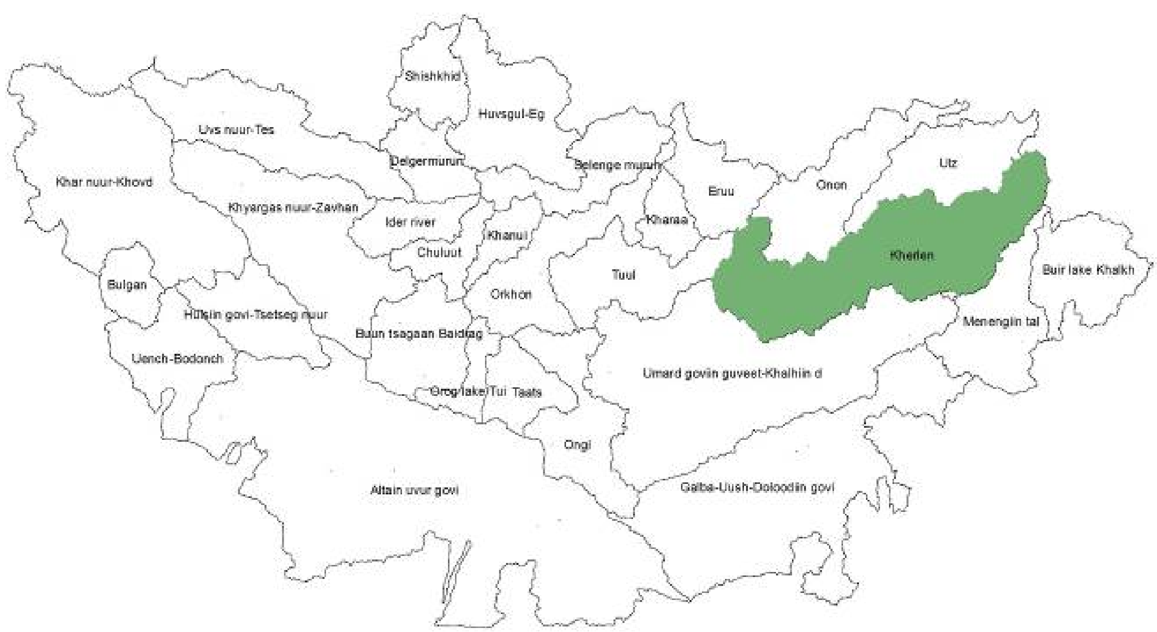


*Figure  Kherlen river basin and other 28 river basins management units of Mongolia (Kherlen Water Authority 2013)*

## 2. Transboundary rivers of Dauria –water wasted abroad?

Dauria is a highland region and many rivers flow out across the border. These rivers are of high ecological value and support globally important natural heritage sites: the Selenge River - the main source of Lake Baikal, the Onon– the largest tributary of the Amur River, the Ulz draining into Torey Lakes and the Kherlen flowing into the Dalai Lake Ramsar Wetland. Together these unique transboundary rivers, however small, are supporting tremendous globally-important biodiversity values and the ecological balance of Mongolia and adjacent countries.

## 3. Biodiversity in River basins of Eastern Dauria

The Kherlen River is the longest river of Dauria Steppe and the most remote source of Amur River which drains into Pacific Ocean. The river starts in the alpine zone of Henti Mountain range and runs over a distance of 1,250 kilometers through cedar-pine forests, forest steppes and vast Eastern steppes to empty into Dalai (Hulun) Lake in Inner Mongolia, China. The area possesses very high level of biodiversity for a steppe zone, and it is included in the list of Global 200 priority ecoregions for conservation as the “Dauria Steppe”.

More than 40 endangered bird species breed in, or migrating through the Lower Kherlen Basin and are listed on the IUCN Red List and in national Red Data Books of Russia, Mongolia, and China. Upstream just near the city of Baganuur, the Kherlen valley is a breeding site for the threatened cranes and bustards and Argali sheep. Thirty eight species of fish are observed in the Kherlen River at the Gun-Galuut Nature Reserve near Baganuur, including the endangered Siberian Taimen.

***White-naped crane (by O.Goroshko)***

## 4. Ecosystem dynamics: Influence of climate cycles on habitats in Dauria Steppe

The Dauria Steppe’s natural climate cycle, which typically spans 25 to 40 years, is a major force shaping regional ecosystems and peoples’ lifestyles. During the dry phase, which is the most critical for many species, a few habitat refugia remain. River floodplains have more frequent flooding events and thus preserve more stable habitat in times of drought. The highly dynamic habitats of the Daurian eco-region are characterized by strong leaps and drops in biological productivity, and support high biodiversity of the Daurian steppes, including the before mentioned abundance of many mammal and bird species.

One of drivers of the rich biodiversity of the Kherlen river, is the low degree of human alteration of river processes, and its intact natural connectivity without interruption by dams from Henti Mountains all the way to the Dalai Lake in China

## 5. **Conservation efforts and water management**

Several parts of Kherlen River valley are protected in nature reserves. The Kherlen source is located in the Khan Henti Strictly Protected Area. The river flows through the Gun Galuut, Khar Yamaat, Toson Khulstai nature reserves in Mongolia. The Dalai (Hulun) Lake Biosphere Reserve receives waters of Kherlen and Halkh rivers coming from Mongolia and is connected to Argun/Erguna River on the border with Russia and China. The Dalai lake is an important breeding, molting, and stopover site of water birds including endangered Swan geese. Dalai Lake Nature reserve forms part of the tri-national Dauria International Protected Area (DIPA) declared by all countries in 1994. Practically all existing conservation efforts are good examples of ecosystem-based-adaptation- they preserve resilience of biota and protect habitats to be used in all phases of climate cycle and during linear climate change.

In Mongolia Water Basin organizations have been formally established in 20 of the 29 Water Basins, including Onon (2012), Tuul (2012), Kherlen (2013) and Ulz(2014) basins. The Kherlen River Basin Authority is a state administrative organization that prevents water resource from water scarcity and environmental pollution, uses the inferred water reserves properly, restores water reserves, regulates interrelation between local and administrative departments and implements the integrated management plan for water reserve. In early 2014 through Hungary-Mongolia cooperation agreement development of the Kherlen River Basin Integrated Water Management Plan was initiated.

Song-Liao Water Resource Commission (SWRC) headquartered in Chanchun, Jilin Province is responsible for river basin management planning and technical supervision in all rivers in China part of Amur river Basin shared with Russia and Mongolia. The SWRC serves to manage the water resources and river courses of the basin in a “unified” manner and is responsible for “comprehensive harnessing, developing and managing major water control structures, doing the planning, management, coordination, supervision, and service to promote river harnessing and the comprehensive development, utilization and protection of water resources”. SWRC works with Hulunbuir Prefecture of Inner Mongolia and Dalai Lake National Nature Reserve(subordinate to Forest Administration )) to manage Kherlen River and Dalai Lake. Given that there is very little water infrastructure associated with lower 200 kilometers of Kherlen River flow, the most persistent management question is adaptation to cyclical drought, that regularly leaves river stretch in China dry.

*Figure Kherlen from Mongolian Border to Dalai lake has no dams and reservoirs-exceptional situation for China (MODIS Imagery 2013)*

## 6. Kherlen river –stronghold of nomadic culture and economy

The large human population and huge livestock economy of the region depends on Kherlen River. The total population in the Kherlen river basin in Mongolia is 110,000 people, and settlements, camps and roads tend to line along Kherlen River, where best living environment is to be found. In China the Kherlen river flows through the “New Right Barga Banner” of Hulunbuir prefecture, with population of 35,000 - mostly ethnic Mongols, engaged in livestock business. Dalai Lake also has important fisheries enterprises and tourist resorts.

### 7. Hydrology in fluctuating climate – river management issues

As it flows from forest into dry steppe Kherlen river loses water. The Kherlen annual average flow rate decreases from 648 million cubic meters at Baganuur to 530 million cubic meters at Mongolia-China border. No surprise that in dry years, like in 2007, Kherlen River total annual inflow into Lake Dalai decreased to only 38 million cubic meters and for 200 days in a single year it completely dried up in China.

Floods are most important hydrological processes that shape the vitality of Kherlen River valley. Flood water is mostly utilized for groundwater recharge, filling of oxbows and lakes and growth of pasture vegetation in vast 2, 900 sq.km. floodplain of the Kherlen river. Flood wave attenuation by the vast natural floodplain makes that the Kherlen floods do not pose any danger to human settlements along the river.

### 8. Climate change and the path to adaptation

The Mongolian nomadic tribes have adapted to temporal and spatial change in availability of water and other resources due to natural climate cycles for centuries. Recent rapid socio-economic changes and loss of nomadic heritage, however, make ecosystems and local communities less resilient to this natural fluctuation in resources and more vulnerable to droughts and floods which are exacerbated anthropogenic climate change.

It is important to understand that thus far changes in water availability in Dauria due to anthropogenic climate change, if any, have been an order of magnitude smaller than changes due to natural climate cycle. It is however likely that the impacts or timing of the climate cycles will change and that therefore the sustainability of adaptive measures for ecosystems and people increasingly less predictable. Drastically different cultures, differences in population density and the often highly unsustainable modes of economic development and water use in Russia, China and Mongolia, make it very difficult to build transboundary mechanisms for the protection of common water resources.

***Kherlen River valley at Gun Galuut Nature reserve 150 km east of UB (by E.Simonov)***

## Part II.Existing and Planned Development and its Possible Impacts

### 9. Human impacts on Kherlen and adjacent rivers

Total water withdrawal in the Mongolian part of the basin is currently around 24 million cubic meters annually, or 5% of Kherlen river flow across the border. It is reasonable to assume that another 3-5% is used in Chinese part of the basin. Large coal mining operations are presently located near the Kherlen River in Baganuur and Choibalsan and are the main sources of industrial pollution. Livestock overgrazing coupled with warming changing climate also contributes to decrease in water quality and quantity. Water mineralization and turbidity increases manifold as Kherlen flows through the dry steppe.

Kherlen, Khalkh and Ulz rivers share similar natural features: they flow through Dauria Steppe and have large freshwater\brackish lakes at the rivermouths,actingas evaporation basins. However, degree of human development is very uneven in three basins. The Ulz River has no large population centers, but only mining industry, while the Khalkh river, also has no sizable towns and so far is practically pristine in Mongolia, but has considerable degree of tourist resort development in China. The Kherlen River basin is the only transboundary basin of the steppe that has sizable and diverse industries and several provincial centers , that actively use and pollute its waters.

Nevertheless the vast majority of water samples taken in Kherlen River basin appears “clean” or “very clean”. Despite presence of three industrial towns and a sizable livestock industry, the Kherlen River is still clean and resilient, largely because it retains natural flow character.

***Placer gold mining site in northeastern Mongolia. (by Simonov)***

## 10. **Planned industrial water supply projects**

Early in the 21st century, when the Mongolian economy started to be driven primarily by Chinese market, mineral licenses were given to various foreign and domestic companies to develop large ore and coal deposits: Oyu Tolgoi, Tsaagan Suvarga, Tavan Tolgoi, Shivee-Ovoo, etc. Development, however, was slowed down by absence of readily available water sources in Gobi regions, due to both natural water scarcity and groundwater exploration lagging far behind industrial demand. Mining and processing of copper ore and coal washing require considerable amounts of water, but even more water is required by coal-energy and coal-gasification complexes that convert coal that is otherwise difficult to transport into easily exportable electricity and gas. In more recent plans, the Mongolian government also seeks to process mining products before exporting them. Several water supply projects emerged:

**1) Prestige Group Schemes**

From 2006 to 2014 the Prestige Group, a Mongolian engineering firm, has developed various water transfer schemes for delivering water from the Kherlen and Orkhon  rivers to Gobi. All designs envision network of water transmission pipelines with water pumped as far as 530-540 kilometers to Tsaagan Suvarga and Zamiin Uud, and serve various users in between.  All designs count with a water intake from a reservoir that block the river with a 25 meter high dam. In addition infiltration water intakes were envisioned on wide Kherlen floodplain downstream to pump subsurface water from alluvial deposits. Proposed water transmission volumes vary from 1 to 2 $m^3$/sec. (30-60 million $m^3$/year).


*Figure  Kherlen-Gobi water conveyance project. (Water Center, 2010)*

*Kherlen River at Gun Galuut near Togos Ovoo dam site (by E.Simonov)*

**2) "Monhydroconstruction" Sainshand Water Supply**

This supply scheme would deliver water from the Kherlen over a distance of 225 to 260 kilometers directly to Sainshand and then fork to serve other users: Tsaagan Suvarga, Tavan Tolgoi, Oyu Tolgoi and Zamiin Uud (Ereenhot). The reservoir with a 20 meter high dam would be located 100 kilometers downstream from Baganuur and count with twice the volume and a surface area of 125 sq.km. The company claims that it has special eco-hydrological software to justify "environmentally safe" withdrawals up to 20% of annual average flow or 60% of flow in dry years.

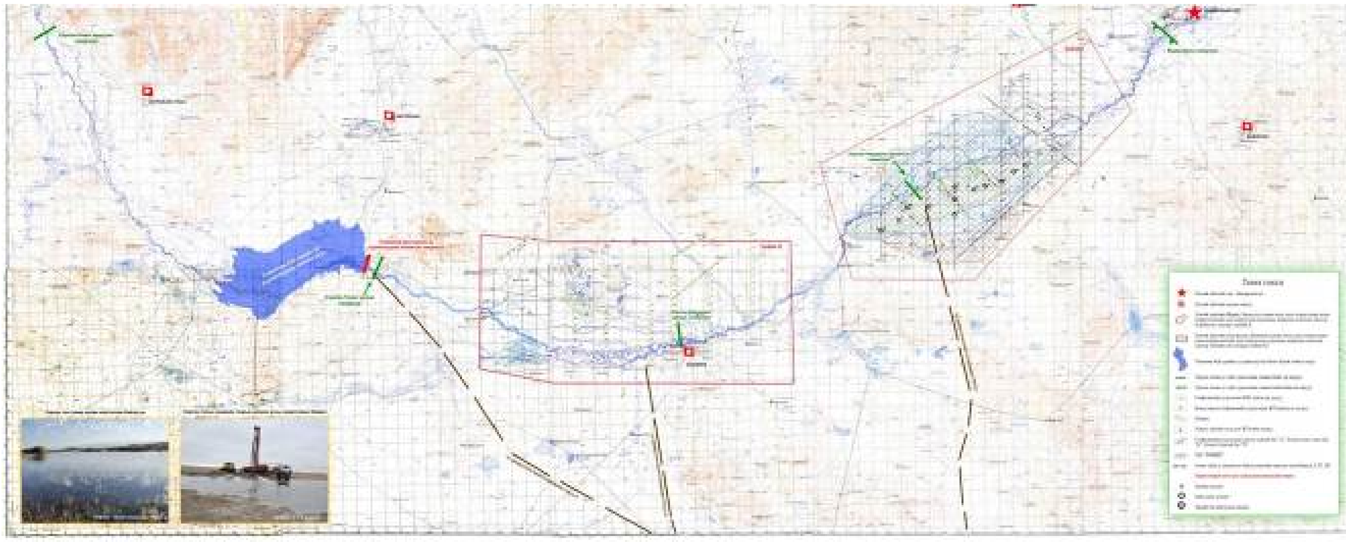

*Figure . Map from Monhydroconstruction presentation, May 2014.*

3) **JETRO Study Design**

This study on the Kherlen-Gobi Project released in2007, sponsored by the Japanese agency JETRO, contains systematic analysis of the available alternatives for water intake and water transport/distribution system as well as other finance and engineering aspects. The study compared 5 different water intake methods: a large dam on the river, a weir on the river, flood impoundment on the floodplain, a collection conduit and shallow wells to draw subsurface water from floodplain alluvium. Shallow wells were recognized as the least costly, and most easily built water intake option with lowest environmental impact. The financial cost of the full project without large dam was estimated in 2006 at 800 million dollars. Japanese agencies and companies did not follow up on the study and did not consider providing funds for project implementation.

The massive water supply schemes designed for Kherlen-Gobi water transfer systematically lack solid environmental impact assessments and plan to withdraw up to 60% of river flow in moderately dry years.

*Figure Shallow wells – a water intake option favored by the JETRO Study*

## 11. Water Supply to Gobi – potential impacts and risks

Long-distance water transfers are marketed to local communities as an “alternative” to using local groundwater. However, most water management schemes and real life situations suggest that local aquifers (if available) will be used first, and if water is still lacking, subsurface water from the floodplain will be pumped into long pipelines. Only if the previous two options would fail to deliver enough water, a reservoir may be built on the river, because it is the most expensive solution. Each of these steps may have different environmental and social consequences.

**a) Supply from local groundwater**

Once large-scale development occurs in certain Gobi area, inevitably local aquifers become the first target for large-scale exploitation. This has purely economic reasons: local groundwater supply systems costs much less than any long-distance water conveyance whether it is sourced from deep aquifers, subsurface alluvial deposits or a reservoir. Therefore local groundwater is threatened in any case with or without additional long-distance sources. The implications of local groundwater exploitation is beyond the scope of this report though as it is about the Kherlen river basin.

**b) Supply from infiltration water intake in floodplain**

Withdrawal of subsurface water from the Kherlen floodplain has potential for high impacts on the river ecosystem downstream. This impact may be serious, mainly during dry year sequences and during the low-flow season without ice (April-June). As the distribution of flow between months is very uneven, in drier years there will be many months when a 2 $m^3$/s withdrawal would render the river dry downstream from the water intake point. Water withdrawals would make the waterless period, typical for the Kherlen River, much longer and extend much further upstream into Mongolia. Nevertheless, if subsurface water is taken from alluvial deposits, the resulting flow reduction in the Kherlen River would be delayed and to a certain extent decreased by the alluvial aquifer, which receives its main recharge during floods. Most changes that may occur due to subsurface water intake are very similar in their mechanism and timing to regular natural changes that occur in dry phases of 30-year climate cycle.

There is no doubt that some amount of water could be taken from Kherlen in a manner similar to the way Ulaanbaatar uses alluvial infiltration water intakes, but the environmental limits are likely many times less than the 100 million cubic meters targeted in plans such as the ones proposed by “Monhydroconstruction”. The limits are also thought to be much more variable and fluctuate from year to year with variations of natural river flow.

***Pipeline construction at Dalai Lake in 2008. Hulunbuir, Inner Mongolia (RwB archives)***

Rigorous research is needed to establish thresholds for withdrawal above which some ecosystem functions or social values may be seriously affected, and limits need to be set for both the volume and timing of water withdrawals based on these thresholds. By setting environmental flow norms before large scale exploitation of water resources takes place excessive environmental, social and economic damage can be prevented and water can be managed in a climate resilient manner. Various examples of methods for environmental flow assessments and incorporation in national water laws and regulations are emerging from other often water stressed countries such as Mexico, South Africa, Australia, the USA and the European Union.

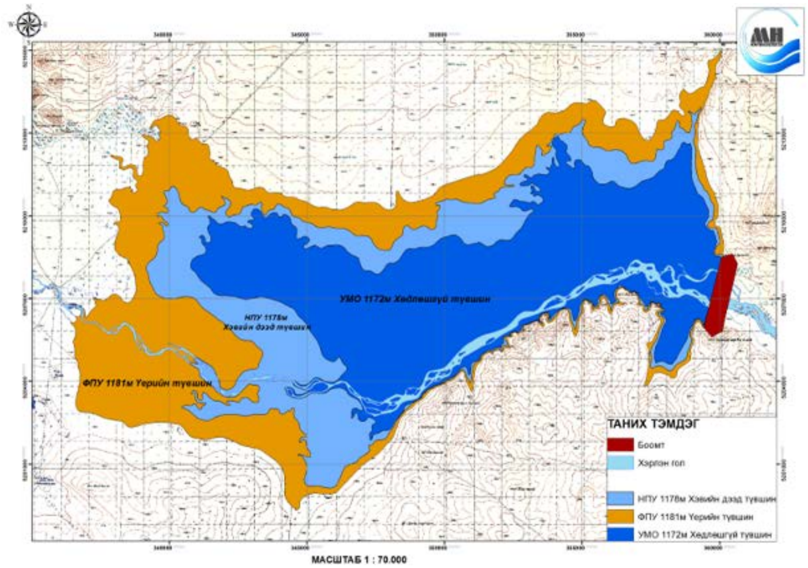


*Figure .Reservoir planned by "Monhydroconstruction" with indication of dead volume level (dark blue), normal level (light blue),forced level (orange)- showing large are to be affected by water level fluctuation.*

**C)** S**upply from reservoir**

Building a large dam may evoke many unwanted consequences and many of those cannot be mitigated. Many previous studies clearly stressed that this is a very dangerous option not to be pursued if viable alternatives are available.

***A reservoir exacerbates water losses***

Proponents of reservoirs say that "regulating the river would minimize negative effects on river flow. It is more likely however that a reservoir will drastically increase losses of water, due to evaporation from the reservoir surface, which according to some estimates could equal to intended supply volume.

, Following these calculations, the design suggested by "Monhydroconstruction" would fail during the dry phase of climate cycle and unable to observe their own proposed "20% environmental flow norms". Due to evaporative losses the Chinese Water Ministry nowadays refuses to build reservoirs on water courses in dryland areas.

***A reservoir would eliminate floods***

A dam would significantly reduce hydrologic variability and change the morphology of the river downstream. Especially episodic flooding is important for pasture areas in the floodplain, bringing precious nutrients and moisture to the soil, and episodic recharge of shallow aquifers lower in the basin.

***A dam would block migration of fish***

The dam is planned between forested headwaters with many cold-water tributaries and the middle and lower reaches where wintering refuges are available in lakes and deep pools. Since the Kherlen River system is frozen to bottom in winter and too warm in hot summers many fish likely migrate from lower basin where they winter to spawning sites upstream. A dam built in between will abruptly decrease fish survival and likely eliminate most valuable fish over the 800 kilometer stretch downstream.

***A reservoir would harm high biodiversity value areas.***

The planned reservoir, depending on its location, would harm either Gun Galuut Nature Reserve or the Kherlen Toono Uul area which was identified by The Nature Conservancy as high priority for future expansion of protected areas. A shallow reservoir would likely become a source of pollution, erosion and favorable habitat for many dangerous invasive species.

***Negative socio-economic consequences***

A dam would displace people from reservoir area, significantly contribute to desiccation of downstream areas all the way to Dalai Lake. The population estimate for the affected area is about 130-150 thousand people, many of them- traditional Mongolian herders. Sectors of economy that would suffer most would be livestock breeding, fisheries of Dalai Lake, nature tourism in both Mongolia and China and especially fishing tourism. On the economic side, the two greatest risks are likely rising corruption and seriously increasing national debt for this project cannot happen without state investment.

## 12. Impacts from Coal Industry and other sectors

In Kherlen river basin Baganuur (Tov), Chandgana (Henti) and Aduunchuluun (Dornod) are the three main coal mining operations. In the adjacent Gobi region, Shivee Ovoo and Tavan Tolgoi are two biggest coal deposits which would potentially be supplied by the planned water pipeline.

Coal is the world's most abundant but arguably, also most environmentally damaging fuel. At a global level it provides 40% of the world's electricity needs and is responsible for an estimated 44% of $CO_2$ emissions and 8 to 10 % of anthropogenic methane emissions. Between 2000 and 2012 global coal consumption has grown with 60% (or 4% annually), largely due to rapidly increasing consumption in China and other non-OECD countries.

Most of Mongolian coal enterprises are developed for the Chinese market. To predict impact from this sector we use data from coal industry in China, where large scale impacts from coal enterprises have already become a major security issue and are subject to strict regulation.

Nowadays Chinese and international investors seriously examine the environmental sustainability of any proposed coal industry projects. Chinese investors require proof that sustainable water sources are available for development of Sainshand Industrial Complex.

The entire life cycle of coal, mining, thermal power plants, coal-to-gas and coal-to-liquid processing, all characterized by high water demands. When all proposed projects in Eastern Mongolia are added together their consumption far exceeds the volume that the proposed water transfer could deliver.

***Dry Ulz River at Erentsaav, Russia-Mongolia border in 2007 (by V.Kiriliuk)***

## 13. Future Water Balance and Climate Risks

We developed preliminary water balance estimates for Kherlen River basin in Mongolia by 2030, which takes into account municipal use, agriculture, evaporative from a potential reservoir and future water loss due to climate change.

This calculation shows that by2030 water consumption and losses could well equal or even exceed average river flow of the Kherlen at across the Chinese border. This illustrates that it is unrealistic to sustain environmental health of river valley and satisfy the currently projected demands. Cyclical change in flow volume typical for Kherlen River and uncertainty about anthropogenic climate change impacts make it impossible to meet such demands during dry phases of climate cycle.

Half of future consumption comes from economic activities within the Kherlen basin and the other half from projected demand based on the potential development of the long-distance water transfer and associated water losses from reservoir.

Downstream reaches of the river in China and the Dalai Lake Ramsar Wetland are severely threatened by planned developments. Even minimal consumption estimates would result in the water supply to Dalai Lake being reduced by 60 to 75%.

Even if all environmental norms are neglected and water resources at the border are equally divided between countries (following to international customary law) China would not be able to get its half at least every 4 years.

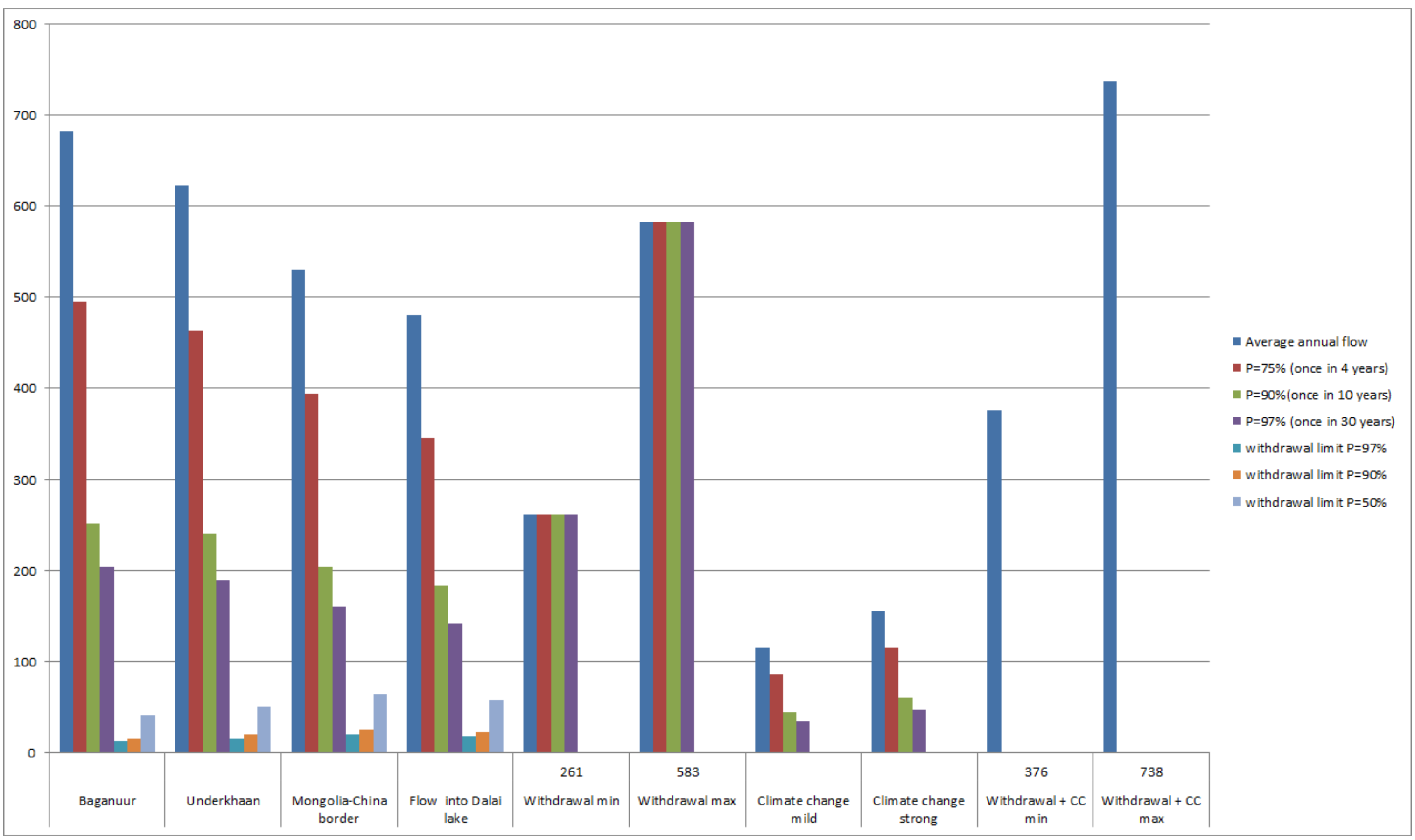


*Figure Kherlen river annual flow and predicted water consumption and loss due to climate changes by 2030*

# Part III. Environmental Safeguards for Kherlen River

## 14. **Cumulative and Strategic impact assessments**

A basin-wide Cumulative impact assessment (CIA) of all planned water supply projects and natural changes in Kherlen River basin is currently missing. Decisions about on the Sainshand and Gobi water supply may profoundly affect development prospects of the whole Kherlen River basin. An assessment of cumulative impacts of all water infrastructure should incorporate provision for environmental flows in Kherlen River-Dalai Lake ecosystem as related to flow of water, sediments and nutrients and include a full evaluation of climate variability and change

A strategic environmental assessment (SEA) of the Kherlen Gobi Project and all associated development plans should be conducted to arrive at better roadmap for development options available in Kherlen River Basin and adjacent Gobi areas. This SEA should create a framework for evaluating possible development scenarios in water sector against wide array of interrelated costs, benefits and limitations in economic, environmental, social and political spheres. Analysis of a wide array of available alternatives lies at the heart of strategic assessment.

## 15. Water supply alternatives in the light of climate adaptation.

There are some alternatives for water supply of the Gobi region that should be further explored before considering tapping into the Kherlen River water resources:

**A. Thorough assessment of Gobi groundwater and setting environmental limits to its use.**

Groundwater supply potential of Southern Mongolia was conservatively estimated in 2010 by the Word Bank at 180 million cubic meters per annum and does not include results of explorations conducted in last 5 years. Exploitation and efficient management of groundwater in Gobi could prove to provide an effective means for securing a medium term water supply. According to some experts the Choir and Sainshand areas count with sufficient recharge to support a sizeable industry with groundwater.

B. **Limiting development in Gobi, moving industries to water.**

The Government of Mongolia needs to assess objectively the sustainability of, and limits to development in arid regions. Recurring attempts to plan development of water-thirsty industries (besides mining) in Gobi are likely to be unsustainable in a long term. If placing processing industries in Mongolia is economically justifiable, then it is likely to be most feasible in regions with sufficient water supply and well developed infrastructure.

C. **Water Supply in fluctuating climate: appropriate adaptation measures.**

***Dauria lake bottom in dry phase of climate cycle.( by V.Kiriliuk)***

***Flood in Hulunbuir wetlands in Inner Mongolia. (by E.Simonov)***

With approximately 70 to 75% of Mongolia's water coming from subsurface alluvial deposits, current supplies are thought to be relatively sustainable and more adaptive to a changing climate than development of reservoirs, which would spur massive evaporative losses.  Additional solutions to enhance water management should be assessed and utilized such as artificial recharge of aquifers, targeted construction of building in floodplains alternating use of surface and ground water sources, and water demand management in concert with different phases of climate cycle, etc.

**D. Basin-wide Climate Adaptation Planning**

Environmental Flow norms should become of the foundation of river basin management plans, ensuring that human activities minimally disrupt flow patterns that sustain river health. Environmental Flow norms should explicitly link hydrological characteristics and requirements of aquatic ecosystems, flora and fauna in all stages of the climate cycle and should be based on ecological requirements both of Kherlen river valley and Dalai Lake ecosystems. Similar norms safeguarding fragile Gobi ecosystems should be developed for various local aquifers.

## .16. Transboundary river issues in Dauria

In 1994, Mongolia and China signed a water treaty which forms the foundation for transboundary cooperation around water management. The Chinese side has consistently requested a comprehensive bilateral evaluation of the Kherlen-Gobi Project and was finally assured by Mongolian side in 2013 that this water transfer is no longer planned.  At the same time, China has been seeking to "improve" water flow from Khalkh to Orshun River, a scheme that would create a shortcut on this tributary that feeds in Dalai Lake, and which would effectively dry out Buir Lake, another Ramsar wetland site of international importance. In the worst case scenario China would seek "compensation" and demand Mongolia's consent for diversion of the transboundary Halkh River. In this case the natural character of two Ramsar sites (Dalai and Buir lakes) will be lost in one shot.

Dauria already has a major negative example of a water transfer affecting a transboundary river. Despite protests from Russia a canal was built from the Hailaer/Argun River to "restore" Dalai Lake that over the past decade has been experiencing dropping lake levels due to the natural dry phase of climate cycle. This canal redistributes river waters into Dalai Lake, potentially stabilizing  its dynamic wetlands, but also likely inflicting harm on the floodplain wetlands of transboundary Argun River in Russia.

## 17. Conclusion. Towards Kherlen River Basin Management Plan

The Kherlen River unites Mongolia and China and sustains the Dalai Lake Wetland of international importance. This great river with tiny flow volume is importance life line for biodiversity and socio-economic stability of Dauria Steppe. This report aims to provide a timely warning. Although plans are drafted for deep transformation of the whole Kherlen river system, there still is enough time to consider more sustainable development options that would secure the resilience and adaptive capacity of its people and its ecosystems and support diverse conomic activities in  this river basin.

***Horses on dry lake bottom (by  V.Kiriliuk)***