

# **World Bank's Netherlands-Mongolia Trust Fund for Environmental Reform**

## **Water Resources Issues for Southern Mongolia Infrastructure Strategy**

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**Dalanzadgad, 24 September 2008**



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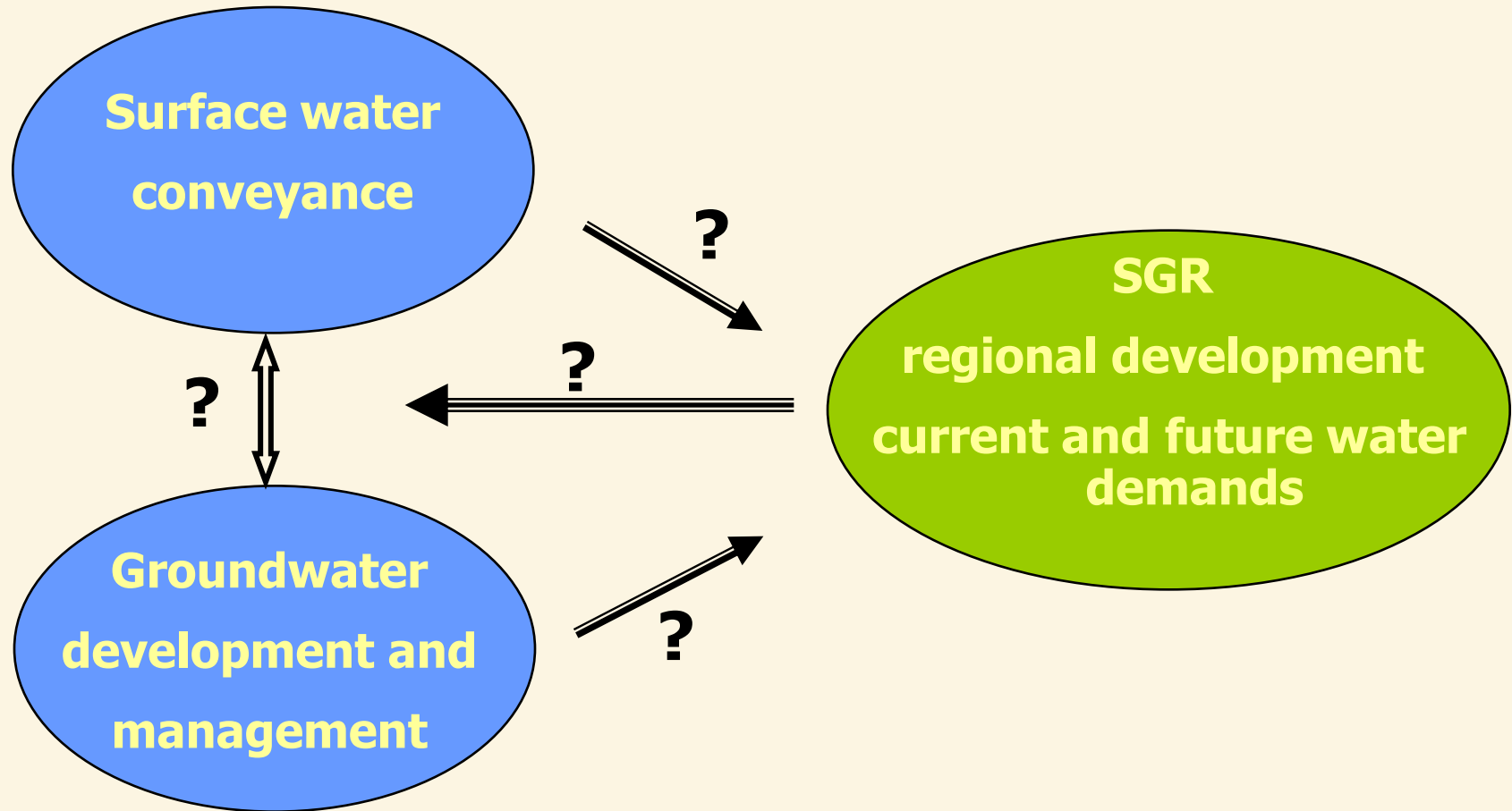


# THE WATER RESOURCE ISSUES

**Resources**

**< matching >**

**Demands**




# WATER DEMANDS

- **Current (planned) water demand (m<sup>3</sup>/day)**

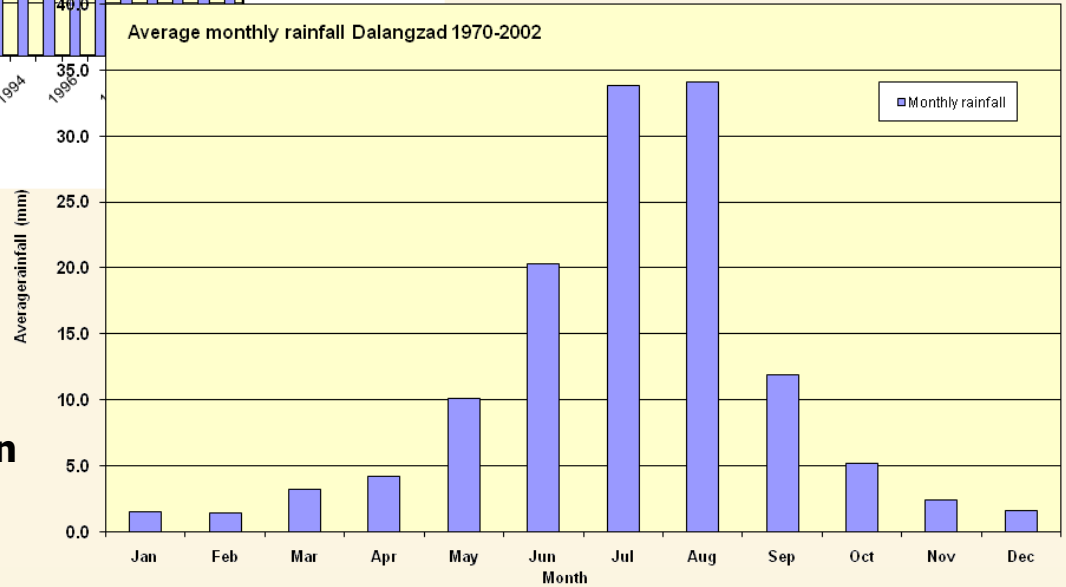
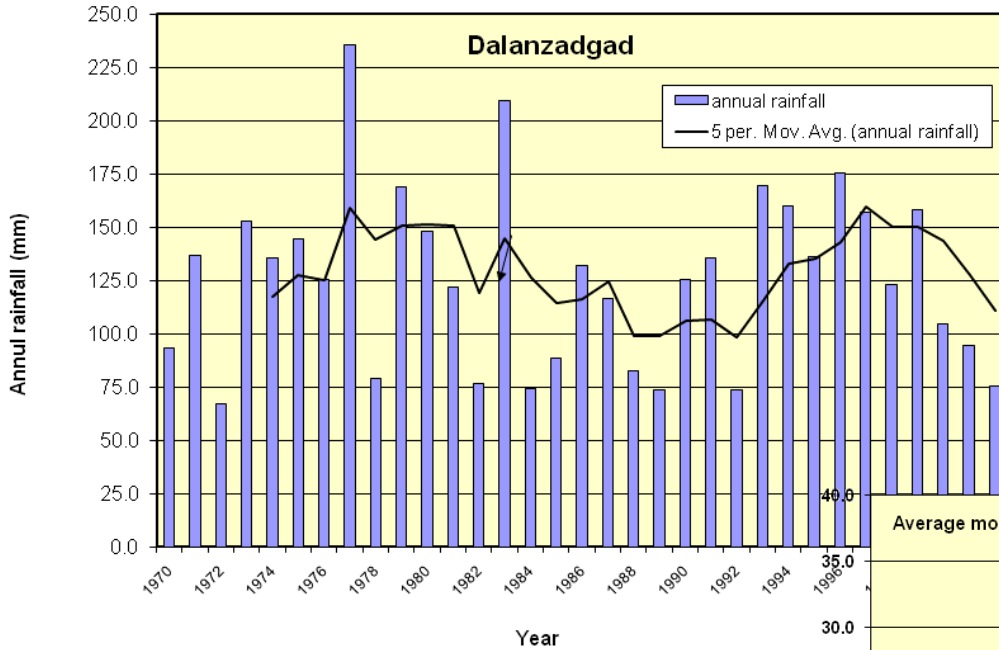
	<u>2008</u>	<u>2020</u>
○ <b>Main mines/energy:</b>	<b>220,000</b>	<b>300,000 ?</b>
○ <b>Other mines:</b>	<b>30,000</b>	<b>50,000 ?</b>
○ <b>Domestic:</b>	<b>50,000</b>	<b>70,000 ?</b>
○ <b>Other uses</b>	<b>small</b>	<b>?</b>

- **Demand projections need further verification**
- **Water quality requirements <> use function**
- **Demand management**

# GROUNDWATER CHARACTERISTICS

- Complex (hydro)geology
  - No extensive aquifers
  - No regional grw. assessment
- 
- Semi-arid climate: little recharge to shallow aquifers
  - Deeper aquifers (> 50m) are discontinuous (local) and contain mainly fossil water:
    - 50-170 m; > 50 studies in SGR (1970-1995) - GIC
    - > 200 m: Gunii Hooloi / Naimant
  - Often water quality in deeper aquifers not suitable for dinking (TDS, metals, hardness)

# RAINFALL

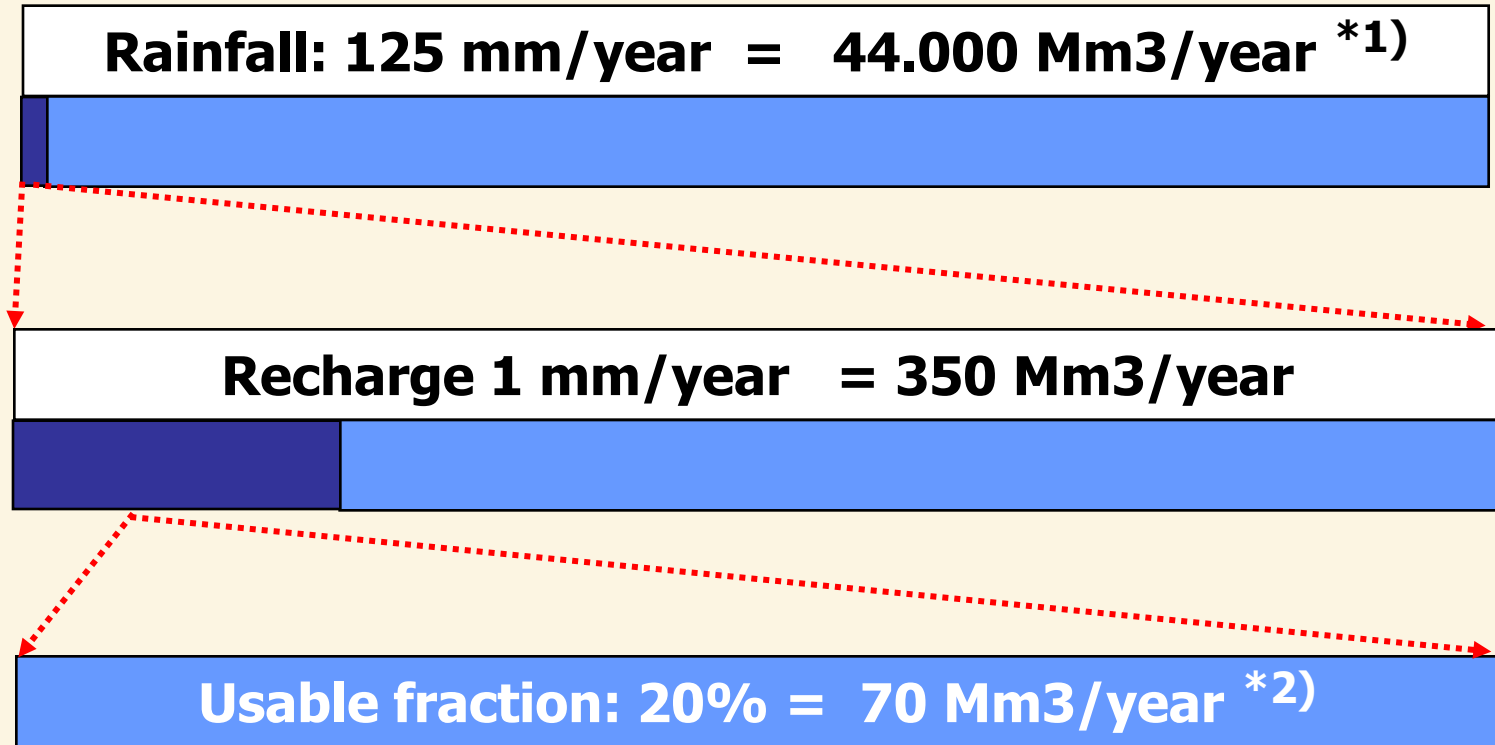


**Sainshand & Mandalgobi: same pattern**





# EFFECTIVE GROUNDWATER RECHARGE



**\*1 ) : Total area of the SGR: 350,000 km<sup>2</sup>**

**\*2 ) : Total current water demand: 110 Mm<sup>3</sup>/yr**

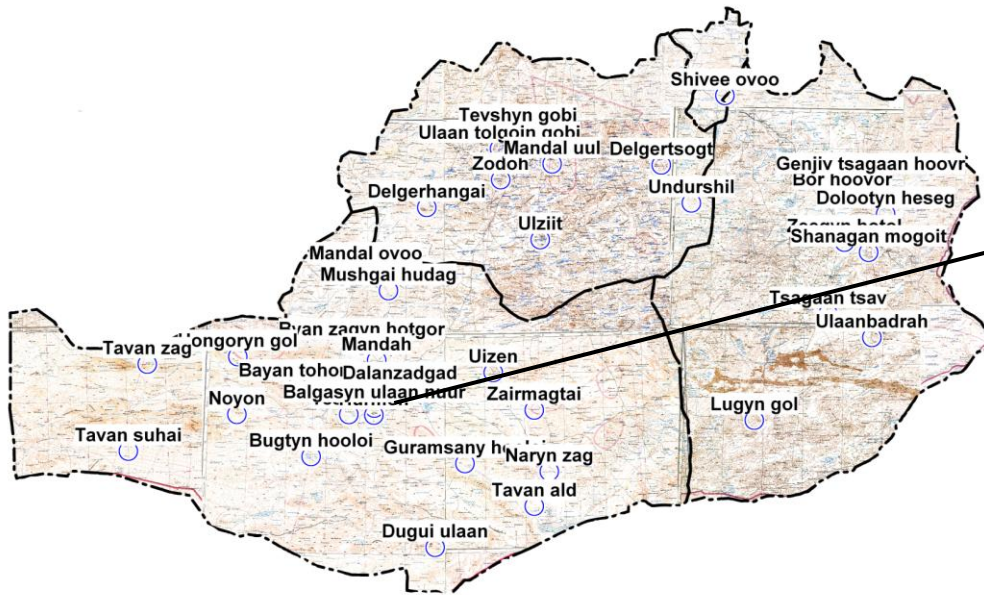
# DRAINAGE PATTERN DALANZADGAD (GOOGLE EARTH)



# DEEPER GROUNDWATER STUDIES

## GROUNDWATER STUDIES LOCATION MAP

scale 1:6 031 000



Location of exploration boreholes in Balgasyn Ulaan nuur groundwater resources

- Reports stored in Geological Information Center (GIC)

# GROUNDWATER RESERVES ESTIMATES

Aquifer classification	Productivity (lit/sec) per 1 km <sup>2</sup>	Estimated groundwater resources (Mm <sup>3</sup> /year)		
		Dundgovi	Umnogobi	Dornogobi
High productive	>1	25	31	19
Moderate to locally high productive	0.1-1.0	77	138	71
Low to moderate productive	0.03-0.1	2	89	19
Low productive	0.003-0.03	3	3	4
Essentially y no groundwater	<0.003	0	0.0	0.0
Total:		<b>107</b>	<b>261</b>	<b>113</b>

Source: estimated groundwater reserves by Dr. Jadambaa (2007)

# GRW. RESERVES AND POTENTIAL ESTIMATES

Groundwater reserve and potential		Information source	Dundgovi	Omnigobi	Domogobi
			Volumes in m <sup>3</sup> /day		
Reserve	Shallow (< 50m)	50% of recharge > 50 studies 1 study	100,000	225,000	150,000
	Deep (<200 m)		11,000	240,000	220,000
	Deeper			90,000	
Potential	Shallow (< 50m)	20% of recharge 50 % of reserve 1 study	40,000	90,000	60,000
	Deep (< 200 M)		5,500	120,000	110,000
	Deeper			60,000	

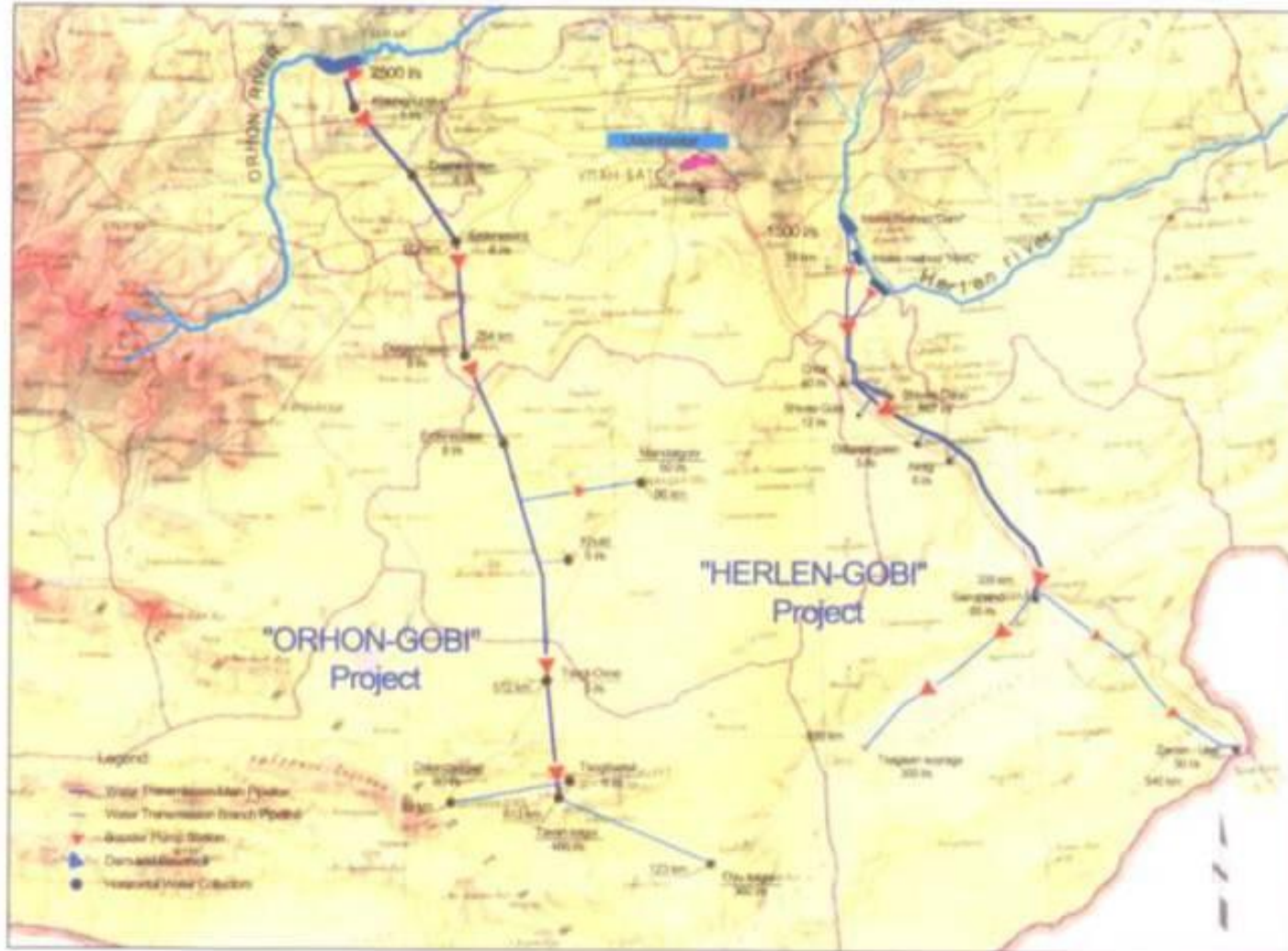
**Total reserve: 1,100,000 m<sup>3</sup>/day (400 Mm<sup>3</sup>/yr; 13,000 l/sec)**

**Total potential: 500,000 m<sup>3</sup>/day (180 Mm<sup>3</sup>/yr; 5,500 l/sec)**

**Demand 2020: 430,000 m<sup>3</sup>/day**

# H-B/O-G PROJECT: LAY OUT

GENERAL PLAN OF WATER TRANSMISSION PIPELINE ON LONG DISTANCE AND ITS APPLICATION FOR GOBI AND STEPPE REGIONS OF MONGOLIA



# H-B/O-G PROJECT: DESIGN DEMANDS

<b>Energy and mining sector</b>	<b>54 %</b>
<b>Agriculture</b>	<b>29 %</b>
<b>Domestic (incl livestock)</b>	<b>10 %</b>
<b>Environment</b>	<b>5 %</b>
<b>Other</b>	<b>2 %</b>

**Feasibility studies not yet carried out**



*Table 2. Water Demand Projections for 2020*

№	Water User	Estimated Demand liter/sec	Source	
			Surface	Under-ground
<b>Energy and Mining Industry</b>				
1	Shivee-Ovoo	616	467	149
2	Tsagaan Suvarga	604	300	304
3	Oyu Tolgoi	1060	360	700
4	Tavan Tolgoi	951	486	465
	<i>Subtotal</i>	<i>3231</i>	<i>1613</i>	<i>1618</i>
<b>Urban Water Supply</b>				
5	Mandalgobi	50	50	0
6	Dalanzadgad	70	60	10
7	Choir	40	40	0
8	Sainshand	85	65	20
9	Zamiin-Uud	50	50	0
10	Soum Center and rural	104	52	52
	<i>Subtotal</i>	<i>399</i>	<i>317</i>	<i>82</i>
<b>Agriculture and Environment</b>				
11	Livestock	200	100	100
12	Agriculture	1750	1750	0
13	Environment	300	100	200
	<i>Subtotal</i>	<i>2250</i>	<i>1950</i>	<i>300</i>
14	Other	120	120	0
	<b>TOTAL</b>	<b>6000</b>	<b>4000</b>	<b>2000</b>

# COMPARATIVE ANALYSIS

- **Groundwater is currently the sole source water for the SGR and will remain an important complementary source of water also in case of long distance surface water conveyance**
- **Groundwater and surface water conveyance are typically different options in terms of design and operation, but also in terms of perception**
- **The decision making process has different dimensions and is not only based on technical, environmental and financial considerations but also includes the political and social aspects**
- **But most and for all it should be based on a good understanding of the options in terms of design, cost, operational efficiency etc.**

# LONG DISTANCE SURFACE WATER CONVEYANCE

## Selling points

- One source (dam, reservoir) and intake
- Secured quantity
- Controlled supply along the pipeline
- Constant water quality

## Issues

- Resource sustainability (climate change, impacts, sedimentation)
- High initial investment (no phased implementation)
- Security of supply (back up through storage)
- Receiver's commitment required (specially mining sector)
- Transboundary issues
- Feasibility of irrigation component (socially, economic)

# LOCAL GROUNDWATER DEVELOPMENT

## Selling points

- Estimated potential sufficient for the next 10-15 years and there is possibly additional potential in deeper aquifers (not studied yet)
- Available near the point of use
- Lower investment cost (50-60% , phased implementation)
- Security of supply (decentralized)
- No transboundary issues

## Issues

- Potential not fully known: continued investigations/mapping needed
- Data and information scattered
- Need for management, regulation and monitoring
- Water quality often poor for domestic purposes: treatment needed
- Mainly fossil water : mining
- Energy supply may be costly at certain location

# DEMAND SIDE ISSUES

- **Regional economic development.** Development of the mining sector is crucial, as it does not only determine the mining water demand (in time) but also the water demand of related developments (urban, industrial, commercial, agricultural)
- **Water uses and required quality:** large portion of future water demands (cooling water, dust suppression, washing water) has lower quality requirements than e.g. drinking water. This should be mapped and be an integrated part of the planning process
- **Demand management** To what extent can re-use and re-cycling further reduce the industrial and domestic water demands. Is infiltration of treated waste water an option?
- **Agriculture:** what are realistic scenarios for irrigated horticulture and agriculture and what are the related water quantity and quality demands

# ISSUES FOR FURTHER DECISION MAKING

- Comparing groundwater and surface water conveyance is hampered by the uncertainties of the groundwater potential and its distribution (diffuse resource). Groundwater needs to be presented as a “single” resource (like surface water) to facilitate the decision making process.
- To do this, a coordinated effort is needed to bring all groundwater information together in one entity (“South Gobi groundwater task force”) to: prepare a detailed assessment of the spatial and vertical groundwater potential, identify ways to enhance recharge, guide additional investigations and set the stage for groundwater management, regulation and monitoring.
- Feasibility studies (for grw. & surface water) should specifically address the sustainability of the resource and the certainty of the future water demands of the main consumers (mines, energy).
- Preparation of pre-designs (and implementation plans) of groundwater and/or surface water conveyance solutions (incl economic, social and environmental impact assessment) for different water demand scenarios will be helpful to guide the decision making process amongst the main stakeholders

# THANK YOU

**It is not about choosing surface water **or** groundwater**



**But about the finding a reliable and cost effective water resource to serve the economic, social and environmental development of the SGR**