MINING, GROUNDWATER MANAGEMENT AND WATER MONITORING TRAINING

2017

Trainers:
Sustainability East Asia LLC & Groundwater Solutions LLC
Objective of the Training

Provide technical and management knowledge on water management, and assist stakeholders to initiate actions that could contribute sustainable water management in the south Gobi Region of Mongolia

Your feedback is important!
1. Understanding of basic hydrogeology/groundwater principles
2. Water monitoring
3. Well maintenance
4. Water use regulation
5. Mining lifecycle and Mine water use requirements
6. Challenges for achieving Sustainable water management in the South Gobi
7. Initiatives for achieving sustainable water management in South Gobi
Understanding of Basic Hydrogeology/Groundwater Principles
Groundwater Occurrence

Definition: Water found beneath earth’s surface in pores and fractures of soil and rocks
Common misconception: Groundwater is Not “an underground lake”
Porosity: empty space in a material, and is a fraction of the volume rock

Groundwater flow path through a sandstone formation
What is Groundwater

Source: Melanie Eirich
Groundwater Sand Tank

Source: Groundwater Solutions
Questions?
Water Monitoring
Introduction to Water Monitoring

Water Monitoring
- Gathering data and information about water quality (chemical, physical, biological characteristics) and quantity (water use, surface water flow, water level in monitoring wells etc.);
- It is done on a regular basis;
- Needs to be done using rigorous and consistent methods

Why is it needed?
- To assess uncertainties such as levels and qualities;
- To assess natural variations of water parameters;
- To assess water use impact, or effectiveness of water management etc.
Water Monitoring Questions

**Why?** Background, baseline, climate, impacts

**Where?** Catchment area, impact zone

**What?** Parameters (water level, water quality)

**How?** Type of monitoring plan, equipment to use

**When?** Frequency, specific events (i.e. floods)

**Who?** Who does the work? (Government? Company? Community? Or stakeholders through participatory approach)
## Water Monitoring Network in Mongolia

### National monitoring network

### River Basin monitoring unit

### Entities internal monitoring

<table>
<thead>
<tr>
<th>Water monitoring</th>
<th>Who conducts such monitoring?</th>
</tr>
</thead>
<tbody>
<tr>
<td>National and regional level water monitoring</td>
<td>State organisations</td>
</tr>
<tr>
<td>Internal water monitoring within organisations</td>
<td>Organisations such as water supply, mining, and water users.</td>
</tr>
<tr>
<td>Participatory water monitoring or community-based water monitoring</td>
<td>Communities, organisations, local governments, universities, etc.</td>
</tr>
</tbody>
</table>
# Water Monitoring Network in Mongolia

## GUD-34

Umnugovi, Bayan-Ovoo  
Last Date: 2016-12-19 18:12  
Temperature (°C): 13.16  
Level Toc (m): 29.21

Use [www.groundwater.mn](http://www.groundwater.mn) to access water monitoring information (subject to rights)

<table>
<thead>
<tr>
<th>River Basin</th>
<th>Manual Logger</th>
<th>Automatic Logger</th>
<th>New bore</th>
<th>Old bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Gobi and Khalkha middle step</td>
<td>27</td>
<td>8</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Galba-Oosh Dolood River Basin</td>
<td>49</td>
<td>6</td>
<td>7</td>
<td>48</td>
</tr>
<tr>
<td>Altain Uvur Gobi River Basin</td>
<td>23</td>
<td>4</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Khyargas nuur- Zavkhan gol River basin</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Kherlen gol River Basin</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Tuul River basin</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>102</strong></td>
<td><strong>23</strong></td>
<td><strong>26</strong></td>
<td><strong>99</strong></td>
</tr>
</tbody>
</table>

Source: [www.groundwater.mn](http://www.groundwater.mn) (MINIS)
Water Level Monitoring

Water Monitoring
- Water level dipper
  - Can only take single data points
  - Easy to use (very little training required)
  - Relatively cheap

Automatic
- Transducer
  - Can be expensive but relatively easy to use once installed
  - Requires periodic data download
  - Ideal for pumping bores
Simple Tool for Water Level Monitoring (Plopper)

Plopper/sampler and tape measure
- Traditional and simple
- Can only take single data points
- Easy to use (very little training required)
- Relatively cheap

When do the monitoring:
- To measure before watering
- Note measurement of date
- To measure same level
Basic water quality parameters can be measured in field:

- **pH** – (Concentration of hydrogen)
- **EC** – (Conductivity)
- **TDS** – (Total dissolved solid)
- **Temperature**

Laboratory analysis are needed for detailed water quality parameters such as metals or bacteria.
## Water Monitoring Datasheet Examples

### Water level

<table>
<thead>
<tr>
<th>Bore №</th>
<th>Year/Month/Day</th>
<th>Stick up (cm)</th>
<th>Water level</th>
<th>Measured by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

### Water quality

<table>
<thead>
<tr>
<th>Bore №</th>
<th>Sample №</th>
<th>Sampling date</th>
<th>Sampling time</th>
<th>Volume of bottle</th>
<th>Deliver to tab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

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*Water Monitoring Datasheet Examples*
**Water Level Monitoring Data (example)**

<table>
<thead>
<tr>
<th>Well ID</th>
<th>Water level (м)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2016-04-09</td>
</tr>
<tr>
<td>Har us</td>
<td>9</td>
</tr>
<tr>
<td>Tohoi</td>
<td>19.85</td>
</tr>
<tr>
<td>Hundii</td>
<td>10.52</td>
</tr>
</tbody>
</table>

**Water levels**

![Graph showing water levels over time for different wells](image_url)
Participatory Water Monitoring (PWM)

Water Monitoring
Scientific data and information about water quality and quantity

Participatory Monitoring
Collaborative process to address problems together

Participatory Water Monitoring
Monitor water through participatory approach
Participatory Water Monitoring

- Participatory water monitoring - uses a participatory approach to monitor water. In the process, it not only generates credible data and information but also builds trust and helps resolve or avoid conflict surrounding perceived or actual impacts.
- Purpose – Any stages of project development if needed.
Benefits and Challenges of PWM

Benefits

- Build trust/social capital
- Part of decision making by community and leads to better decision making
- Generates credible data, builds trust, helps resolve or avoid conflict
- Increased learning and knowledge sharing
- Transparent stakeholder relationships
- Community empowerment

Challenges

- Coordinating and engaging with stakeholders with diverse views on impacts to water
- Managing stakeholders expectations
- Getting the monitoring indicators right
- Making extra efforts (time and resources)

Purpose - to avoid any misunderstanding between the local communities and the company regarding environmental issues and increase transparency. Started in 2014

Participants – involved 45 local stakeholders from Ulaanbadrakh, Zuunbayan soums who represented the local government and citizens

Activities - water quality monitoring at 8 locations, presenting results to the soums and water training for communities

Results - relieved tension that existed between the company and communities, improved relationships with communities
Oyu Tolgoi LLC: Participatory Water Monitoring Program

Background – started in 2011 with the aim of improving stakeholder environmental knowledge, building mutual trust, and increase transparency by engaging with herders through voluntary participatory water monitoring.

Participants – OT, herders, and students from 7 secondary school students.

Monitoring – water level and recharge rate (over 40 wells), water quality (7 schools), and precipitation (4 points).

Results
- Herders acknowledged that OT’s water monitoring results are reliable.
- Herders water knowledge increased.
- Based on monitoring results OT delivers water to herders whose well water level decreased.
Energy Resources: Participatory Water Monitoring Program

**Background** – started from 2011 (28 herders)
- 10 groundwater boreholes, 2 reservoirs with a total storage volume of 56,000 m³;
- In partnership with the authority of Galba Uush Dolood Gobi water basin, 2 groundwater monitoring boreholes around water extracting area were equipped with remote data loggers

**Participants** – 99 community members (Tsogttsetsii administration, hospital, kindergarten, secondary school), herders and citizens from Siirst, Bilgeh, Uguumur and Tsagaan Ovoo baghs, herders from Baayn-Ovoo impact area

**Monitoring** – monthly, herder wells around the mine, Tsogttsetsii soum centre and coal transportation road

**Results** – better public awareness; better trust

**Role play** – 30–60 min
Role Playing Exercise for Participatory Water Monitoring
Questions?
Well Maintenance
Overview of well maintenance

Wells and springs - main source of water for in the Gobi and steppe regions of Mongolia

Without regular maintenance well’s service lifespan, yield, or water quality decreases overtime!
Well Protection in south Gobi (Survey results 2013)

Source: Baseline community perception survey, IRIM, 2014
<table>
<thead>
<tr>
<th>Type of maintenance</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removing solid i.e. mud, sand etc. materials and deepen the well</td>
<td>Prevent reduction in water level and/or drain of well water</td>
</tr>
<tr>
<td>Install concrete casing</td>
<td>Prevent well wall collapse and enhance well durability</td>
</tr>
<tr>
<td>Enlarging well shaft diameter</td>
<td>Provide enough space to work in the well</td>
</tr>
<tr>
<td>Elevate well collar</td>
<td>Prevent unwanted items and sand, mud and dirt to enter the well due surface run-off</td>
</tr>
<tr>
<td>Concrete well collar and areas around trough</td>
<td>Prevent soil contamination around well from livestock waste and surface run-off</td>
</tr>
</tbody>
</table>

Preparations for well maintenance

Well condition assessment

Planning

Collect necessary tools
Different types of well maintenance

- Well cleaning
- Elevating well rim
- Making well cap

Concrete around well collar and trough

Well maintenance considerations

- Safety - Consider all safety risks before start
- Select your timing correctly - Spring or fall when there is low recharge
- Clean the tools before start work
- Removed materials should be disposed in a safe distance from the well i.e. not getting into the well.
- Select your tools depending on what is planned:

Video on well cleaning
Well cleaning work safety

**Key potential risks**
- People falling into well
- Items may fall into well from surface or collapse of the well walls
- Faulty equipment e.g., ladders, ropes, hooks, buckets

**Key mitigation measures**
- Get advise from water expert prior to well maintenance;
- Don’t do if it is unsafe
- Not recommended to work in too deep wells;
- Never work alone;
- Use safe ladder and/or safety harness
- Place tools or equipment in safe distance from well opening to prevent them falling into well
- Use minimum PPE such as no slippery waterproof boots and hard hat.
How to measure water recharge rate after well maintenance work

<table>
<thead>
<tr>
<th>Measuring water recharge</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
</table>

Measure the static water level of the well

<table>
<thead>
<tr>
<th></th>
<th>depth in meter</th>
<th>depth in meter</th>
</tr>
</thead>
</table>

Empty the well water

Record the time of well water reaches its static level

<table>
<thead>
<tr>
<th></th>
<th>HH:MM:SS</th>
<th>HH:MM:SS</th>
</tr>
</thead>
</table>

Difference in water recharge period

<table>
<thead>
<tr>
<th></th>
<th>HH:MM:SS</th>
</tr>
</thead>
</table>
During socialist times, collective farms organized the cleaning and protection of hand dug water wells, but now this type of work has almost been forgotten.

Initiatives by mining companies in Mongolia

Oyu Tolgoi LLC
27 hand-dug and 12 deep wells were repaired and restored in Khanbogd and adjacent soums of Umnugobi aimag (2013)

Erdene Mongol LLC
Five wells (Khurentsav, Suul tolgoi, Khanan, Zadgai, and Mandal) commissioned during 1989-1990 in Shinejinst soum, Bayankhongor aimag were cleaned, restored and new cover sheds constructed in 2016.
Questions?
topic 4
Mongolian Regulatory Environment
Key water resource and management laws

CONSTITUTION OF MONGOLIA

Law on Environmental Protection

Law on Water
- Law on Water Pollution Fee

Law on Natural resource use fee
- Gov’t regulations
  - Gov’t decree (302/2011) on Ecological and economic base value of water, and water use coefficients
  - Gov’t decree (326/2013) on water use fee & rebate
  - Gov’t decree on updating water use coefficients (327/2013)
Water Use Rights and Permissions

Water is under state protection – State manages water use permission

- **Right to use water** (commercial)
  - Land use right ≠ Water use right
  - Not transferable and tradeable

- **Right to consume water** (non-commercial)
  - Permit for bores, wells, diversion canal from rivers, etc. is provided by aimag or capital city EA

Is water available for use?

**EXPLORATION** - Permission is given by MET

Who provides water use/waste water disposal permission?

**WATER USE PERMISSION**

- Water use permit can be cancelled by MET
- Initial permit 10 years, extended by 5 years

**WASTE WATER DISPOSAL PERMISSION**

<table>
<thead>
<tr>
<th>Consumption (m³/day)</th>
<th>Screening</th>
<th>Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>Aimag EA</td>
<td>Soum Governor</td>
</tr>
<tr>
<td>50-100</td>
<td>RBA</td>
<td>Aimag EA</td>
</tr>
<tr>
<td>100&lt;</td>
<td>MET</td>
<td>RBA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste water (m³/day)</th>
<th>Screening</th>
<th>Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>RBA</td>
<td>Aimag, soum EA</td>
</tr>
<tr>
<td>&gt;50</td>
<td>MET</td>
<td>RBA</td>
</tr>
</tbody>
</table>
Mineral exploration water use fees in Mongolia (Tug/m³)

Water use fee factors:
- Location of water resources
- Type of activities
- Ground water vs. surface water
- Exemption from water fees
Water Use/water pollution fees for some industries

Water use fee: Galba-Uush-Doloodiin Govi basin (Tug/m³)

- Ground water
- Mineral use and processing
- Mineral exploration
- Agriculture (plant)
- Agriculture (pasture) and domestic use
- Dewatering of coal mine (non export)
- Energy production (lowest)

Water pollution fee is calculated considering the following:

- Amount of waste water
- Pollutants in the water (organic and mineral substances, heavy metals, toxic substances)
- Location of water resources
Water Use Impact Assessment Process in Mongolia

Environmental Impact Assessment

- Strategic EIA
- Env’l Baseline Assessment
  - For major projects (Feasibility study stage)
- EIA
  - All new projects
- Cumulative EIA
  - Some regions or River Basins

General EIA

- No
- Yes, with some conditions
- Do detailed EIA

Environmental Management Plan

Environmental Protection Plan

Environmental Monitoring Programme
Community participation in EIA process in Mongolia

DEIA

Impact prediction stage
- Community meeting, participatory methods

Impact assessment stage
- Public forum, discussions, questionnaire

Environmental management plan (EMP) development
- Include community participation

Public comment submissions to the Citizens khural before to decision

DEIA report, EMP that reflect community concerns

Bagh and District Citizens khural discuss the documents within 15 working days

Project proponent
Questions?
Mining Lifecycle and Mine Water Use Requirements
Mining Water Demand Estimate

Changes in water use demand in south Gobi region (based on medium economic growth scenario)

### Mine lifecycles and Water Use Requirements

<table>
<thead>
<tr>
<th>Phases</th>
<th>Key water use/issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>Drilling, dust suppression, camp, temporary water supply, discharge of excess drilling water, water disposal, site stormwater</td>
</tr>
<tr>
<td>Planning / approval</td>
<td>Water supply identification, quantification, EIA,</td>
</tr>
<tr>
<td>Development</td>
<td>Construction water use, dust suppression, camp use, water supply, storage, treatment, disposal, site storm water management</td>
</tr>
<tr>
<td>Production</td>
<td>Mineral processing, dust suppression, camp use, water supply management, water treatment, mine dewatering, worked water recovery, storage, reuse, catchment management, acid drainage, rehabilitation</td>
</tr>
<tr>
<td>Closure</td>
<td>Rehabilitation, contaminated site treatment, mine pit lake, stakeholder approval, management plan</td>
</tr>
<tr>
<td>After closure</td>
<td>Monitoring, erosion control, contaminated site treatment and verification</td>
</tr>
</tbody>
</table>
Characteristics of Mining Water Use

- Without water mine can't operate
- Most of the mine operates in water scarce regions
- Mine is water intensive, but water quality is of less concern
- Mining water use could cause negative env'l, social impacts if it is not managed properly
- Mining water use does not get good perceptions by community, it is increasingly becoming a source of conflict
Sources of Mining Water Use Conflicts

- Lack of information or knowledge about regional water resources available and impacts from water use
- Water pollution or shortage caused by the mining elsewhere
- Lack of collaboration or cooperation by mining companies
- Sense that mining companies take what they want at the expense of others
- Lack of participation by local community in water management decision making
- Lack of water infrastructure/sustainable service provision to locals
- Competing water uses (herders and mining, domestic)

Impacts and management differs case to case, but positive and transparent dialogue is the key recipe for responsible water management.

Water resources:
- Changes in hydrological and hydrogeological regimes
- Contamination, deterioration of water quality and quantity
- Mine pit water issues such as salinization
- Water level lowering and herder well access
- Degradation of aquatic ecosystem etc.

Ecology and biodiversity:
- Water shortage impacts habitat or species (wetlands, ground water dependent ecosystems)
- Excess water could cause polluted water table, threatening groundwater dependent species
Potential social impacts of water use

- Reduced access to water (quantity and quality - legal human rights)
- Impacts on culture (worshipped springs or water points)
- Competition, tension, and dispute among water users
- Health issues
- Resettlement

Without effective management in place these may lead to:

- Tensions
- Lack of trust
- Conflict

Engagement needed

Effective impact management needs both technical and social engagement approaches
Assessment and Management of Mining Water use Impacts

Impacts Assessments
- Hydrogeological study and approval
- Detailed Environmental Impact Assessment (DEIA)
- Lender required env’l and social impact assessment

Management
- Annual Environmental Management Plan (EMP) in DEIA
  - Environmental protection plan
  - Environmental monitoring plan
  - Water monitoring requirements for > 50m3/daily use
- Dedicated water manager for water use > 50 m3/daily
- Mine closure plan
- Lender requirements for water management plan and monitoring

Impacts and management differs case to case, but positive and transparent dialogue is the key recipe for responsible water management
Stakeholder Participation for Water Management

River Basin Council

RBA initiates and MEGD institutionalises
- Monitoring of RBA, and water users’ actions
- 31-45 members
- Representation of Gov’t, Env’t authority, GASI, NGO, citizens, water users, researchers, professional entities in the basin

Community consultation (CC) is not in the current water legislations!
DEIA (2012) Law requires CC.
Case Study: River Basin Councils in Mongolia
Questions?
Challenges for Achieving Sustainable Water Management in the South Gobi
Mining water use and Community perceptions

Perceived factors for Water quantity and Quality in south Gobi

Source: Baseline community perception survey, IRIM, 2014
Mining water use and Community perceptions

Perceived Water Management stakeholders and trust levels by community

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>District</td>
<td>35.0</td>
</tr>
<tr>
<td>Sub-district</td>
<td>29.5</td>
</tr>
<tr>
<td>Neighbour, close</td>
<td>25.6</td>
</tr>
<tr>
<td>Neighbour, distant</td>
<td>23.8</td>
</tr>
<tr>
<td>GoM</td>
<td>18.3</td>
</tr>
<tr>
<td>Mining</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Source: Baseline community perception survey, IRIM, 2014

Widespread lack of trust in the mining industry’s water resource management
Causes and Effects of Community Concerns around mine water use

PROBLEM: Community concerns about water issues

CAUSES:
- Lack of information
- Lack of transparency
- Failure at implementation
- Lack of engagement in decision making

EFFECTS:
- Increased competition
- Pessimism
- Conflicts
- Tensions
- Lack of trust

The diagram illustrates the causes and effects of community concerns related to mine water use, highlighting issues such as lack of transparency, information, and engagement, which lead to increased competition, conflicts, tensions, and a lack of trust.
Technical uncertainties for sustainable water management in South Gobi
Mongolia has arid climate / low recharge
- Limited surface water – groundwater often best or only viable option for large scale water supply

Main aquifers present
- Alluvial aquifers – highly variable
- Fractured rock aquifers – uncertainty in storage potential
- Basin fill sedimentary aquifers – large storage potential

Groundwater quality highly variable
- Often brackish/saline
- However still suitable for industrial purposes

Significant technical uncertainty exists
- Some quantification for Southern Gobi
- Overall lack of rigorous systematic regional / countrywide study

Developing a secure water supply can be a risk
- Requires comprehensive exploration to establish supply longevity
- Work needs to follow a structured approach / started early
Coverage of hydrogeological survey
Potential groundwater deposit (K)
Challenges for Mongolia Water Management

- Regulatory challenges
- Coordination challenges
- Technical challenges
- Stakeholder challenges

No solid, generally accepted database

Source: Mongolia: Targeted analysis of water resources management issues 2014
Current Knowledge Gaps

- Lack of baseline data and detailed Impact Assessments
  - Groundwater level and groundwater quality baseline monitoring
  - Numerical groundwater model development to simulate long term impacts
  - Climate change uncertainty
- Potential areas of concern through long term groundwater supply operations
  - Reduction in groundwater levels
  - Potential impact on existing herder wells
  - Potential impacts on groundwater supported vegetation
  - Change in water quality
- Require social and environmental studies in parallel with hydrogeological studies
Observed climate change in Mongolia

Climate change in Mongolia for the last 60 years:
- Annual mean temperatures have risen by 2.14°C since 1940s. The warming has been most pronounced in winter, with a mean temperature increase of 3.6°C, while spring, autumn, and summer mean temperatures have risen by 1.8°C, 1.3°C, and 0.5°C respectively.
Projected climate change in Mongolia

Both winter and summer temperature will likely to increase, while winter precipitation is projected to increase. The changes are not uniform across the country.
Projected climate change impacts on water resources in Mongolia

- Climate change impacts on groundwater resources are poorly understood.
- The climate change impacts on groundwater will likely be through surface water processes and recharge.

What might happen to the surface water from climate change in Mongolia:
- Mild winter could cause less water stored in snow and glaciers.
- Slight increases in stream flow.
- Increased evaporation will outweigh the stream flow increase.
- River basin will likely be drier than now, due to increased evaporation.
Projected climate change impacts on groundwater resources in Mongolia

Shallow aquifers may be impacted via:
- Less soil moisture due to elevated evaporation
- High run-off probability due to extreme rainfall
- Reduced recharge especially for shallow aquifers

Deep aquifers:
- Not adequately studied and understood
- Unlikely to impact deeper aquifers not linked with shallow aquifers
Discussion time: What should be done to address the challenges

What should Government do?

What should Mining industry do?

What might be the community inputs to the solution?

Who else should be involved?
Questions?
Initiatives for Achieving sustainable Water Management in South Gobi
Government Initiatives

Changes in regulations

- Integrated water resource management
  - Catchment based water management – RBAs
  - Catchment based Water Management Planning
  - Stakeholder participation in water management - RBC
- Inter-sectoral coordination
  - National Water Committee is headed by Prime minister
- Increased responsibility by water users
  - Increases in water use tariffs
  - Introduction of Water Pollution fee
  - Requirement for dedicated water manager if water use >50 m3/day
  - Requirement for internal water monitoring bores if water use >50 m3/day
- Research and development
  - National ground water monitoring network
  - Hydro-economic analysis in selected areas
IWRM and River Basin Administration

29 River basins in Mongolia under direct management of MEGDT
Mining industry water use fee trend

Galba, Uush, and Dolood Gobi basin (Tg/m³)

<table>
<thead>
<tr>
<th>Year</th>
<th>SW</th>
<th>GW</th>
<th>1995</th>
<th>2005</th>
<th>2009</th>
<th>2013</th>
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<td>6</td>
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<td></td>
<td>241</td>
<td>170</td>
<td>1359</td>
<td>959</td>
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</tbody>
</table>

- Mineral exploration
- Mineral use and processing
Monitoring of Groundwater

Establishment of ground water monitoring network in south Gobi

Key benefits:
- Study natural fluctuations of groundwater levels and quality
- Monitor water use impacts in high water demand areas
- Long term water management planning at regional level
Understanding the ground water

Establishment of ground water monitoring network in south Gobi

http://groundwater.mn/
Voluntary Code of Practices (VCP) for Minerals Industry and Water Management

- 10 signatories agreed to implement Voluntary code for water management
- Signatories have specific commitments
Mission
We acknowledge that access to water is a basic human right and voluntarily commit to the responsible, legally compliant, and sustainable use of water. We will be efficient in our use of water, transparent in our monitoring, maintain water quality and will provide broad participation in our water management activities.

Vision
We will be responsible companies and build trust by working together to relieve water stress, support the development of sustainable communities and bring benefits to Mongolia.
### Voluntary Code of Practice: Minerals Industry and Water Management

**What are VCP signatories committed to?**

<table>
<thead>
<tr>
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</thead>
<tbody>
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<td>2.1 Comply with Mongolian law, catchment governance requirements (RBAs RBCs) and international standards on water management</td>
<td>3.1 Develop participatory monitoring programs for communities adjacent or near to exploration and mining activities</td>
<td>4.1 Maintain a water monitoring program that respects local customs and monitoring reports will include information on water levels and water quality in wells</td>
<td>5.1 Support impacted local communities to maintain or improve access to water resources</td>
<td>6.1 Rehabilitate or improve impacted water resource infrastructure in pastureland to pre-project status</td>
</tr>
<tr>
<td>1.2 Organize project site visits for communities and vice-versa</td>
<td>2.2 Support Government of Mongolia in developing and implementing its legal and regulatory framework for water resources management</td>
<td>3.2 Organize community discussions and information sharing, including the results of any monitoring programs</td>
<td>4.2 Optimize water efficiency and conservation at mine site operations and minimize water waste</td>
<td>5.2 Support local communities to improve traditional ways of protecting wells</td>
<td>6.2 Engage community members to improve water management practices in pastureland themselves</td>
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<td>2.3 Incorporate good international industry practice for mine-water management in business operations</td>
<td>3.3 Support public education and awareness raising through communications materials in a format that is accessible to the given audience</td>
<td>4.3 Identify, monitor and manage high value biodiversity assets that are dependent on water to ensure their safeguard</td>
<td>5.3 Support access to water for livestock in times of stress</td>
<td>6.3 Support community projects to develop sustainable water supplies in areas of impact</td>
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<td></td>
<td>4.4 Maintain a site water balance to report annually on key metrics pertaining to water performance and that is used to inform long term mine planning and closure plans</td>
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Voluntary Code of Practice: Minerals Industry and Water Management

**What are VCP signatories committed to?**

- Act transparently and with accountability
- Comply with national law and international standards
- Engage proactively and inclusively
- Effective water resource management and conservation
- Create positive impacts
- Support local water infrastructure and services

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What VCP means for communities?

VCP Companies agreed to:

1. Be open about what they do with regard to water management
2. Show stakeholders what they do (for example site visit or vice-versa)
3. Listen to the stakeholders concerns
4. Engage with other stakeholders and jointly monitor water resources
5. Provide or exchange relevant information
6. Support communities to improve access to water resources
7. Support community projects for sustainable water supplies in impacted areas
### VCP Reporting Metrics

<table>
<thead>
<tr>
<th>Reporting of mine water use</th>
<th>Monitoring of surrounding water systems</th>
</tr>
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<tbody>
<tr>
<td>Extracted water</td>
<td>Water levels</td>
</tr>
<tr>
<td>Used water</td>
<td>Rainfall / climate</td>
</tr>
<tr>
<td>Recycled water</td>
<td>Herder wells near mine</td>
</tr>
<tr>
<td>Discharged water</td>
<td>Local drinking water quality</td>
</tr>
<tr>
<td>Mine water quality</td>
<td>Water quality around mine site</td>
</tr>
</tbody>
</table>

Would your perception about mine water management be different if you know all of these?

What do you want to know more about?
What is your role for mine water management!

- What is your experience in water management?
- What can you do differently in the future and why?
Questions?
THANK YOU FOR YOUR ATTENTION