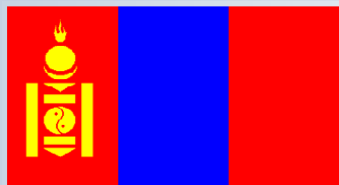


# Environmental Pollution Abatement Approach

Know-how Transfer project  
Development co-operation  
of the Czech Republic with Mongolia  
2013 - 2014

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**Dekonta a.s. and Geomin, s.r.o.**

## Know-how Transfer project 2013- 2014

# Environmental Pollution Abatement Approach

**Realisation Consortium and Mongolian Partner:**

- Geomin and Dekonta companies
- Office of the National Chemicals Management Council



# Basic Project thesis:

**Soil and water pollution**



**environmental damage  
and health risk for the population**

**Groundwater and soil pollution  
may represent a risk  
even for the distant future**

**The state must take responsibility for  
Environmental Pollution Abatement**

# Principal project goals and outputs

**Transfer of know-how on the field  
optimization and standardization  
of the pollution abatement process**



## **1) Tools for standardization of the process:**

- **development of methodological guideline documents for investigation and assessment of polluted sites**
- **demonstration field investigation of selected sites**

## **2) Tools for optimization of the process:**

- **development of the database of polluted sites**
- **development of the priority classification system**

# Standardization tools 1

Set of methodological guideline documents for investigation and assessment of polluted sites:

- Pollution investigation methodology
- Principles of representative sampling
- Sampling methods
- Risk analysis methodology
- Geophysical methods in pollution investigation
- Review of remediation methods

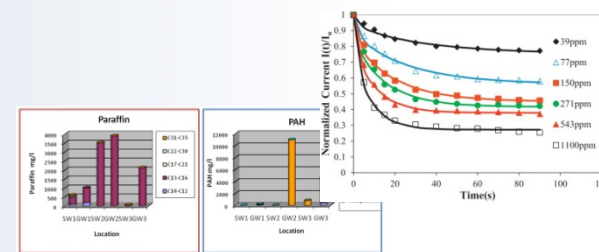
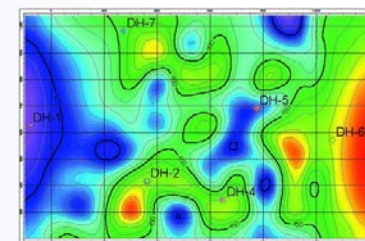
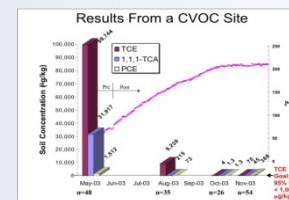


Fig. 6: Petroleum Hydrocarbon contamination in water



# Standardization tools 2

## Pollution investigation and assessment - knowledge transfer

- Evaluation of existing information on polluted sites in 3 selected aimags
- Field reconnaissance for selection of 20 sites for preliminary investigation
- Preliminary investigation of 20 sites - sampling, laboratory analyses
- Assessment of site investigations
- Design for further detail investigation of 3 selected sites
- Workshop for state administration

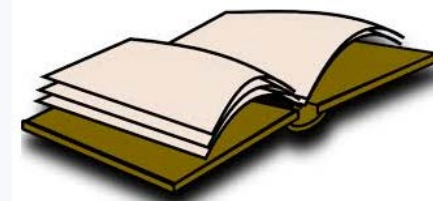




# Optimization tools

Tools for effective management of the pollution abatement process:

- development and installation of the database of polluted sites
- development of the priority classification system and its integration into the database
- methodological guideline document and database manual
- workshop for database operators and administrators



# **Optimalization tools**

# **System for prority classification of polluted sites**

# **Brief introduction to the system**



# Optimization tools

## Reasoning for prioritization:

**Pollution abatement = long and costly process**



**Priority setting is essential  
for effective allocation of effort and money**

**Sites posing the highest threat  
to the human health and environment  
must be investigated and remediated firstly**

## Optimalization tools

**Prioritization of polluted sites is based  
on risk analysis principles**



## Optimization tools

# Prioritization principles






**Source classification**

x

**Pathway classification**

x

**Classification of receptors**

-  size/amount
-  toxicity
-  mobility

natural conditions for persistence and spreading of pollutants

(soil properties, hydrogeology, distance to a water stream, distance to a receptor, etc...)

their character and importance



# Optimalization tools

## Site classification and ranking system

# Principles

**Three basic groups of site categories according to character of further action:**

- A - sites requiring a corrective action  
(unacceptable pollution)**
- N - sites where no action is required  
(low or no pollution)**
- P - insufficient information for a decision -  
investigation or monitoring is required  
(potentially hazardous - suspected sites)**

**Supplementary simple number code for classification of the site hazard seriousness and urgency of its solution.**

## Optimization tools

# Database

- For setting priorities, we must have a list of sites and some information on them
- Database of polluted and potentially polluted sites is the necessity!



## Optimalization tools

# National database of polluted and potentially polluted sites

- effective management and control of the environmental pollution abatement process
- protection of human health and environment
- city and landscape planning
- environmental information for public
- real estate transfers





## Optimalization tools

# National database of polluted and potentially polluted sites

To enable full control of risks from soil and water pollution, proposed Mongolian database can incorporate and classify also:

- locations with naturally increased concentrations of harmful substances in soil and waters
- waste water discharges to surface water bodies

## Optimalization tools

**Database and prioritization  
are crucial elements  
for the effective management  
of the pollution abatement process**

# Optimalization tools

## Database can be useful for practice only if:

- it contains data from the whole country
- it is as much complete as possible
- it is kept actual permanently

## How to secure these preconditions:

- organization of the initial nationwide campaign for inventory of polluted and potentially polluted sites
- official appointment of the database operator and administrator
- obligation to fill in the database with data from site investigations and remedial actions and with data from newly identified and newly originated sites

## Optimization tools

# Tiered approach to prioritization of polluted and potentially polluted sites

**Desk-top inventory, site identification**

*Selection of priorities for reconnaissance*



**Site Reconnaissance**

*Selection of priorities for further investigation*



**Preliminary investigation – introductory sampling**

*Selection of priorities for further investigation*



**Detail investigation, Risk analysis**

*Selection of priorities for remediation*



**Site Remediation**



# Czech experience

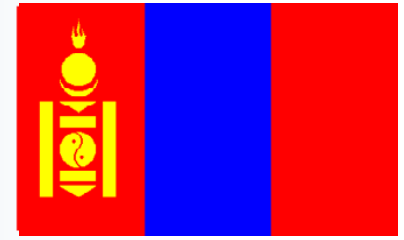
App. 9 thousand polluted sites

**National pollution abatement programme**

**Situation after 20 year's effort:**

- expenses: about 2300 billion MNT
- investigated sites: 18%
- remediated sites: 3%

**Pollution abatement = long and costly process**



**Czech Republic**

**Mongolia**

**Area**

**78 886 km<sup>2</sup>**

**1 564 115 km<sup>2</sup>**

**Population**

**10,5 million**

**2,9 million**

**Polluted sites**

**app. 9 thousand**

**???**



## Standardization tools 2

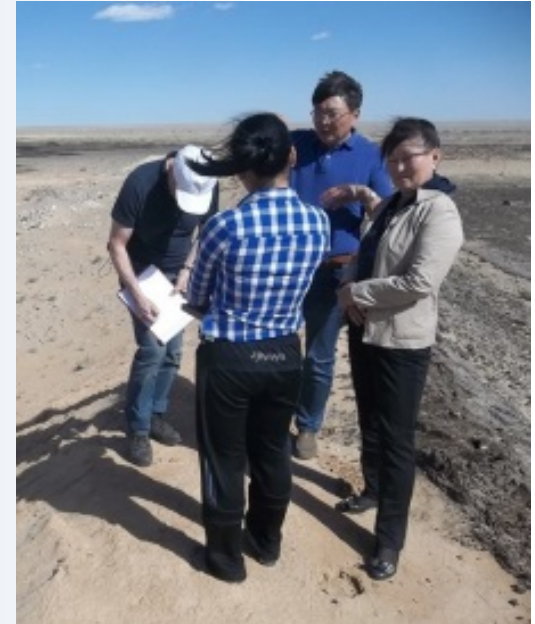
# Demonstration field investigation of polluted sites

# Investigation of polluted sites - main tasks

- Field reconnaissance and selection of 21 sites for preliminary investigation
- Preliminary investigation of 21 sites, evaluation of results, final report
- Selection of 3 priority sites for subsequent detail investigation (investigation, risk analysis, conceptual proposal of corrective measures)
- Direct know-how transfer

# Site identification, field reconnaissance

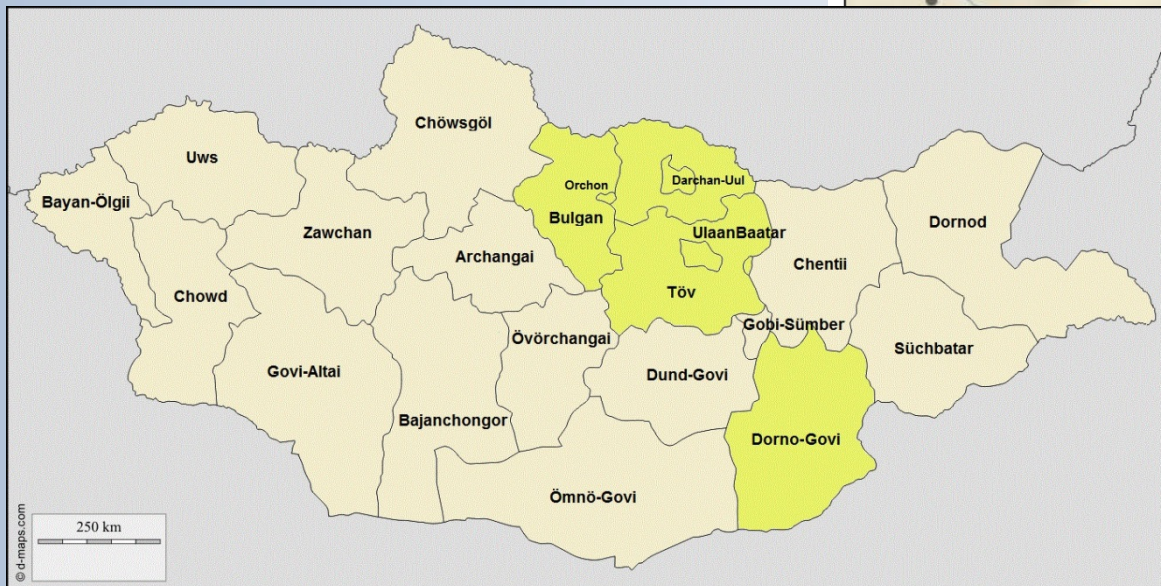
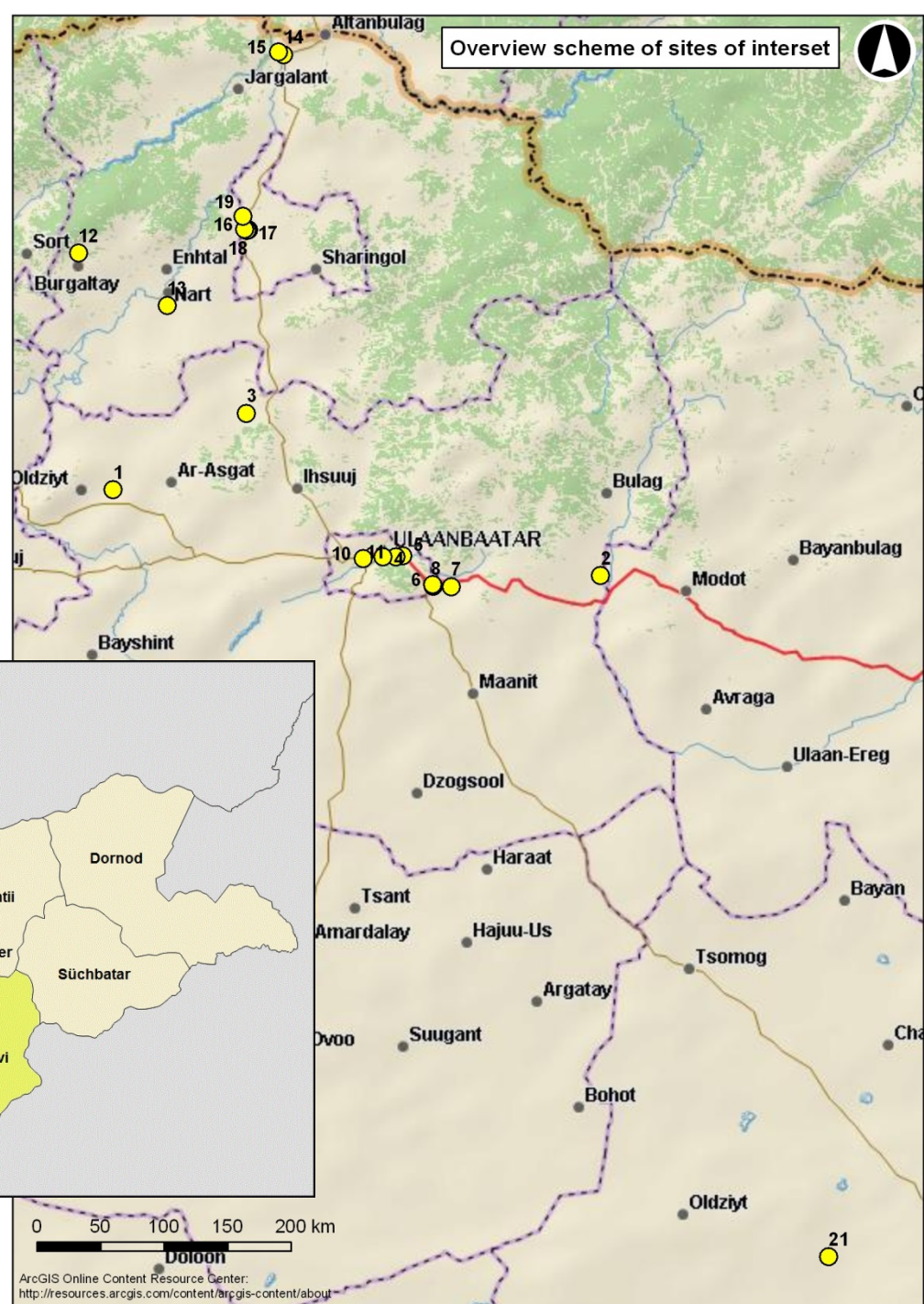
- Ministry of Environment and Green Development
- National Chemicals Management Council's Office
- National Environmental Information Center
- State Professional Inspection Authority
- Academy of Science
- National Petroleum Authority
- Czech geological projects
- Questionnaire campaign
- Interviews with aimag and somon representatives and with environmental inspectors
- Field Reconnaissance



# Location of sites for preliminary investigation

Aimags:

Ulaanbaatar, Selenge, Darchan, Bulgan, Erdenet, Dornogovi, Central Aimag





# Sites for preliminary investigation

- Petroleum Terminals
- Former army bases
- Wood tar impregnation facilities



# Sites for preliminary investigation

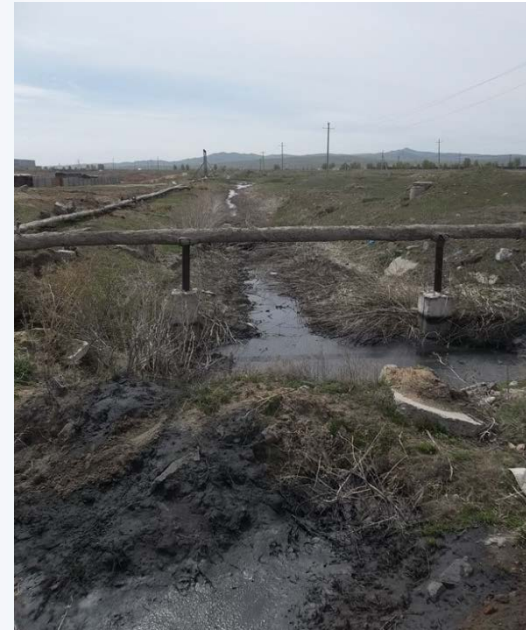
- Obsolete pesticide storage and dumping sites
- Livestock disinfection field basins
- Mining activities impacts (crude oil, gold, other metals)





# Sites for preliminary investigation

- Abandoned industrial site - glass factory
- Heat station fly ash lagoons
- Waste sludge outlet from a tanning factory



# Preliminary investigation - sampling

Water samples		Solid matrix samples	
Surface water	14	Soil, sludge, waste	162
Groundwater	20	Stream sediments	15
Waste water	4	Construction materials	4
QA/QC	5	QA/QC	24
<b>Total</b>	<b>43</b>	<b>Total</b>	<b>205</b>









# Preliminary investigation - Lab Analyses

## Central geological laboratory Ulaanbaatar:

- heavy metals, Hg a Cd
- cyanides
- basic water analyses

## Commercial Czech laboratory (ALS, Prague):

- petroleum hydrocarbons (TPH)
- polycyclic aromates (PAHs)
- benzene, toluene, ethylbenzene, xylenes (BTEX)
- polychlorinated biphenyls (PCBs)
- organochlorine pesticide (OCPs)
- chlorinated aliphates (PCE, TCE...)

# Preliminary investigation - Evaluation

## Final report for each site:

- pollution assessment
- evaluation of migration potential
- preliminary health and environmental risk analysis
- site priority evaluation  
(priority and character of further action)
- conclusions and recommendations



# Preliminary investigation - Evaluation

## Pollution interpretation - comprarison with limits and other indicative values

MNS 4586:1998	surface water
MNS 6148:2010	Ground water
MNS 0900:2010	drinking water
MNS 5850:2008	soil

- Dutch Target and Intervention values
- Czech Indicative values (= US EPA RSL values)

# ZUUNBAYAN - crude oil exploitation

- Large, severely polluted crude oil exploitation field

*TPH > 47 000 mg/kg*

- threat to groundwater sources
- threat to livestock pastures and watering places
- risk food chain contamination









# NALAIKH - former glass factory

- open air storage and dumping of various chemicals
- pollution of soil and construction materials by heavy metals (As, Pb, Cr, Cd)

*As > 2800 mg/kg*

- increased radiation

*(U = 50 mg/kg, 73  $\mu$ R/h)*

- located in the centre of the town
- pollution of surroundings due to wind and water transport









# BULGAN - Pesticide dump site

- organochlorine pesticide buried in a shallow pit in the residential area

- OCP soil pollution

*lindan* > 1600 mg/kg

*DDT* > 380 mg/kg



- located in the centre of the town
- direct threat to inhabitants and namely to children
- pollution of surroundings due to wind and water transport
- risk of migration to groundwater source for public drinking water supply

# TAL BULAG - sludges from gold ore processing

- dump site of sludge from gold ore amalgamation processing
- pollution by heavy metals (Hg, As, Cd, Pb)  
*Hg > 22 mg/kg, As > 135 mg/kg*
- possibility of pollution migration due to wind and water transport
- pastures and villages in surroundings
- risk of pollution of groundwater sources
- risk of pollution entry to a food chain







# DARKHAN - waste outlet from the tannery

- illegal disposal of waste sludges
- pollution of a surface stream (i.e. water and stream sediments)  
by Cr, As, Zn, Cu, petroleum HC  
*Cr > 34,7 g/kg, TPH > 143 g/kg*
- pastures and water sources  
in surroundings
- close to the Kharaa river





# Ulaanbaatar - railway depot

- long lasting spilling of petroleum products
- soil pollution by metals and petroleum products  
*TPH > 36 000 mg/kg*
- city centre location
- risk of groundwater pollution and subsequently of its entry to the Tull river







## Final tasks:

- development of the project proposal for detail investigation of three selected priority sites
- inserting data from site investigations to the national database of polluted sites
- closing seminar - training workshop for all stakeholders of the pollution abatement process





# Together for better environment



Thank you  
for your attention