



**SKRI**

SUSTAINABLE KAZAKHSTAN  
RESEARCH INSTITUTE

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**NARXOZ**  
UNIVERSITY

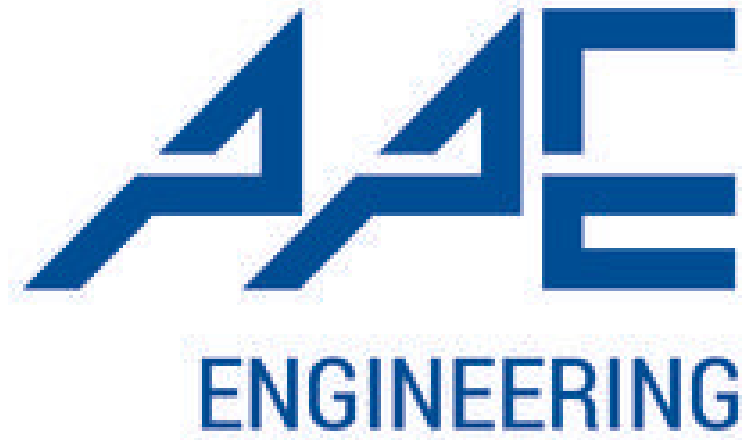


# Nature Based Solutions

An aerial photograph showing a dense, vibrant green forest on the left side of the frame. A dark blue body of water, likely a river or lake, runs along the right side. On the right bank, there is a boat dock with several white canoes or small boats moored. Further inland on the right, there are several buildings with grey roofs and a dirt path. The overall scene depicts a natural ecosystem adjacent to human infrastructure.

**Protect, manage and restore natural ecosystems impacted by industrial waste; simultaneously benefiting people and nature.**





**UNECE**



- SKRI work on NbS recognized as a good practice within the scope of the UNECE Convention on Water and Industrial Accidents JEG Meeting in October 2022
- Completed commercial contract with our partners from Altynalmas Ltd.
- Narxoz University received 300 mln tenge from RG Gold as part of the 1% research contribution to explore NbS (phytocapture project currently underway at mining operations site)

# Example: Phytocapture



# Phytocapture

## Application for the Industrial Sector





# Dust Suppression

- Costly (annual costs \$10-20,000 per 1.5 km)
- Ineffective
- Routine Maintenance
- Environmental Impact: Chlorides leach from road surfaces. Corrosive to metal, hurt vegetative growth, change the **chemistry** of nearby soils (further hurting local vegetation) and are **toxic** to aquatic life)



# **Phytocapture helps companies comply with regulatory requirements and save money!**

## **Subsoil and Subsoil Use Code of the Republic of Kazakhstan**

**Article 129:** 2) to finance research, scientific and technical and (or) development work in the amount of one percent of the production costs

## **Environmental Code of the Republic of Kazakhstan**

Best Available Techniques principles: independent domestic and foreign experts relevant fields of application of the best available techniques; 3) focus on the best world experience;

**Sanitary Zone Requirement:** 40% of territory planted for vegetation

***Companies can use research funds to pay for sanitary zone requirements and save money!***



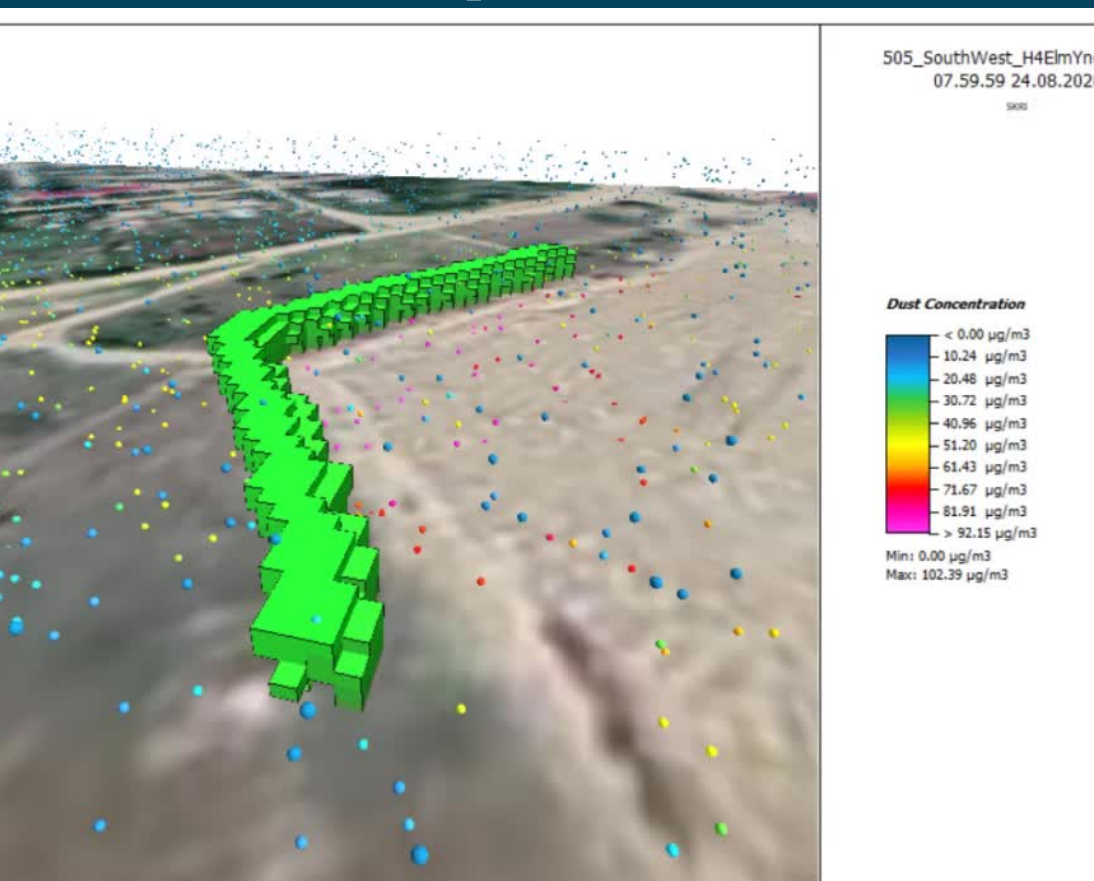
# AKSU GOLD MINE





# SKRI, Services Provided

1. Initial scoping (remote or on site depending on needs)
2. Scientific modeling on a super computer plant-surface-atmosphere interactions concerning the outdoor environment
3. Reports and analysis to be used for internal and external use
4. Implementation of barrier, promotion of work





# Nature based Solutions to Mine Tailing Water Waste in Central Asia



- Literature review of best global practices of nature based solutions
- Site visit and pre-design of nature based solution to the selected sites (Ak Tuz in Kyrg. RG Gold site)
- International stakeholder consultation/fundraise for their application





Nature Sustains  
Strengthening Mine Tailing Safety  
in  
Central Asia through Nature Based  
Solutions (June 2022)

**Tailing Closure Methods**

**Dry covers**

**Wet covers**

**Nature based solutions to increase pH**

**Examples of pH increasing**

**Nature based solution to remove heavy metals through a filter system**

**Examples of heavy metal filters**

**Nature based solutions to remove phosphorus**

**Examples of phosphorus filters**

**Nature based solutions through phytoremediation for soil and water contamination**

**Phytosabilization/Phytoextract (selecting vegetation)**

**Examples of phytoremediation**

**Other means of bioremediation: fungi and bacteria**



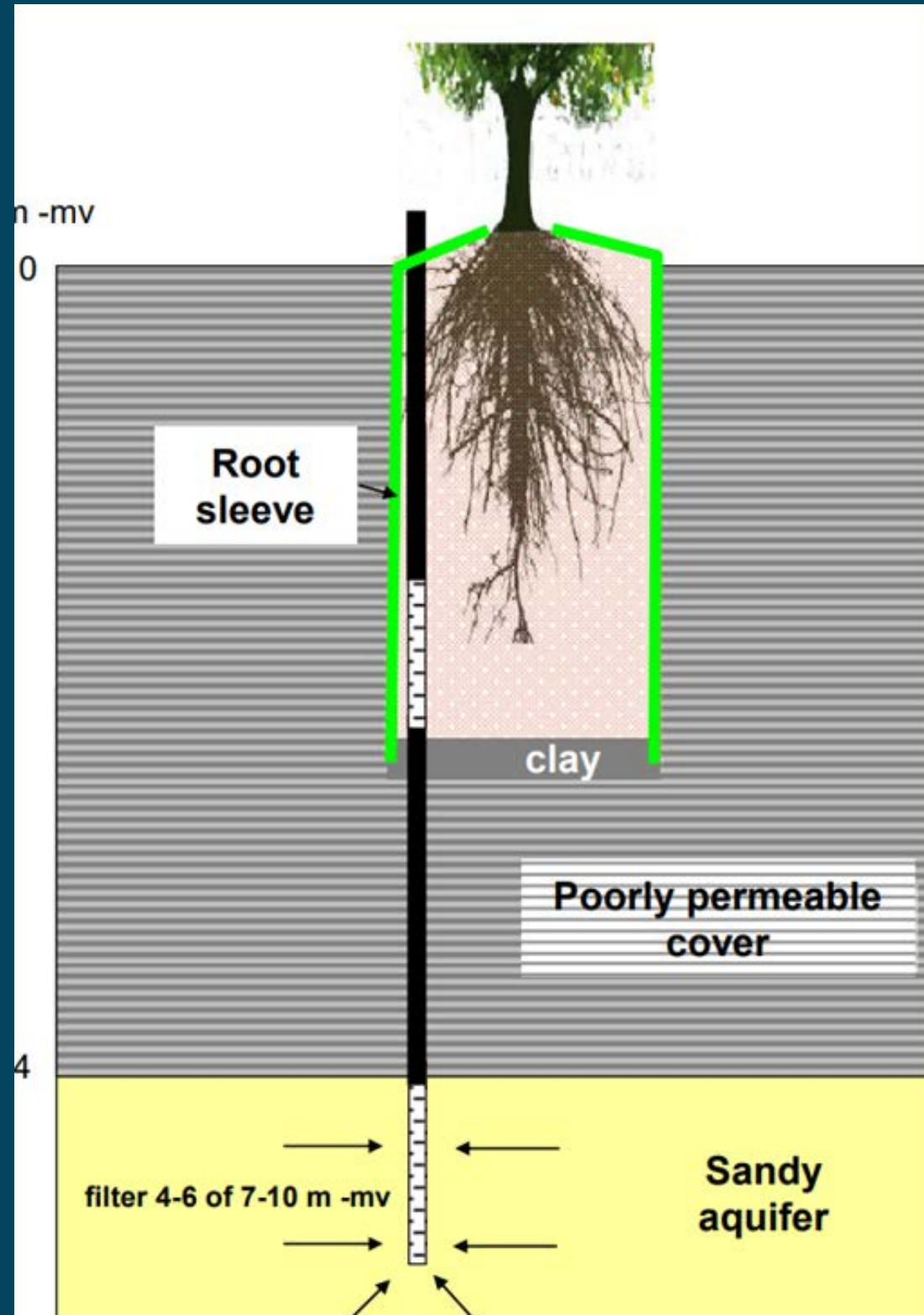
# Tree Wells (Tauw Engineering Firm)

- Controlment of BTEX groundwater contamination at DOW Benelux, Terneuzen, the Netherlands
- Controlment of Chlorinated Hydrocarbons groundwater contamination
- Phytocontainment: geohydrological barrier for pollutants
- Phytostabilization: immobilization of pollutants by adsorption
- Phytoextraction: removal of pollutants by uptake and allocation
- Poplars, Eucalyptus, Willows





# Tree Wells





# Reactive mat for biosorption (Tauw Engineering Firm)

- Polluted canal near Ghent, next to an old asphalt factory Belgium
- Pollution with aliphatic and aromatic hydrocarbon
- Reactive mat with biochar and peat
- Reduction in pollutants of 85 to 100%
- Replacement every 10 years





# Reactive mat for Biosorbption





# Conclusions and Future work

- For nature based solutions its important to have time and the space for the implementation of the solutions-Central Asia has both.
- Nature based solutions provide low cost support for the prevention, mitigation and resortation of contaminated sites.



# THANK YOU!

The Sustainable Kazakhstan Research Institute:  
*'providing technical solutions to the world's most  
pressing sustainability challenges'*

If you interested please contact us!

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