



Improvement of degraded soil by waste – case studies

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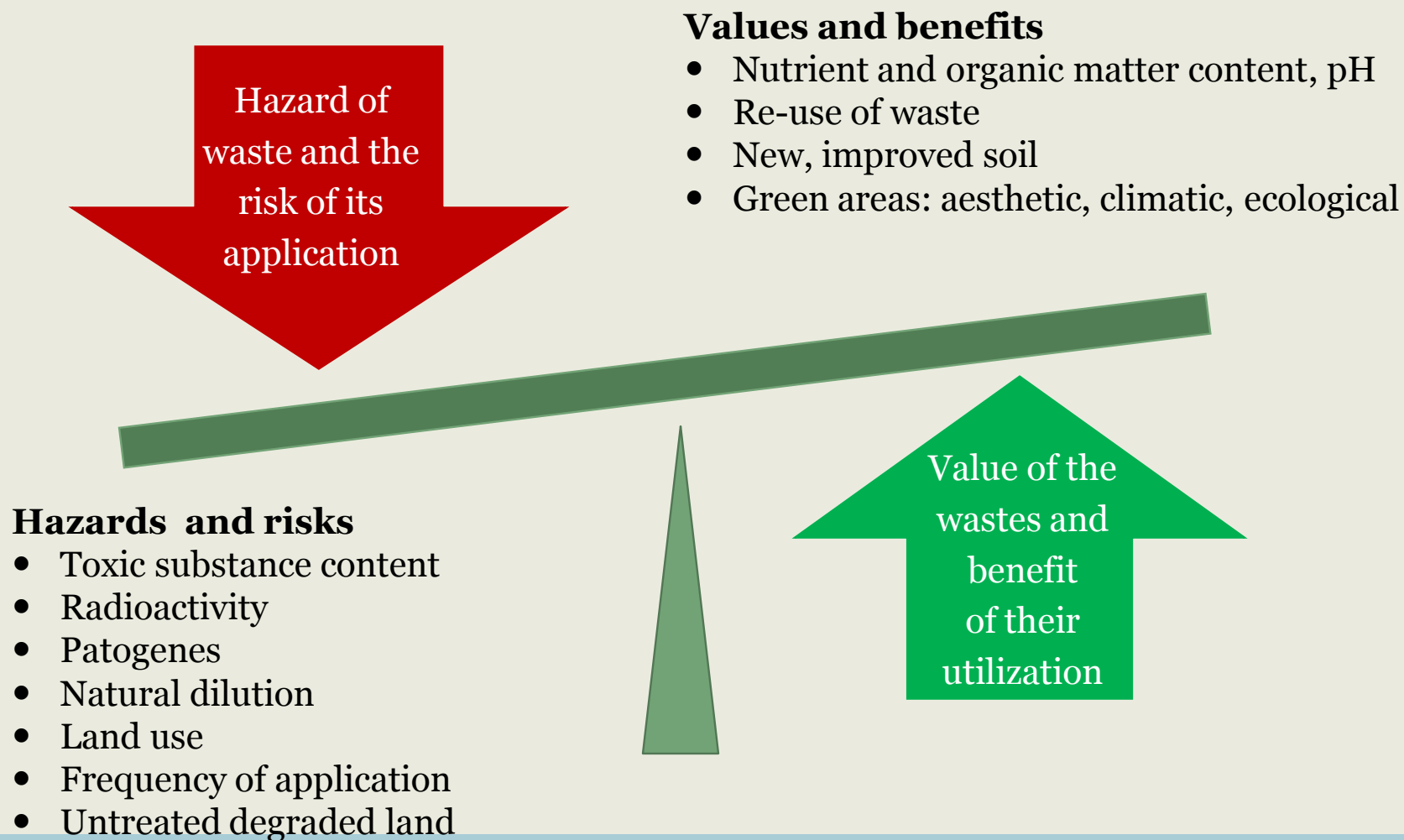
**WITH THE CONTRIBUTION OF THE "SOILUTIL" AND THE
"BÁNYAREM" PROJECT CONSORTIA**

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Evaluation of wastes and their application for soil based on their risks and benefits

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Case studies: wastes for soil improvement

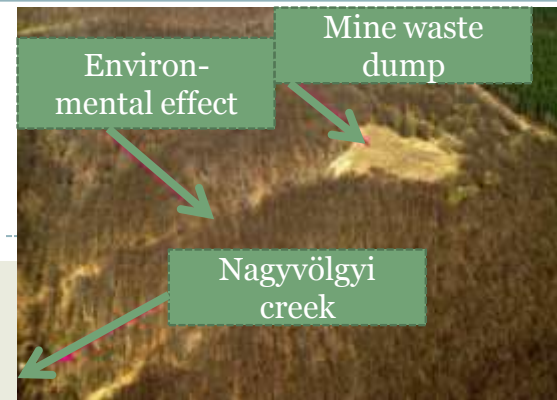
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- **No. 1.** Remediation of mine waste by fly ash and other amendments
- **No. 2.** Remediation of metal contaminated soil by fly ash
- **No. 3.** Revegetation and rehabilitation: creation of a fertile topsoil layer from fly ash and organic wastes
- **No. 4.** Soil substitute from red mud

Case study No 1.

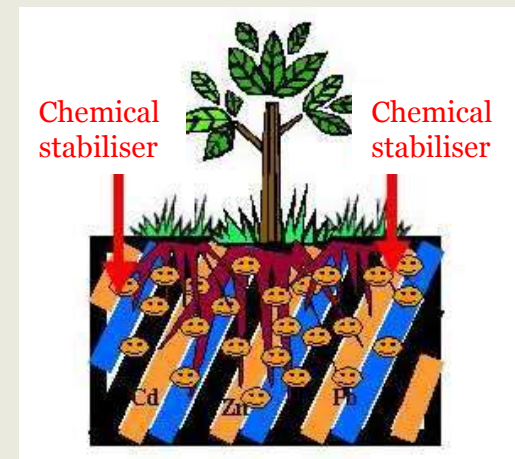
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- **Site:** GyöngyöSOROSZI mining site
- **Problem:** acidic (pH=2.8), Cd, Zn, Pb and As containing mine waste on the surface for 40 years
- **Solution:** combined chemical and phytostabilisation
- **Amendments:** fly ash, lime, iron grit
- **Plants:** grass mixture, broom corn, sudan grass



Metal ore mine waste to be treated

Combined chemical and phytostabilisation



Field experiment



Effect of chemical stabilisation

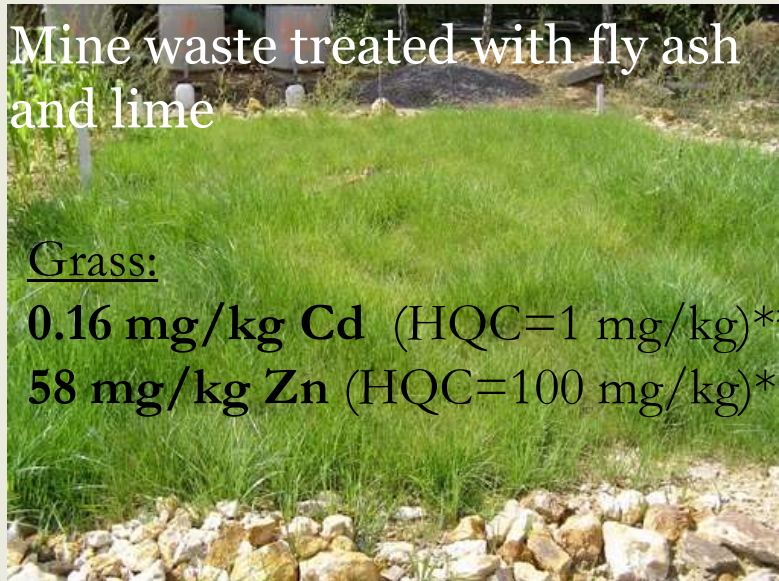
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Leachate:

Cd: 441 µg/l (HQC: 5 µg/l)* → **0,12 µg/l**

Zn: 89 079 µg/l (HQC: 200 µg/l)* → **29.3 µg/l**

(Untreated mine waste, 2007 → Fly ash+lime+iron, 2009)



Grass:

0.16 mg/kg Cd (HQC=1 mg/kg)**

58 mg/kg Zn (HQC=100 mg/kg)**



* B contamination level for underground water, 6/2009 (IV. 14.) KvVM-EüM-FVM joint decree

** Hungarian quality criteria for food and fodder, 44/2003. (IV.26.) FVM and 17/1999. (VI. 16.) EüM decree

Case study No 2.

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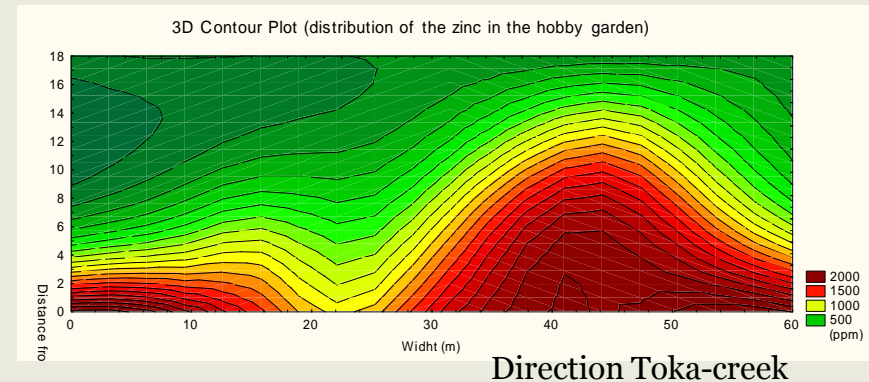
- **Site:** Gyöngyösoroszi mining site
- **Problem:** agricultural soil contaminated with Cd and Zn by flooding
- **Solution:** combined chemical and phytostabilisation
- **Amendment:** fly ash
- **Plant:** grass mixture, broom corn, sudan grass, maize



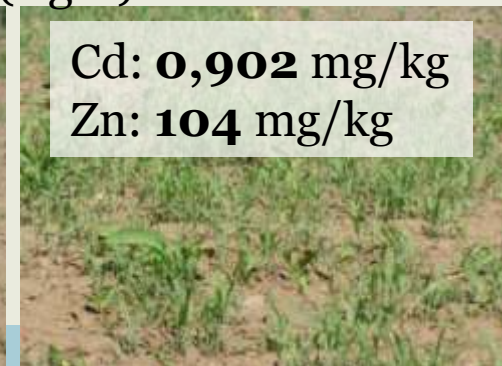
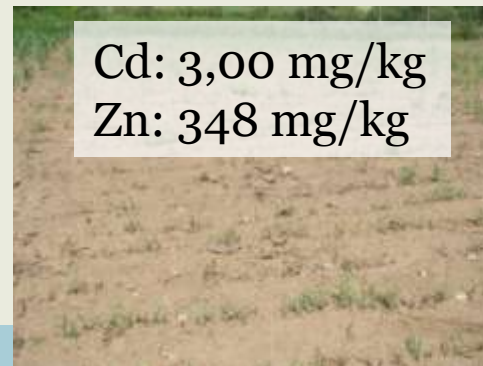
Flooding in Gyöngyösoroszi



Mine waste in the Toka-creek



Sudan grass on untreated (left) and fly ash treated (right) soil



Case study No. 3.

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- **Site:** .A.S.A. Hungary Ltd. municipal landfill site at Gyál
- **Problem:** steep ringwall with no vegetation – bad aesthetic view, erosion
- **Solution:** *in situ* waste mixing
- **Amendment:** fly ash; wood ash; raw, digested and composted sewage sludge
- **Plant:** grass mixture



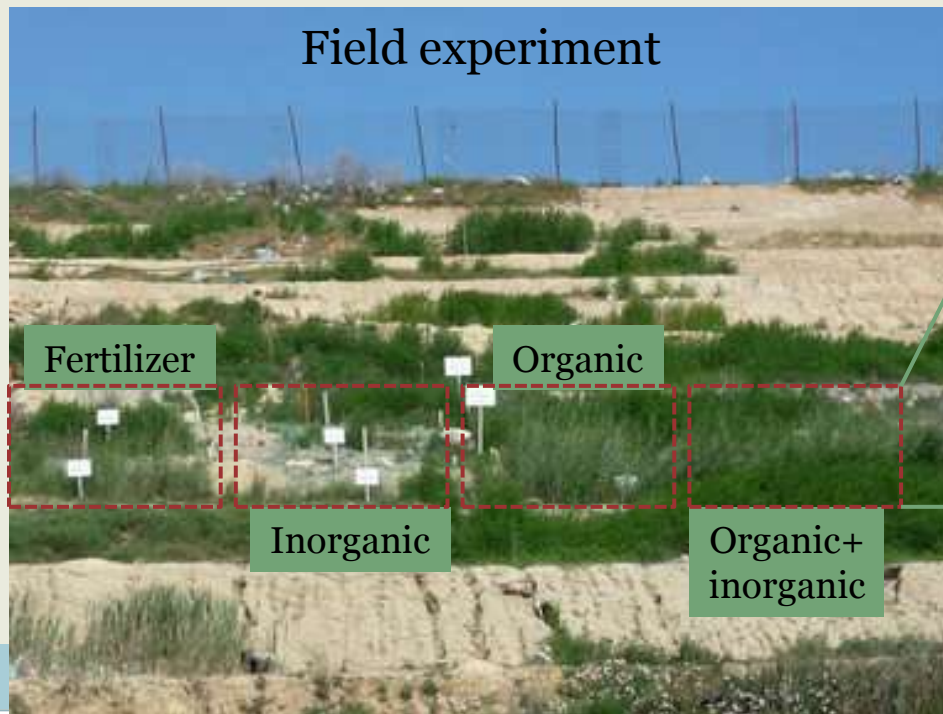
Barren ringwall
of the municipal landfill



Eroded
ringwall

Long term effect of waste treatment (2.5 years)

- One-time treatment, but improvement from year to year
- Improvement in texture, nutrient-availability, biological activity
- No toxic effect
- Best option: organic+inorganic amendment together



Case study No. 4.

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- **Site:** .A.S.A. Hungary Ltd. municipal landfill site at Gyál
- **Problem:** cheap and fertile cover material needed
- **Solution:** soil substitute from waste
- **Wastes:**
 - subsoil (construction waste)
 - red mud (Ajka)
 - red mud contaminated soil (removed after Ajka accident)
 - compost, green waste, saw dust
- **Plant:** grass mixture



Experimental plots



Plants grown on the waste mixtures

Best combinations:

- subsoil + 2% Ajka red mud + 10% green waste or compost
- subsoil + 20% red mud contaminated soil

Soil substitute with good water balance, sufficient available nutrient and organic matter content, active microflora, no toxic effect

Wastes are solution for degraded land!

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Thank you for your attention!

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