

MiMi

Establishment of Vegetation on Water Covered Mine Wastes

**– Integration in the Performance
Assessment Framework**

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The MiMi Programme

- An integrated research programme
- Funded by MISTRA, the Swedish Foundation for Strategic Environmental Research and the Swedish Mining Industry
- Six Universities, The Mining Industry, Consultants
- Fundings for 1997 - 2003 about 11 million CAD

MiMi - Objectives

- Safe methods for remediation of mining waste
- Reliable prediction of the long-term performance
- Challenge
 - economically and environmentally efficient solutions
 - meet future demands

MiMi - Problem description

- **Key issues:**

- Mine waste often contains metal sulphides
- Sulphides oxidise when exposed to oxygen and water
- Oxidation creates an acidic, metal-laden leachate
- Leachate generation over long time

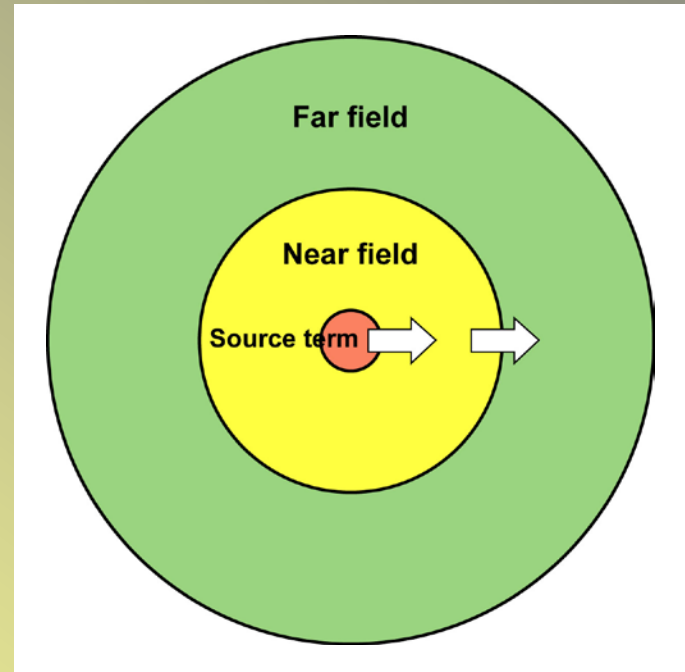
- *How can we assess the performance of a proposed disposal design over a period of time that by far exceeds the period for which experimental evidence can be provided?*

MiMi - Demands on preventive measures

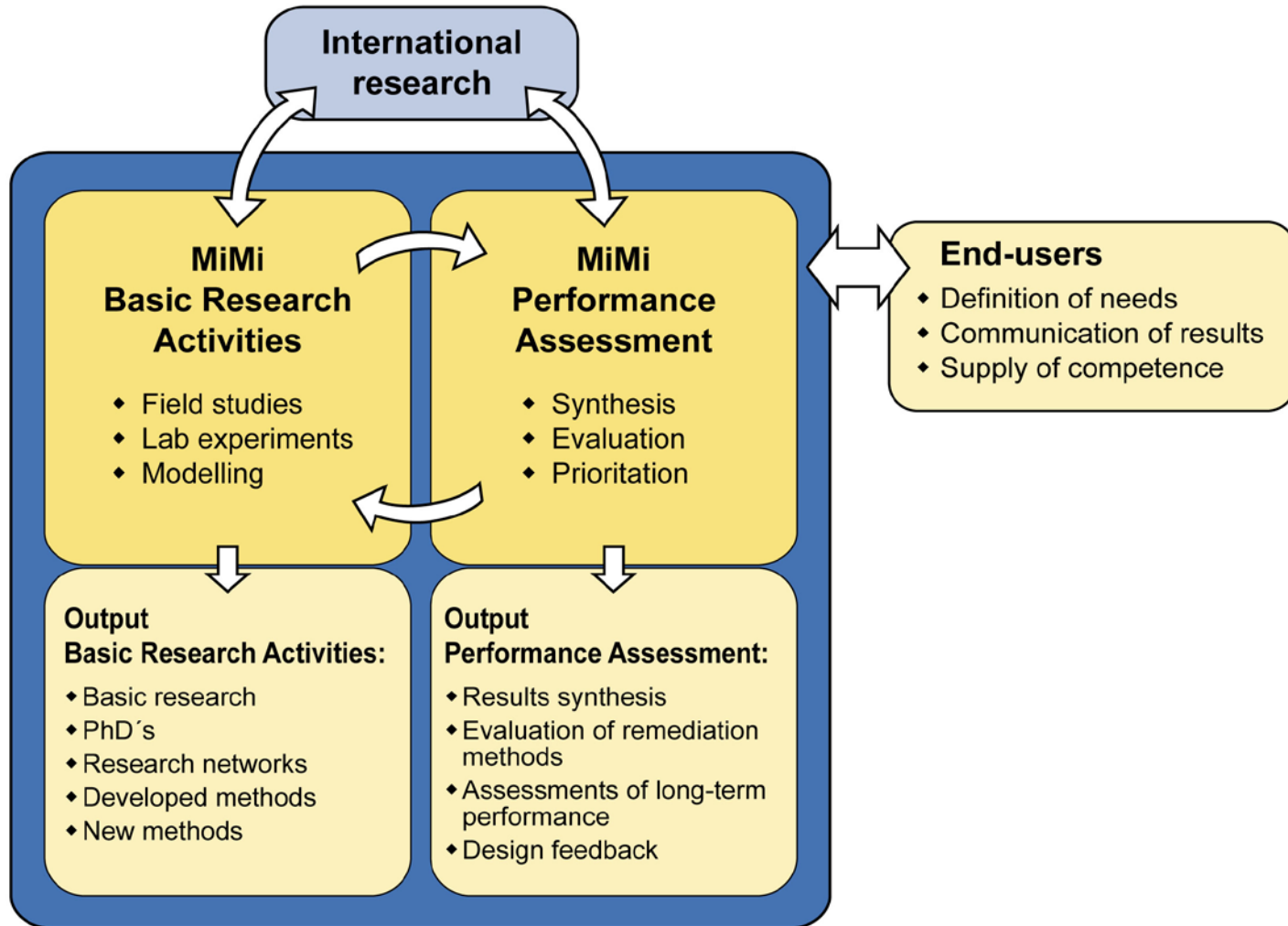
- Long functional life-time required
- Constructions - robust and stable
- Crucial to demonstrate the longevity in a solid scientific way
- Relevant time-scales are hundreds - thousands of years

MiMi - Structuring

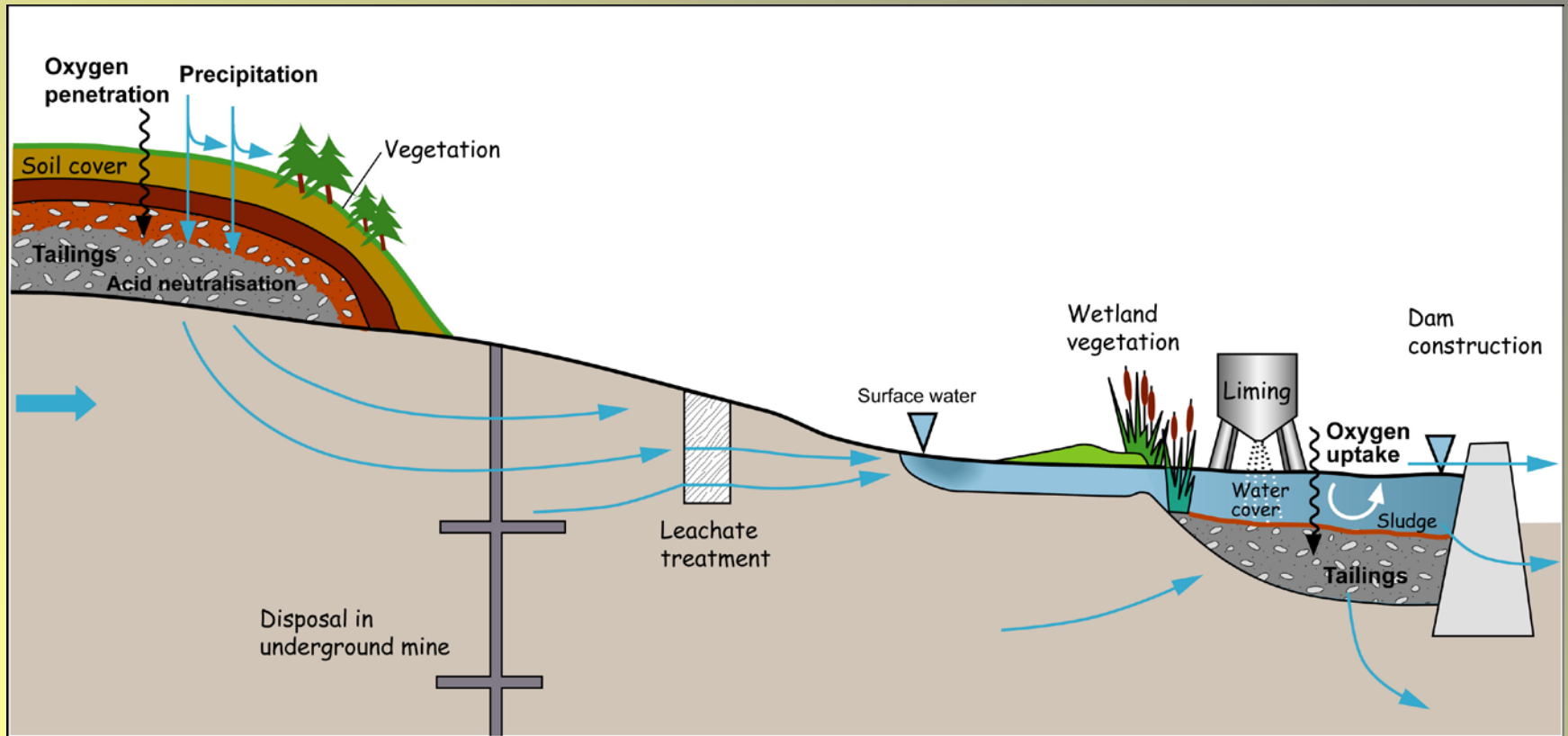
- A simple and robust methodology -
Performance assessment
- Based on fundamental and well-established scientific principles
 - thermodynamics
 - mass-balances
- Developed & extensively applied within radioactive waste management



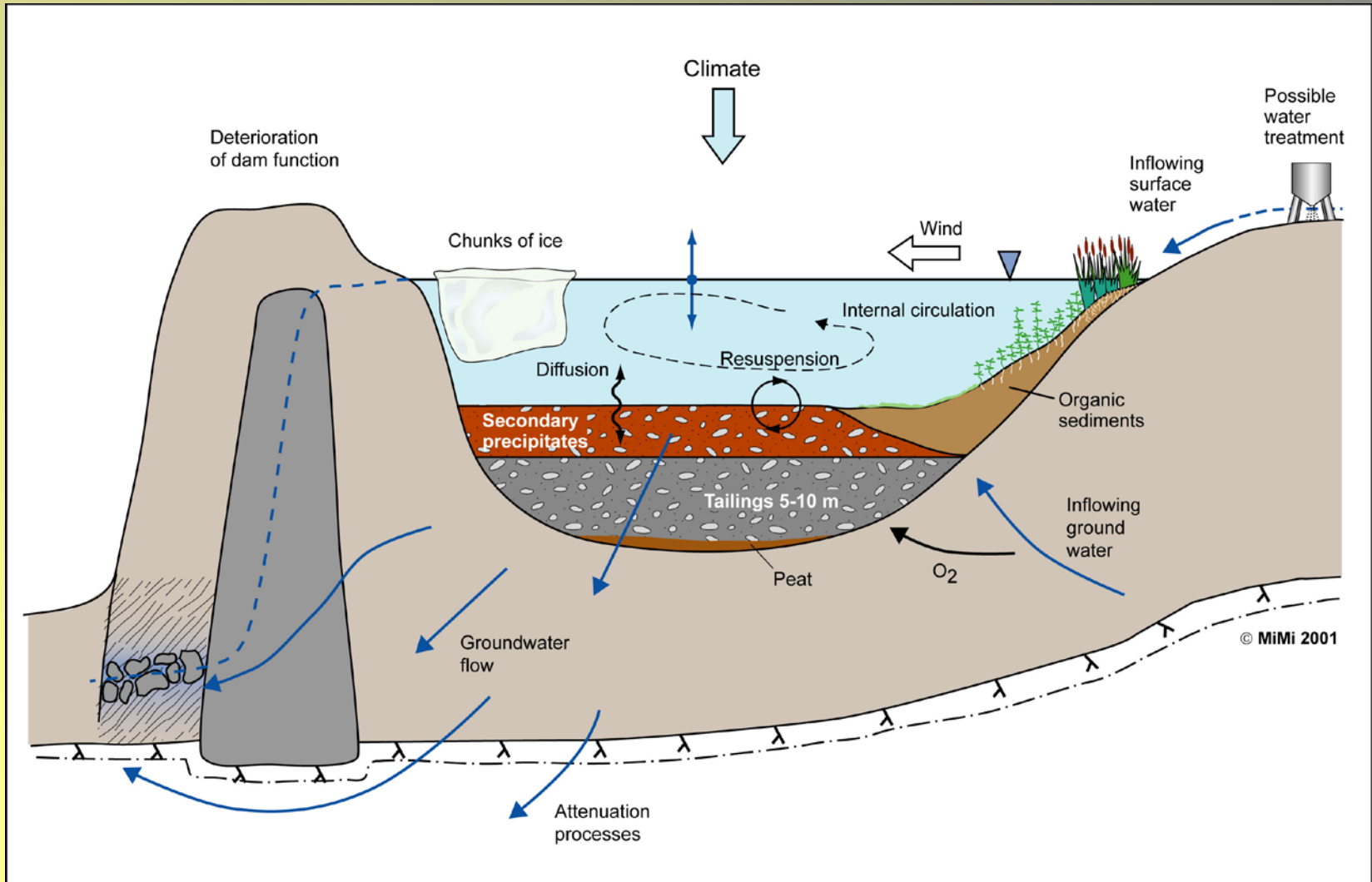
MiMi - Working strategy



MiMi - Causes and remedies - AMD



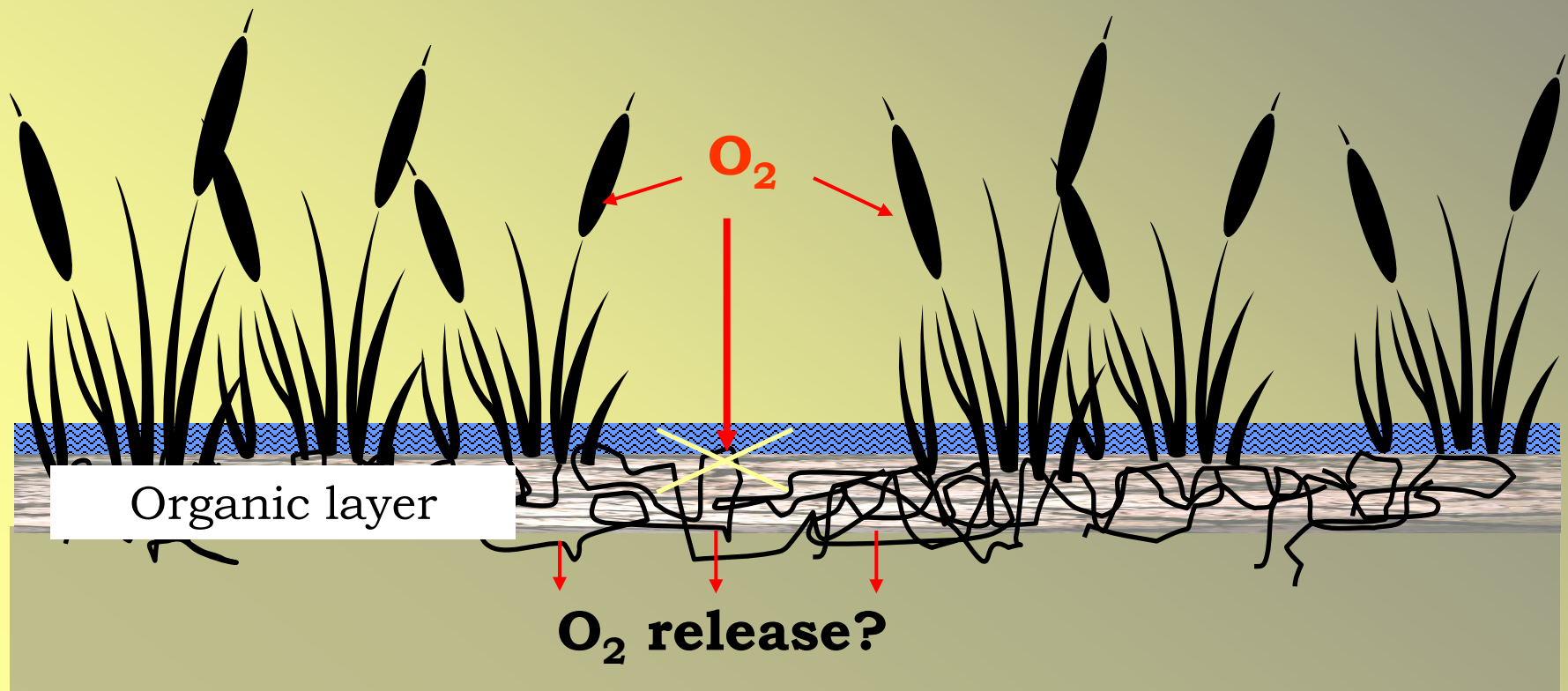
Performance Assessment - Water Covered Tailings



Establishment of Vegetation on Water Covered Tailings

- Current Research Activities and
Results

Plant establishment on water covered mine wastes might reduce the oxidation of sulphide minerals due to the production of an organic oxygen barrier





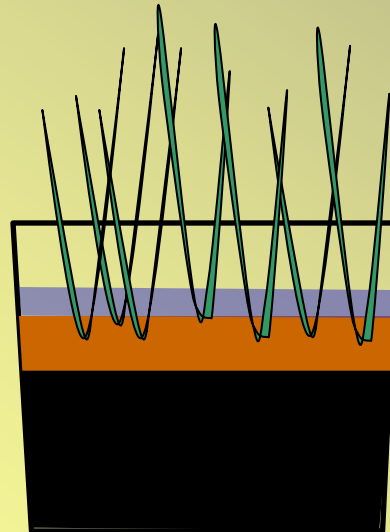
Aims:

1. To find suitable low-cost amendments for plant establishment
2. To find the effects of plant establishment on metal release, pH and SO_4

Amendments for plant establishment

Plant growth on different waste products was investigated

- Sewage sludge
 - Bio sludge
 - Ash
 - Green liquor dregs
 - Peat
- Sewage sludge + ash
 - Sewage sludge + ash + peat

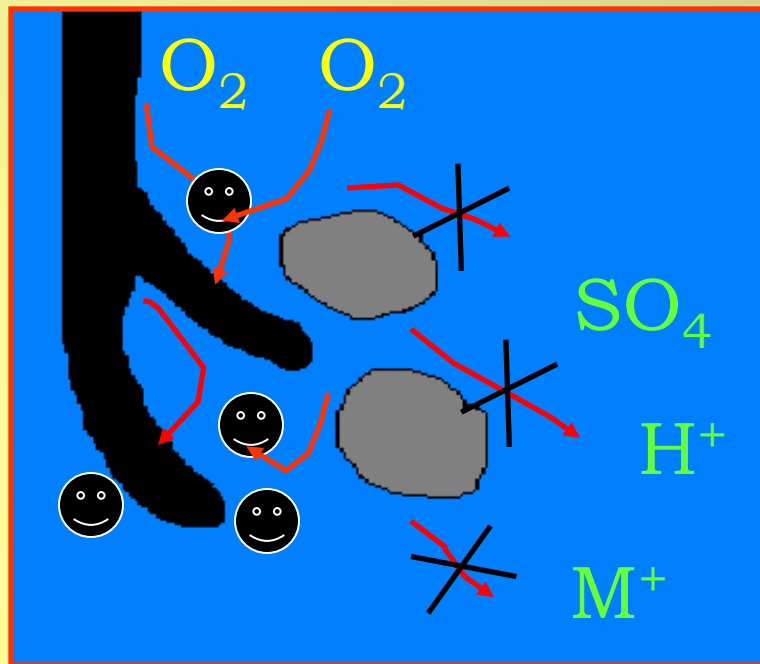
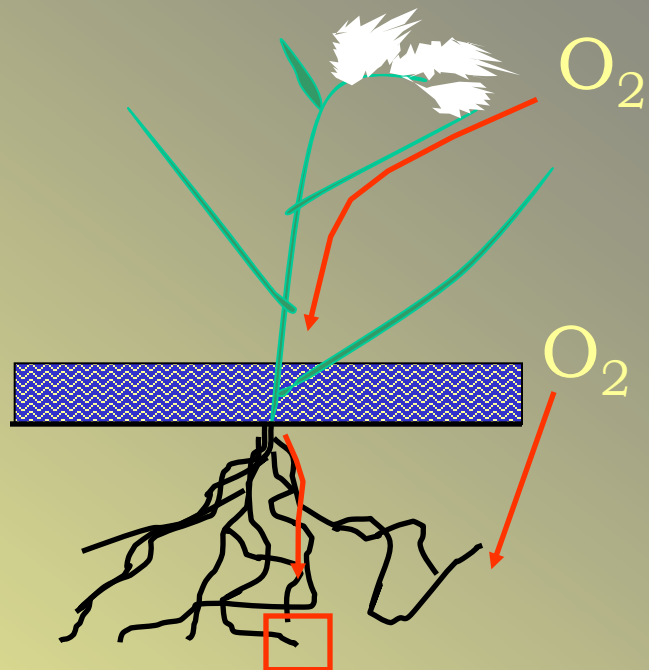


***Phragmites
australis*** (Reed)
and

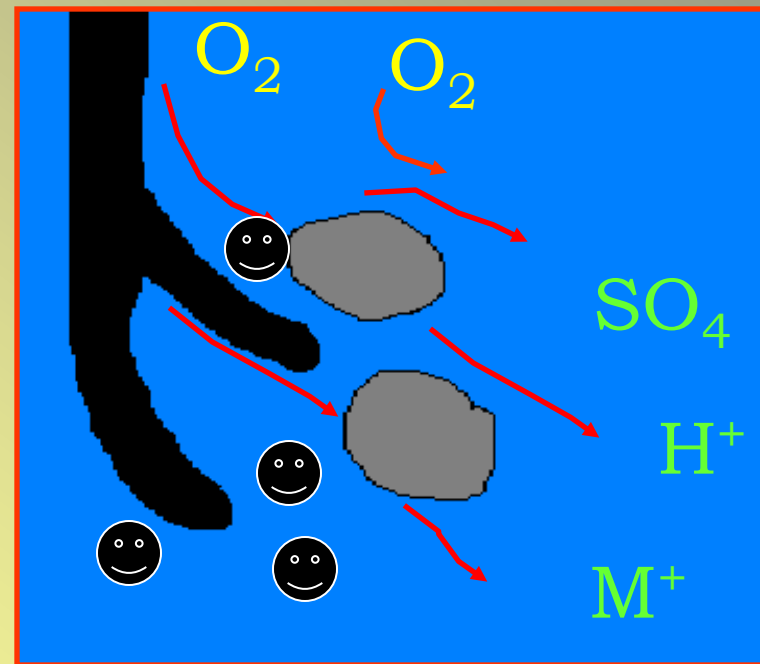
***Eriophorum
angustifolium***
(Common
cottongrass)



Effects of wetland-plant growth



OR



Plant species studied



Eriophorum angustifolium (Common Cotton grass)



Levels¹ in drainage water from tailings with different treatments

	pH	SO ₄ (mg l ¹)	Cd (µg l ¹)	Cu (µg ml ¹)	Pb (µg l ¹)	Zn (µg ml ¹)
Control	2.6 b	1137 a	435 a	3.21 a	8134 a	123 a
Sewage sludge	2.8 b	394 b	29 b	0.30 b	5864 a	5 b
<i>E. angustifolium</i>	5.9 a	608 b	6 b	0.04 b	92 b	6 b
+ sewage sludge						

¹Different letters (**a** and **b**) indicate significant difference between the various treatments



Effects of *Eriophorum angustifolium* on drainage water from water covered wastes amended with sewage sludge compared with controls

Metal content: decreased

pH: increased
(plants:~5.7,
control:~2.6)

SO₄: decreased



Conclusions

Sewage sludge is suitable as amendment supply for plant establishment on water covered wastes

Metal levels and SO_4 of the drainage water are decreased and pH is increased by *E. angustifolium* and sewage sludge

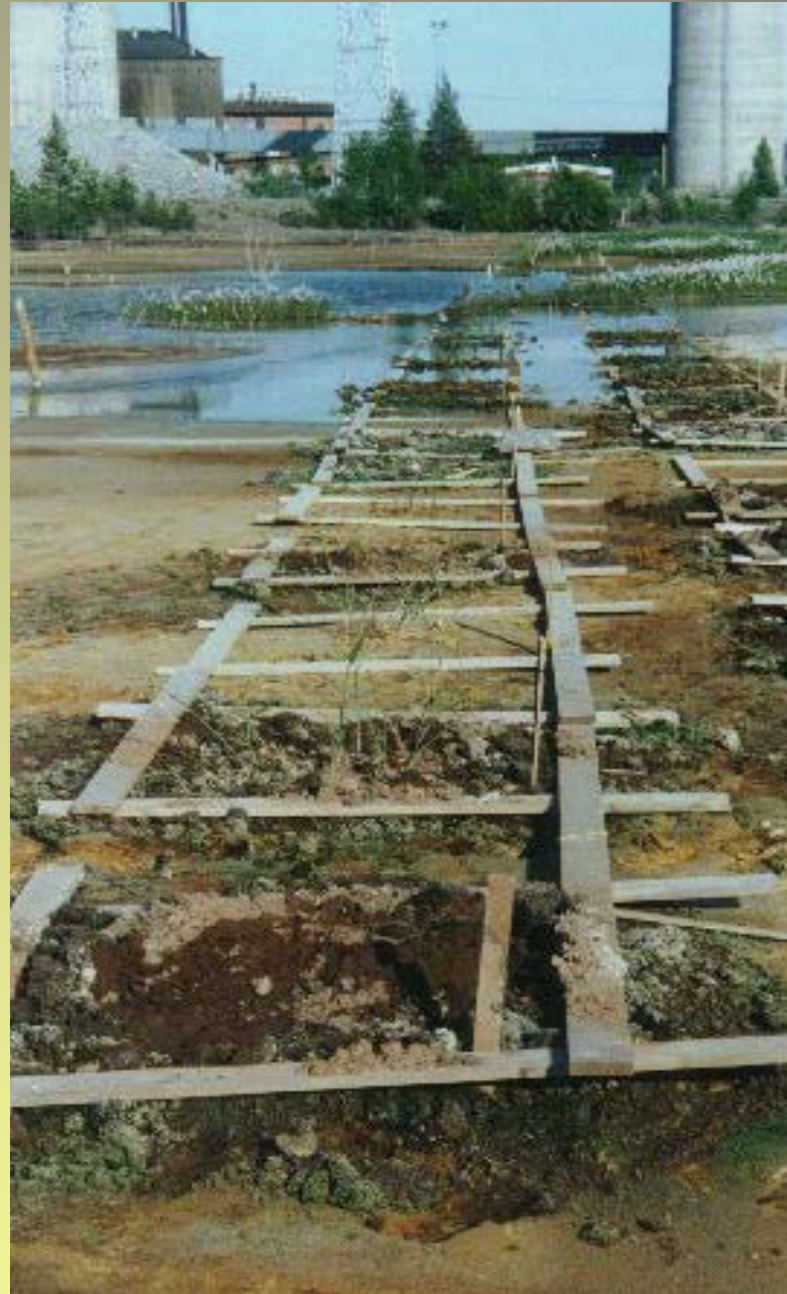
Vegetation may have an important role in the Performance Assessment Framework

- It is necessary to find solutions that work coherently with nature in the long-term perspective

MiMi - Vegetation test field



MiMi - Vegetation test field



Plant species used in the test field, from the left:

Carex rostrata
(Bottle sedge)

Eriophorum angustifolium
(Common cottongrass)

Phragmites australis
(Reed)



MiMi - Field studies of Wetland systems

