

# **ENvironmental ENgineering**

**Land Reclamation**

**Landscapes**

**EIA**

**David Zumr**



# **Landscape reclamation / restoration**

Reconverting disturbed lands to its former or productive uses

**WHY?** → Potential source of pollution (soil erosion, heavy metals, organic pollution, odour etc.)

→ Aesthetical , economical and ecological reasons

Reclamation plan must be made before any disturbing project is undertaken - landscape is a nonrenewable resource !!!

## Most commonly reclaimed areas:

- ✓ **mines** (quarries, coal mines, spoil tips, pit heaps)
- ✓ **closed landfills** (waste ponds, chemical ponds)
- ✓ **contaminated or abandoned areas** (brownfields)

## Reasons for restoration

- natural (fire, flood, earthquake) – usually faster and easier
- anthropogenic – industry

*(every locality can be restored, it is a matter of time and costs)*

Golf course on former pit heaps

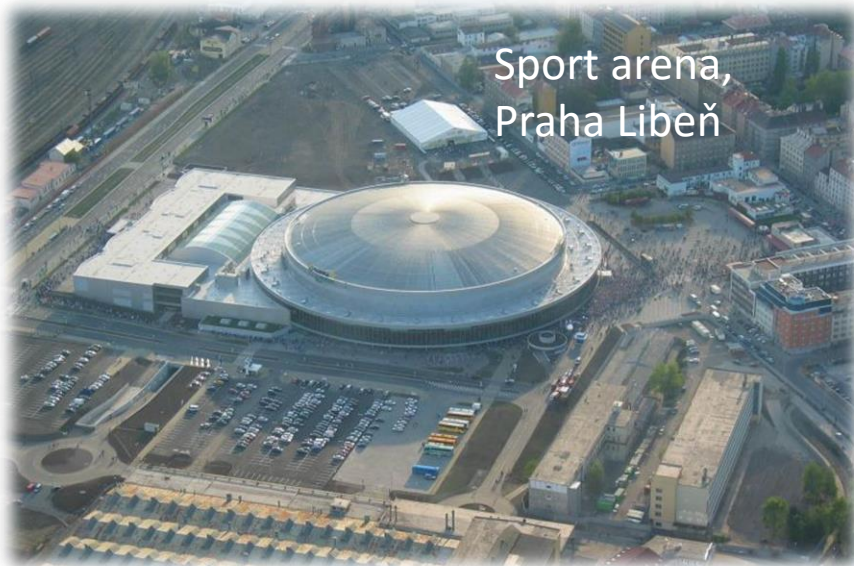


Landfill of domestic waste



## Examples

Wetlands



# Reclamation vs Revitalization

Reclamation → new use of the land, with no relation to its former state  
(agriculture, sport areas, buildings)

Revitalization → create ecologically valuable areas (increase of  
landscape stability and biodiversity)

Revitalization should be a part of reclamation!!!

Germany – 15% rec. area (of large surface quarries) must be left to  
its natural evolution (succession)

Pros and cons of natural evolution:

- + increased biodiversity, low costs, good ecological value
- Long term, lower value for people opposed to a culture landscape



## More examples



*Reforested sand quarry Cep*



*Racing circuit Most*



*Lužická jezera (flooded quarries)*



*Protected area Sand quarry Dračice*

# Costs

Technical reclamation/revitalization is expensive (in CZE: mining - app 100000 eur/ha, landfills and brownfields even more)

→ Recultivation reserve (eg. as a fraction from every ton of coal...)



# Landscape and basic principles

## LANDSCAPE:

*Heterogeneous part of the Earth surface, which consist of the ecosystems, which are in permanent interaction.*

***Landscape*** → surrounding space, consisting of individual landscape elements

→ it has both of material and spiritual extension  $\approx$  HOME

→ environment of many species (which are effected by)

→ place for anthropogenic activities (mining, production, construction, ...)





# *Landscape ecology:*

The science about interactions between organisms and their environment

1. **STRUCTURE:** spatial relations between present ecosystems or landscape units
2. **FUNCTION:** interaction between spatial units
3. **CHANGE:** development of the structure and function of ecological mosaic in time



# Basic classification of the landscape

➤ **natural** (undisturbed by humans – very seldom in Central Europe)

➤ **cultural** (artificial  $\approx$  anthropogenic)

✓ city

✓ agricultural

✓ industrial

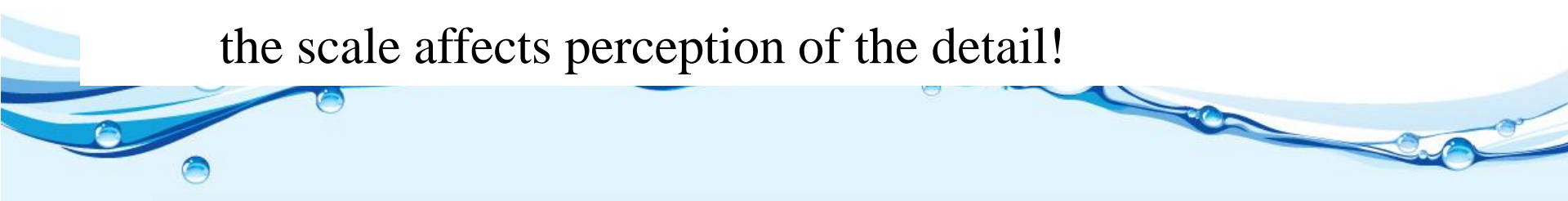
→ „what can we afford“ (landscape character conservation)

→ The landscape has its „scale“

→ Japan x Russian taiga

→ Pyrenees x Himalayas

the scale affects perception of the detail!



# landscape structure

## Landscape-generating elements

**LP** – forests

**VP** – water (streams, reservoirs, lakes)

**TTP** – permanent grass

**Pa** – pastures

**Mo** – wetlands

**Sa** – orchards

**Vi** – vineyards

**OP** – arable land

**AP** – anthrop. areas (roads, urbanized places)

**Ch** – hop fields



# Landscape units

areal:     **spots** – originates spontaneously or with anthropogenic contribution

linear:     **line corridors** – green fences, roads, railways, windbreakers, ditches

**zone corridors** – all corridors, which have their own environment and typical conditions → have border effect (ECOTON)! (**water courses**)





# Stability???

Ability to resist changes of external conditions

(biotic x abiotic) – climate, pests, ...

- ***physical stability*** (biomass is not present – desert, rock,...)
- ***resilience*** – quick restoration after disturbance  
(small amount of biomass)
- ***resistance*** – resistance to disturbance – (usually high amount of biomass is present, biodiversity)







# ? What should be protected ?

Where ? → differentiate ➤ natural  
➤ intermedial  
➤ agroindustrial (changed by humans)

→ landscape character... ➤ to protect  
➤ to develop current state  
➤ to  
change



# Complexity of Environment

- Multidisciplinary
  - Difficult tasks – experts
- Interconnectivity (cause effect chains)
- Long response times
- Uncertainties
- Difficult to communicate
- Need of a decision supporting TOOL



**Environmental Impact Assessment**



# EIA - definition

...an evaluation procedure that helps planners and decision-makers to understand the environmental **impacts** of a proposed project or activity

...a technique for drawing together, in a systematic way, expert qualitative assessment of a project's environmental **effects**

1. Planning tool
2. Decision making instrument



# EIA - purpose

- **Avoiding mistakes** that can be expensive and damaging in ecological, social and economic terms
- **Avoiding conflicts** and increasing project acceptance
- Integrating short-term needs with long-term goals
- Addressing **transboundary issues**
- **Improving project design** and **reducing capital and operating costs**
- Improving institutional co-ordination
- Considering **alternative projects** and designs
- Improving accountability and transparency in planning and decision-making.

(after Looijen, 2004: Lecture notes on EIA)



# EIA - history

- 1970s – USA (from National Environmental Policy Action)
- soon Western countries (70s and 80s)
  - Since 1988 in EU legislation
- Today: countries independently modify the exact EIA procedure



# EIA - stakeholders

- Developer – private or governmental agency
- Decision maker – government agency
  - (+ Advisors)
- Board of experts
- Public
- EIA consultant – performs the study

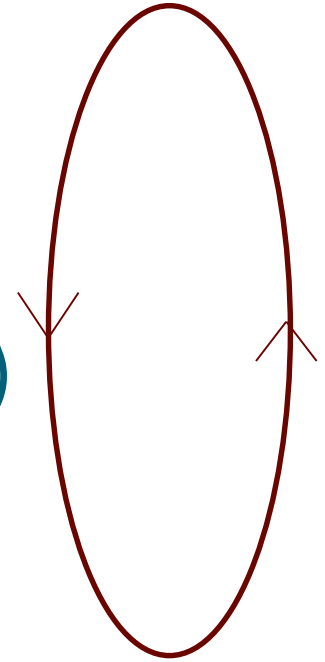




# EIA – process

- Differ by country (eg. positive or negative lists)
  1. Considering variants of the project
  2. Designing the activity
  3. Screening (is EIA necessary)
  4. Scoping (which topics will be studied)
  5. EIA report + review
  6. Decision
  7. Monitoring

Methodology exists



# EIA – scoping

## Environmental aspect (ecological & socio-economical)

- Abiotic (land, water, soil, air, etc.)
- Biotic (flora, fauna, biodiversity, ecology)
- Current infrastructure (buildings, roads, monuments...)
- Aesthetic, scientific, cultural values
- Interrelationship of the above



# EIA – proposed alternatives

1. Proposed design
2. No-go alternative
3. Most environmental friendly
4. Others...

