ENEN

Waste management, Land Reclamation

- ✓ Waste management – landfills, incineration plants, recyclation, noise
- ✓ Reclamation of landfills, mines and contaminated lands

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Waste management

- anything unused, unproductive, or not properly utilized
- anything left over or superfluous
- rejected as useless or worthless

Minimize waste, („no-waste technology“ is utopic)

Necessary condition
(requirement) for further
effective waste handling
SEPARATION → at the source **x**
central

The Most Common Types of Waste

• Household waste means waste from households as well as other waste, which, because of its nature or composition, is similar to waste from households

• Municipal waste means all waste from a city/town/village (households + public bins, waste from streets, waste from green areas maintenance…**NOT INDUSTRIAL**)

• Hazardous waste must have one or more of the properties listed in LoW

• LoW – List of Wastes (formerly named the European Waste Catalogue) The European Waste Catalogue (EWC) classifies waste materials and categorises them according to what they are and how they were produced

The European Union Commission Decision 2001/573/EC 23 July 2001

Municipal Waste

- Miscellaneous, varies in time and space
- In the CR every year 300÷500 kg/person (1 kg person/day)
- in Europe approx. 400 kg per person/year, and increasing…

Properties: (important for landfilling)

- Bulk density approx. 300 $kg.m^{-3}$ (after compaction on a landfill approx. 500÷700 $kg.m^{-3}$)
- Total amount of waste is rapidly increasing, the composition is changing (particularly light and bulky materials – paper, plastics, packing)

Waste management

Increasing amount of waste – consequence of rising living standard
($\rightarrow$ waste is more dangerous than 100 years ago)

…we are responsible for the waste!

Source of Waste (CR)

Source	[%]
Agricult. and Forestry	6,3
Mining	0,3
Industrial waste	44,6
Energetic waste (*!)	19,8
Municipal waste	6,1
Other	22,9

(*!) not energies (heat, light, vibration…)

Municipal Waste in Prague

Year	MW [t]	Waste disposed [t]			Recycling [t]
		total	landfill	incinerator	
1998	232 000	224 000	94 000	130 000	8 000
1999	240 300	224 500	31 000	193 000	15 800
2000	250 700	226 000	59 000	167 000	24 700
2001	256 950	228 200	31 900	196 300	28 750
2002	281 800	244 500	31 900	202 000	37 300
2008	268790				51407
2009	270123				53418
2010	272134				52553
2011	264206				50248
2012	264206				50936
2013	259138				51153

decreasing **increasing**

Waste cannot be obeyed, can be stored, modified or reused. All we can speed up or slow down its return to biosphere, but we cannot get rid of it completely !

- landfills (deposition, storing)
- incineration (modification, energy resource)
- recycling (modification, definitive solution is postponed)
- biological waste – (modification, composting)

Landfilling

PROS:

- ✓ the cheapest
- ✓ „the safest“ = most known
- ✓ verified technologies

CONS:

- ✓ long waste activity after storing
- ✓ is not a definite solution, we leave it for the future generation(s)
- ✓ takes up place, decreases the value of the area

→ we are making an effort to reduce, disposing just earth friendly materials (similar constitution) – but still 62% of HOUSE.W ends up at landfills….**TOO HIGH**

WHAT IS A LANDFILL?

A secure landfill is a carefully engineered depression in the ground (or built on top of the ground, resembling a football stadium) into which wastes are put. The aim is to avoid any hydraulic [water-related] connection between the wastes and the surrounding environment, particularly groundwater.

Landscape reclamation / restoration

Recorventing 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 !!!

LANDFILL RECLAMATION

• after a landfill is full (and covered) its surface should either look similar to neighbouring environment

• or should be used for something else:

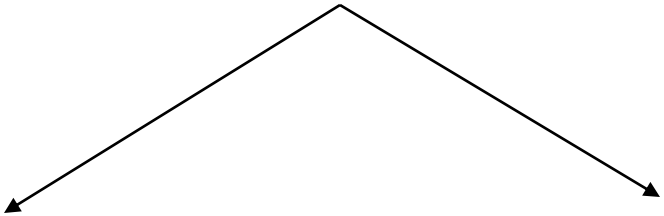
  • biological reclamation: agriculture, forestry, recreation (park, golf course)..

  • technical reclamation: construction **!!!** (if it is close to larger urban complexes)

Major issues:

- Subsidence – ground settling (up to 30% in 30 yr)
- leachate control
- Topsoil quality
- Keep plants in good conditions (cap protection, stormwater management)

INCINERATION



PROS:

- ✓ we can use energy from incinerators
- ✓ reduces the amount of waste (volume 1/10, weight 1/3)

CONS:

- ✓ atmosphere pollution
- ✓ 50 x more expensive than landfilling
- ✓ complicated technology

Burning is happening at high temperatures – commonly up to 1200 °C

Sometimes gas has to be added – some materials are less burnable

Separation is useful prior combustion

Ash and dust from incinerators is toxic – concentrated has to be treated as hazardous waste

RECYCLING

PROS:

- ✓ saves primary natural sources
- ✓ postponing final solution

CONS:

- ✓ needs separation
- ✓ often high demands of energy

Label – made from materials that can be recycled

Label – is made from recycled material

paper

glass

plastics

wood

Constr. materials

COMPOSTING

PROS:

- ✓ uses energetic potential of waste
- ✓ Gain quality material – improving soil properties, decreasing necessary amount of fertilizers

CONS:

- ✓ smell in neighbouring areas
- ✓ Specific conditions for composting – must be sustained
- ✓ expensive

It is decomposition of organic matter to the basic substances under aerobic conditions

➢ composting needs
- O_2
- heat (50÷60 °C)
- moisture
- ratio between C:N = 30:1

Disposing Hazardous Waste

• at least **stop** transport and spreading of Hazardous W., when we don‘t know how to handle it (seal the waste in concrete, glass, bitumen…)

• or **reduce** toxicity and store it somewhere

There is a hope (NAIVE ?) that the future generation will sort it out (better technologies, methods…)

Conclusion

Ideal waste management actvites woud be:

- Waste which doesn´t need to be produced – let it not be produced = REDUCE

⇓

- REUSE all waste which can be reused

⇓

- Separate and RECYCLE

- Not recyclable:
    1) Composting
    2) Incineration (both reduce the volume and produce energy)
    3) Landfill

Wastes are often toxic
Sources of toxic compounds –
Contamination transport

industry
agriculture
civilization
natural processes

Sources of toxic compounds

- Point source

  landfills, local sources of contamination on factory premises, petrol station, military areas, fertilizer depositories

- Non-point source

  Agriculture – application of pesticides and fertilizes (and toxic compouds such as heavy metals naturally present in it)

  Industry – pollution of air by exhausts (factories, incineration plants => rain and dry dust atmospheric depositions

- Combined

  civilization activities – river pollution from point and non-point sources

  natural processes – volcano eruptiony (Hg-mercury), discharge of earth gases (Ra-radon)

Major contaminants in air, water, food

- PCBs
  industrial chemical, banned, cancer
- Pesticides
  Residues in most of the food, many carcinogenic

Dioxins
From combustion process, accumulate in animal fat, skin rashes, cancer, reproduction

Heavy metals
Accumulate in soft tissues, drinking water, food, construction materials, neurological problems, Alzheimer,

Asbestos
Construction material, release fibres, cancer

Fuels and additives
Pharmaceutics
…

“Energetic waste”

Wasted energy created by human, that negatively impact the environment

- **noise** (traffic, construction, mining…)
- heat (industrial cooling, cities)
- light (advertisements, street lamps, ski slopes …)
- electromagnetic emissions (cell phones, TV towers)

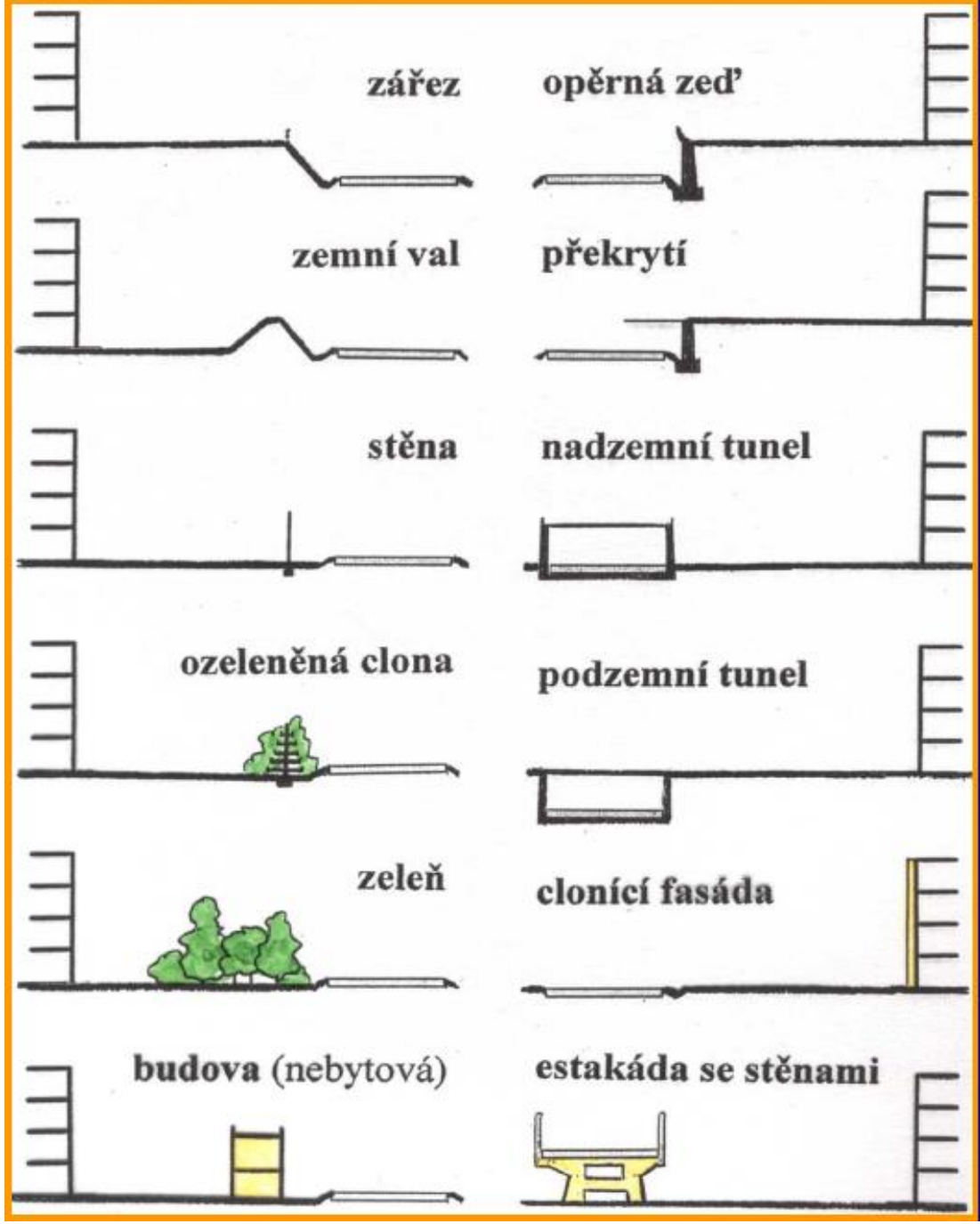
Noise from transportation

1) reduce the source = tech. state of the machines (engine, covers)
= contact of tire and road (road surface, rails, tires)
= human behavior (schedule, horns)
= move noise out of inhabited areas

2) decrease noise level = absorb (mobile) noise barriers, green belts

Examples…

Line structures to mitigate line sources (traffic)



Source: Dep. of railroad constructions, FSv

The goal is to **absorb** the noise, not to **reflect !**

$\rightarrow$ Heavy, massive structures with coarse surface

(concrete barriers with bush or trees)

membranes (steel, glass) are not preferred
reflection + resonance

Summary

- ✓ Land Reclamation x Revitalization
- ✓ Possibilities of new landuse
- ✓ Handling of waste
- ✓ Energetic waste – sources, consequences
- ✓ Mitigation measures – prevention **x** technical measures

Further reading, references

- http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000D0532_do_001.pdf (consolidated version of the EWC)
- http://www.wasteonline.org.uk/
- http://www.environment-agency.gov.uk/subjects/waste/?lang=_e (Environment Agency waste pages)
- http://www.howstuffworks.com/landfill.htm
- http://waste.eionet.europa.eu/definitions (European Topic Center on Resource and Waste Mangement)

Thank you

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