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Natural Cap Conference  
20 - 21 April 2011  
Amsterdam

# Natural catch – enhanced natural attenuation in constructed wetlands

Landfill Rhoon  
Landfill Philippine

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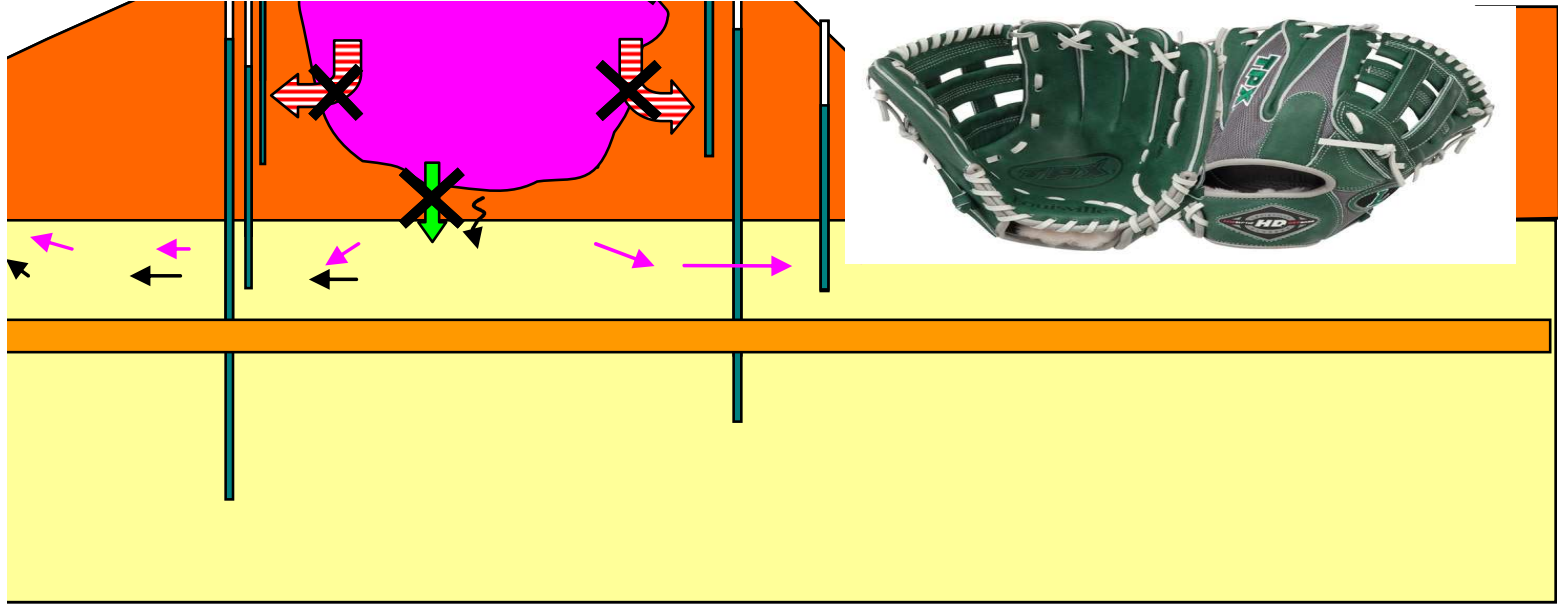
# Hazardous waste management



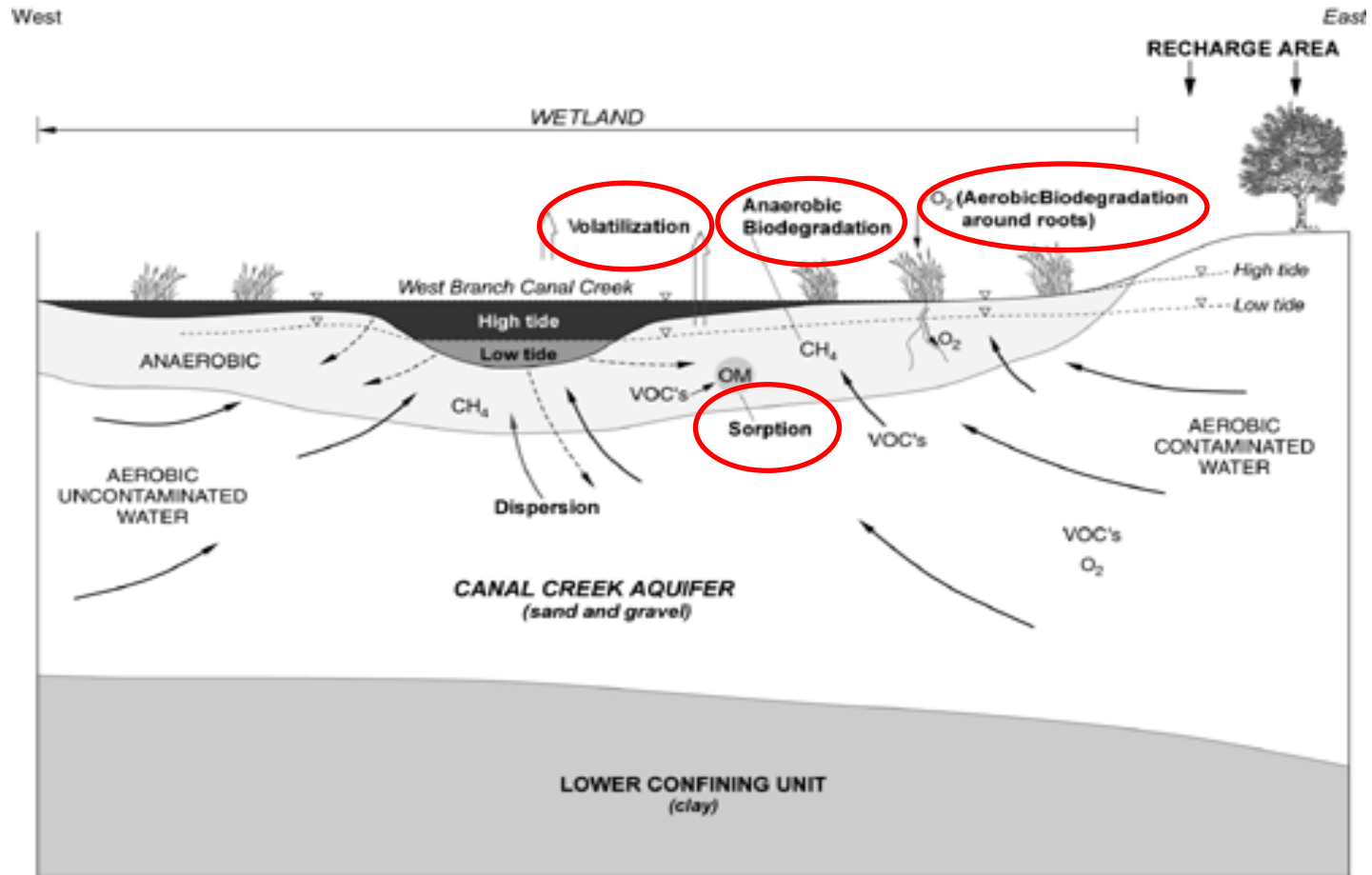
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## Green rehabilitation



## Natural attenuation in wetlands



NOT TO SCALE

EXPLANATION		
→	FLOW DIRECTION AT LOW TIDE	VOC's VOLATILE ORGANIC COMPOUNDS
---→	FLOW DIRECTION AT HIGH TIDE	CH <sub>4</sub> METHANE
⊙	ORGANIC MATTER	O <sub>2</sub> OXYGEN
□	WETLAND SEDIMENT	▽ WATER TABLE
		🌿 VEGETATION



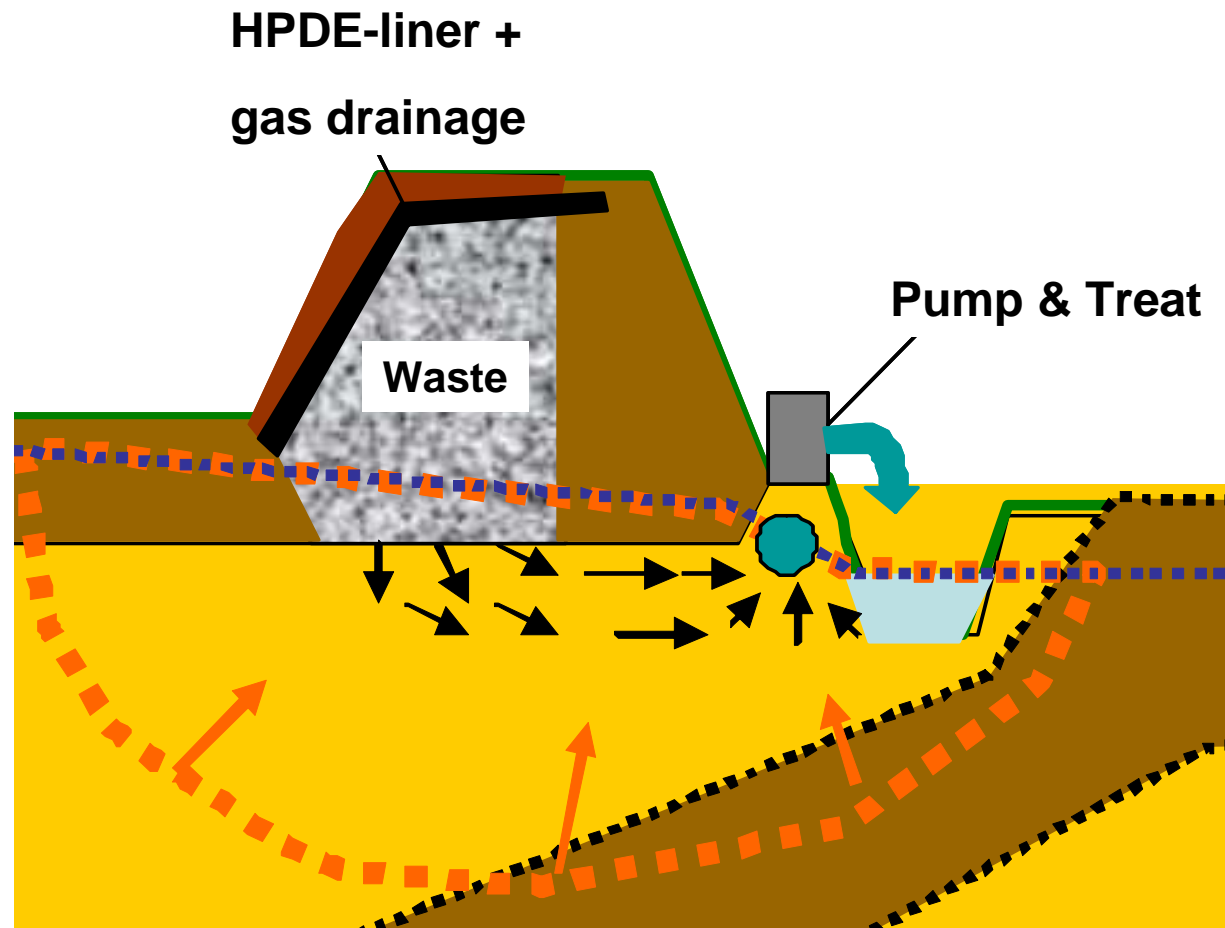
## Nature Park Buytenland of Rhoon



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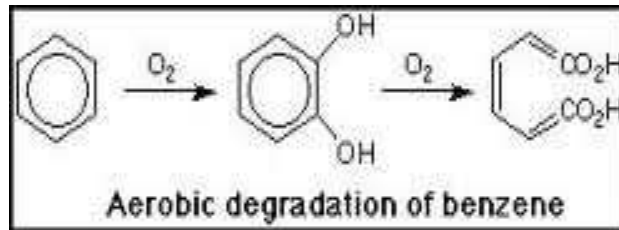
## Conventional remediation



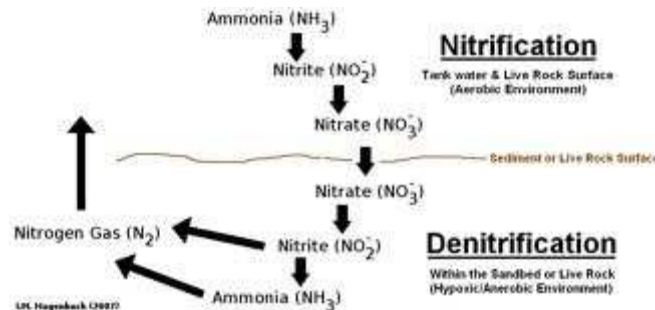
## Natural approach

### Biodegradation CoC:

- benzene/phenols



- ammonium



### Steering mechanism:

#### 1. decrease flux

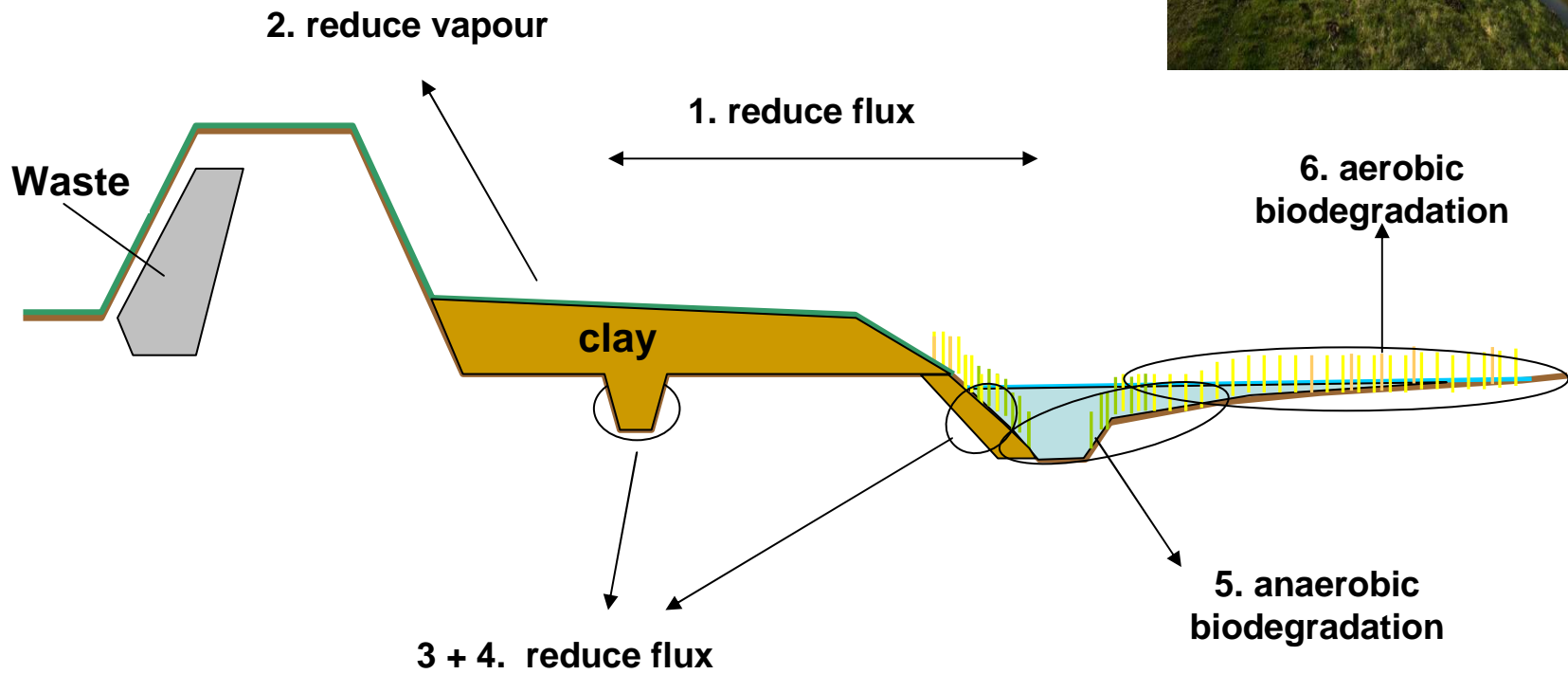
- organic barrier
- mineral barrier

#### 2. increase biodegradation

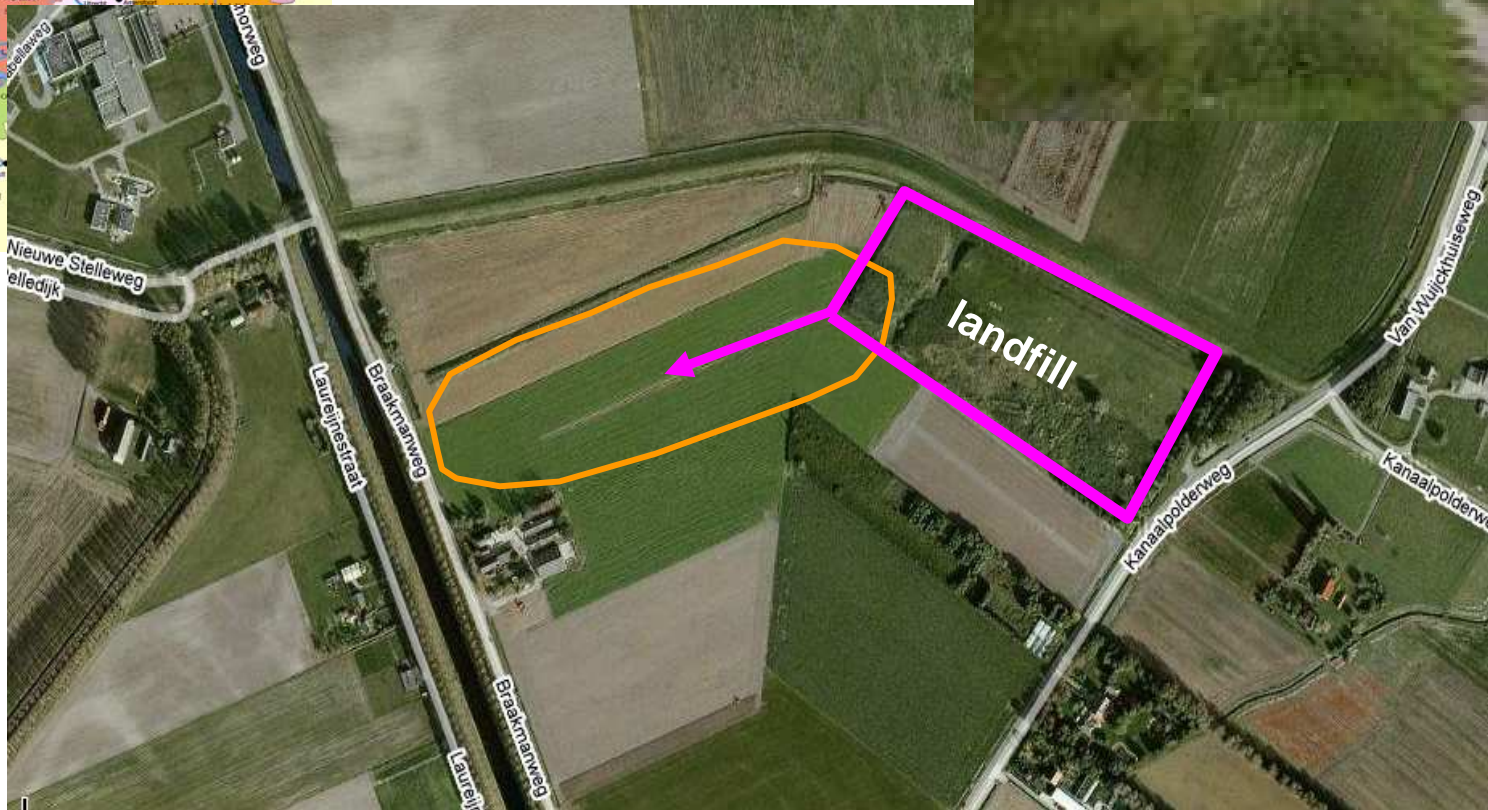
- water plants
- shallow water
- fluctuating water level



## Natural catch

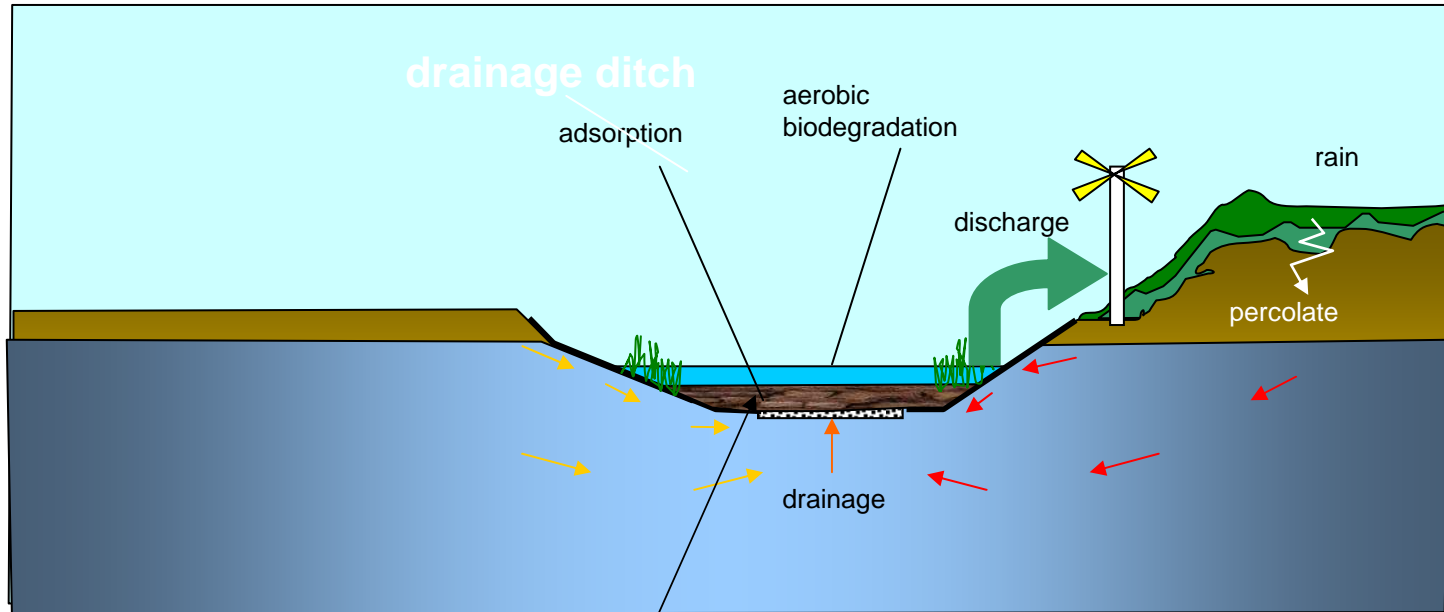


## Landfill Philippine



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## Drainage ditch + organic barrier



## Pilot: peat vs compost



Drainage ditch stopped further migration

### Compost

- fermentation of compost
- bad odor / black water
- flux of contaminant

### Peat

- effective reducing flux
- slow release (buffer)
- additional test
  - aerobic degradation vs volatilization vs adsorption

## Natural Catch

- Enhanced natural attenuation in catchment areas
  - biodegradation in wetlands
  - natural barriers (peat, clay, etc)
- Cost-effective management of hazardous waste
  - low cost for maintenance / after care
  - single or in combination with
  - fit in surrounding landscape

## Lessons learned & challenges

- Field test are very important for optimization of design and management of constructed wetlands
- Acceptance of natural approaches by stakeholders:
  - regional and local authorities
  - local community

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**Questions?**

**Thanks for your attention.**