Loss of wetlands since the 1950’s and their restoration potential in Flanders (Belgium)
A GIS and ecosystem service exercise

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SER2014, Oulu
Flanders

- 13,520 km²
- ‘Low lands near the North Sea’: 0-90m above sea level
- mild oceanic climate
- dense river network
Land reclaimed on the sea
Peat soils: at present ± 6000 ha left
Soil sealing

480 inh/km²

Source: VMM 2011
Flood hazard map Flanders 2011

VMM, 2012
Water quality monitoring network Flanders
Proportion of sampling points with trend 2000-2013

VMM, 2014

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Louette et al. 2013
Where do we have potentials for wetland restoration?

How to convince policy makers and the public?
Basic Map Layers: Flemish soil map

- ± 1950-1960’s
- Very detailed (1:20,000)
- Texture class (11)
- Drainage class (9)
- Profile development class (13)
- Substrate class (15)
Basic Map Layers: **Biological Valuation Map**

- 1998-2007
- Very detailed (1:10,000)
- 180 habitat type units *(40 types of wetland habitat)*
Basic Map Layers: **Flood hazard map 2014**

- Areas with actual high risk of flooding (more than once in 10yrs)
- 7.5% of Flanders
Abiotic profiles of different wetland types based on:
- Water regime
- Mean lowest groundwater level
- Resistance to flooding by surface water
- pH
- Nutrient level
- Salinity
- Soil texture
- Water origin

Example: Wet/moist heathland

POTNATmodel (Wouters et al. 2014)
Wetland type categories

Combinations according to:

• Drainage Class:
  • Open water
  • Permanent wet soils
  • Temporary wet soils
  • Tidal marsh

• Trophic State:
  • meso-eutrophic
  • oligotrophic

• Land use:
  • forested
  • non-forested
Wetland type categories

7 wetland types

1. deep water
2. shallow waters (oligo-mesotrophic, eutrophic)
3. temporary wet soil (meso-eutrophic)
4. temporary wet soil (oligotrophic)
5. permanent wet soil (meso-eutrophic)
6. permanent wet soil (oligotrophic)
7. tidal marsh
GIS analysis

• Resolution: grid cells of 20x20m
• Area of water courses not considered (constant)

3. "Potential wetlands":

• Assumptions:
  • Return to environmental conditions of ±1950 is possible
  • No potential for restoration if urban
  • Standstill for existing habitat types with biological value

• Scenario 1: "open wetland landscape"
• Scenario 2: "forested wetland landscape"
Historical wetlands in Flanders (± 1950)
Actual wetlands in Flanders (2005)
GIS modelling

1. “Historical wetlands”: ± 1950
2. “Actual wetlands”: ± 2005

3. “Potential wetlands”: long-term
   • Assumptions:
     • Return to environmental conditions of ± 1950 is ± possible
     • No potential for restoration if urban
     • Standstill for existing habitat types with biological value
   • Scenario 1: “open wetland landscape”
   • Scenario 2: “forested wetland landscape”
Potential wetlands in Flanders (forest landscape scenario)
Potential wetlands in Flanders
(open landscape scenario)
Total wetland area in Flanders

- 75% lost since 1950’s: 45,000ha (18%) by urbanisation; rest (82%) by agricultural intensification
- At present still 5% of Flanders is ‘wetland’ (68,000 ha of which 44,000ha protected)
- 147,000ha potentially to be restored historical wetland
Wetlands on temporary wet soil (meso-eutrophic)

- 75% (95,000ha) of historical floodplain grasslands (converted into intensive agriculture or urbanized)
- 55% of historical floodplain forest
Wetlands on temporary wet soil (oligotrophic)

- 95% (24,000ha) of historical moist/wet heath and nutrient-poor grassland
- 95% of forest
Wetlands on permanent wet soil (meso-eutrophic)

- 95% (41,000ha) of historical rich fens and marshes
- 60% (4,500ha) of historical swamp forest
- 72% can potentially be restored
Wetlands on permanent wet soil (oligotrophic)

- 95% (4,000ha) of historical wet heath and bog
- 50% of bog forest
- 88% can potentially be restored
### Tidal marsh

- 90% (2,700ha) of salt, brackish and freshwater tidal marsh
- Huge potential for restoration along the river Scheldt (ongoing !)

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**x32**
Shallow waters

- >200% increase
- At present: 90% of shallow waters are eutrophic
Deep water

300% increase since 1950’s (port docks, extraction pits etc.)
Main wetland ecosystem services

Regulating services:
- Flood protection
- Water quality regulation
- Carbon fixation and storage
- Water storage (+ groundwater recharge)

Provisioning services:
- Fish production
- Dairy and beef production (grazing marsh, hay, silage)

Cultural services:
- Science and education
- Tourism and recreation
- Heritage landscapes

Supporting services
- Biodiversity and gene pool
Capacity for provision of ES

• Semi-quantitative approach
• Explorative
• 105 experts were asked to score 23 land use classes for the delivery of 20 ecosystem services

scores: 0 = no ES; 1 = lowest capacity for ES; 5 = highest capacity for ES)

• Result: matrix (Jacobs et al. 2013)
% ES supply capacity change for wetland restoration in Flanders
To be continued...