Historical Geography of the Waasland polders

*Landscape evolution and interactions between social and ecological processes*

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Presentation outline

1. Holocene evolutions
2. Medieval evolutions
3. Tactical inundations
4. Remaining embankment: Doelpolder
5. Re-embankments: Prosperpolder
6. Impact society on ecology
7. Impact ecology on society
8. Interactions
- Waasland Scheldt polders (BE)
- Land of Saeftinghe (NL)
1. HOLOCENE
Historical Geographical overview

- Holocene

Legend:
- Coversand
- Peat
- River

Present-day river Scheldt

1850 BP

Kieldrecht

Verrebroek

Doel

Beveren
2. MEDIEVAL PERIOD
Medieval period

- North of the area: embankments by abbeys/lords
Medieval period

- South of the area: peat extraction Counts of Beveren
End of medieval period.
3. TACTICAL INUNDATIONS
• Tact
4. REMAINING EMBANKMENT: DOELPOLDER
Change in size

ARA, Kaarten en Plannen II, 8623
5. RE-EMBANKMENTS
Main embanker: Arenberg family

- Acquisition Seigniory Beveren 1575/1613

- Evolution in strategy
  - Before 1750: traditional (land lords/co-embankers)
  - After 1750: transformation of the landscape

- Through active embankment practises
  - Monopolist position
  - Not according to entrepreneur-model
  - Expert advice
  - ‘Aggressive’ embankment
  - Rational organisation of exploitation
« Classical » income

Melselebroek total (Guilders)
Beverenbroek total (Guilders)
Total (Guilders/CPI index)
Wheat price (index)
Co-embanking
Active embanking

- ca 1758 - Bolder intertidal area
- 1767 - Intertidal area at Moerspui
- 1772 - Intertidal area Rilland/Maire/Bath
- ca 1787 - Intertidal area in between Hulst and Saeftingen
- ca 1789 - Hoofdplaat intertidal area
- 1804 - Saeftingenpolder
- 1806 - Intertidal area of St. Albert
- ca 1828 - Hellegat
- ca 1845 - Mouth of the Braakman
- Unknown (19th C.) - Intertidal area at Boekhoute/Weterdijk
- 19th C. - Intertidal area Olieslager
- 1925 - Hellegat

Legend:
- % Tidal channel
- % Tidal flat
- % Tidal marsh
- Estuarine
- Nieuw-Arenbergpolder
Rational landscape design

*Nieuw-Arenbergpolder (1729-1784)*
Innovative agriculture

Prospelpolder (1846)
Heritage Prosperpolder
6. IMPACT SOCIETY ON ECOLOGY
Landscape reconstructions

- 1570
  - Original configuration
- 1625
  - Tidal marsh
  - Re-embankments
- 1700
  - Inundations
- 1791
  - Re-embankments
- 1852
  - Re-embankments
Surface equilibria

- Based on historical maps/DEM
- Intertidal area in equilibrium state:
  - Large proportion tidal marsh
  - Smaller % tidal flat/channel

- Turning point around 1850-1900
  - Stabilization embankment activity
Equilibrium only reached after > 60 years after last embankment.
Fossilization

Cross section 1

DECLINING PARTICLE SIZE

INCOMING TIDE

Tidal marsh
Flat
Channel

Cross section 2

DECLINING PARTICLE SIZE

Sedimentation

Clay
Sandy loam
Sand

Tidal channel
Tidal flat
Tidal marsh
Dike
New dike (Seaward)
Sandy loam
Sand
Old dike (Landward)

Cross section 2
Fossilization

- Clay: former tidal marsh
- Sandy loam: +- former tidal flat
- Sand: +- former tidal channel)
7. IMPACT ECOLOGY ON SOCIETY
Soil conditions & land value

Legend

Average classification per plot
- 1,00 - 1,49
- 1,50 - 2,49
- 2,50 - 3,49
- 3,50 - 4,49
- 4,50 - 5,00
Soil conditions & land value

- Clay (former marsh): high value
- Sandy loam (former tidal flat): medium value
- Sand (former tidal channel): low values
- But... normalization over time
Soil conditions & crop rotation

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
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<td>Oats</td>
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<td>Year 5</td>
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<td>Wheat</td>
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**TOTAL INCOME (fl./ha)**
- Year 1: 1274.74
- Year 2: 1133.78
- Year 3: 819.97
- Year 4: 474.99
- Year 5: 270.29

**DEDUCTIONS (fl./ha)**
- Year 1: 719.29
- Year 2: 668.93
- Year 3: 541.18
- Year 4: 313.49
- Year 5: 194.61

**PROFIT (fl./ha)**
- Year 1: 555.45
- Year 2: 464.85
- Year 3: 278.79
- Year 4: 161.5
- Year 5: 75.68

**PROFIT PER YEAR (fl./ha)**
- Year 1: 55.54
- Year 2: 46.48
- Year 3: 34.85
- Year 4: 26.92
- Year 5: 18.92

**TAXABLE INCOME PER YEAR (fr./ha)**
- Year 1: 105
- Year 2: 88
- Year 3: 65
- Year 4: 50
- Year 5: 25

More complex rotational systems on high value lands.
8. INTERACTIONS
Simple interaction scheme

Society

ACTORS (II)

EMBANKMENT (proces) (II)

TOOLS: HISTORICAL MAPS (I)

EMBANKMENT SOIL PATTERN (III & IV)

HISTORICAL AGRICULTURE (IV)

Ecology

PHYSICAL PROCESSES (III)

INTERTIDAL AREA (III)

INTERTIDAL AREA SEDIMENTATION PATTERN (III)

Interaction

Translation?
Complex interaction Scheme

**Embankment (process)**

**ACTORS**
- Typical Early Modern: Consortia
  - Risk spreading
  - Risk manipulation
  - Urban capital
- Waaland polders specific: Arenberg family
  - Active embankment policies
  - "Aggressive" embankment tactics
  - Capitalistic approach

**Economic situation**
- Profit maximization

**Political situation**
- Registration

**TOOLS:**
- Preparation
- Management
- Registration
- Designed landscapes

**TOOLs:** historical maps

**1. EMBANKMENT INTERVAL**

**2. EMBANKMENT SIZE**

**Embanked surface**

**Interactions**
- Short intervals prevent equilibria (+2)
- Minimum intertidal area height
- Remaining intertidal area height (+1)
- Remaining % marsh/flat (+2)
- Minimum proportion tidal marsh (+1)

**Intertidal area**

**INTERTIDAL AREA SEDIMENTATION PATTERN**
- Tidal channels
  - Sand
  - Coarse material
  - Close to source
- Tidal flats
  - Sandy loam
  - Fine material
  - Far from source
- Tidal marsh
  - Clay
  - Complex

**Society**

**Ecology**

**AGRICULTURE**
- Land use: Meadow ➔ Arable land ➔
- Holding size: Small ➔ Large ➔ Small
- Land value: Low ➔ High
- Crop rotation: Simple ➔ Complex

**Embankment soil pattern**
- Former channels
- Former flats
- Former marsh
- Sand ➔ Sandy loam ➔ Clay

**Tidal channel evolution**
- Particle size settlement properties
- Sediment supply
- Mean High Water Level

**1. Intertidal sedimentation VERTICAL EQUILIBRIUM (62-90 years)**

**2. Intertidal SURFACE % EQUILIBRIUM (85-97 years)**
Thanks for your attention!