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## Conference Paper

# The increasing importance of water management in the Dutch planning system

50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy", 19-23 August 2010, Jönköping, Sweden

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# The increasing importance of water management in the Dutch planning system

Frank Bruinsma

Mark Bokhorst

IGU Conference, July 1-4, 2010,  
Groningen

# Contents presentation

- Introduction
- Impacts of climate change
  - (Descending ground level)
  - Increasing sea level
  - Change in rainfall
    - Intensified rainfall
    - Periods of drought
- Polders become brackish
- Transformation rural areas
- Conclusion

# Introduction: the Netherlands

- 16.5 million inhabitants
- About half of the country below sea level
- Lowest point: 6,74 m. below sea level
- Randstad below sea level
- 70% GDP produced below sea level

Source: [www.waterland.net](http://www.waterland.net)

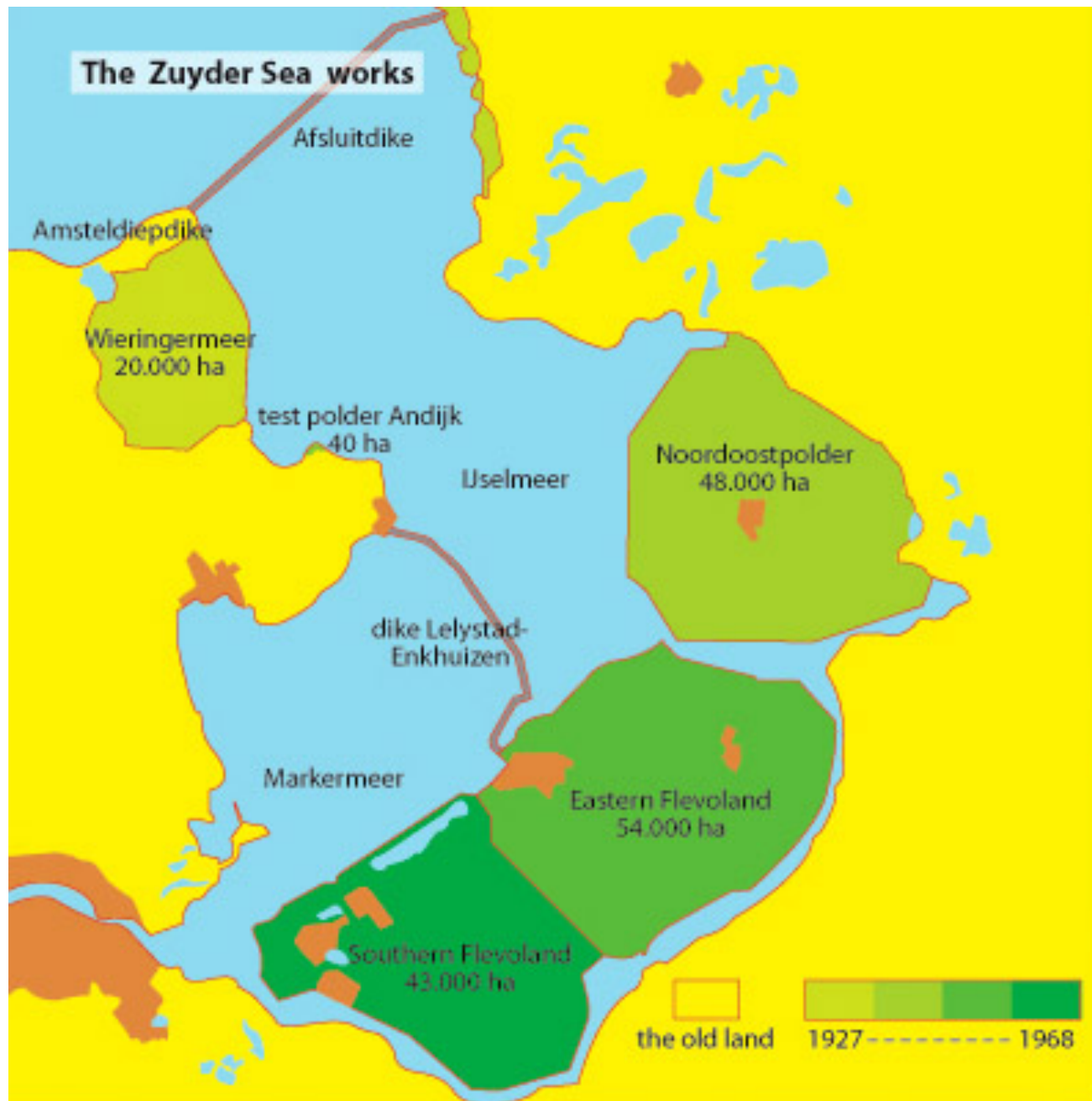


Source: Ministry of Transport and Public Works, 2004

# Primary defense

- 3,500 kilometers
  - 1,430 km. river dikes
  - 1,017 km. dikes around lakes (IJsselmeer)
  - 430 km. dikes coastal defense
  - 260 km. dunes coastal defense
- Big projects to reduce coastal defense:
  - IJsselmeerdam (1932)
  - Deltaworks (1997)

Source: [www.waterland.net](http://www.waterland.net)



Source: Stg. Deltawerken online



Source: [www.deltawerken.com](http://www.deltawerken.com)



# Secondary barriers

- About 14.000 kilometers
  - Storage basin dikes
  - Polder embankments
  - Canal dikes

# Organization water management

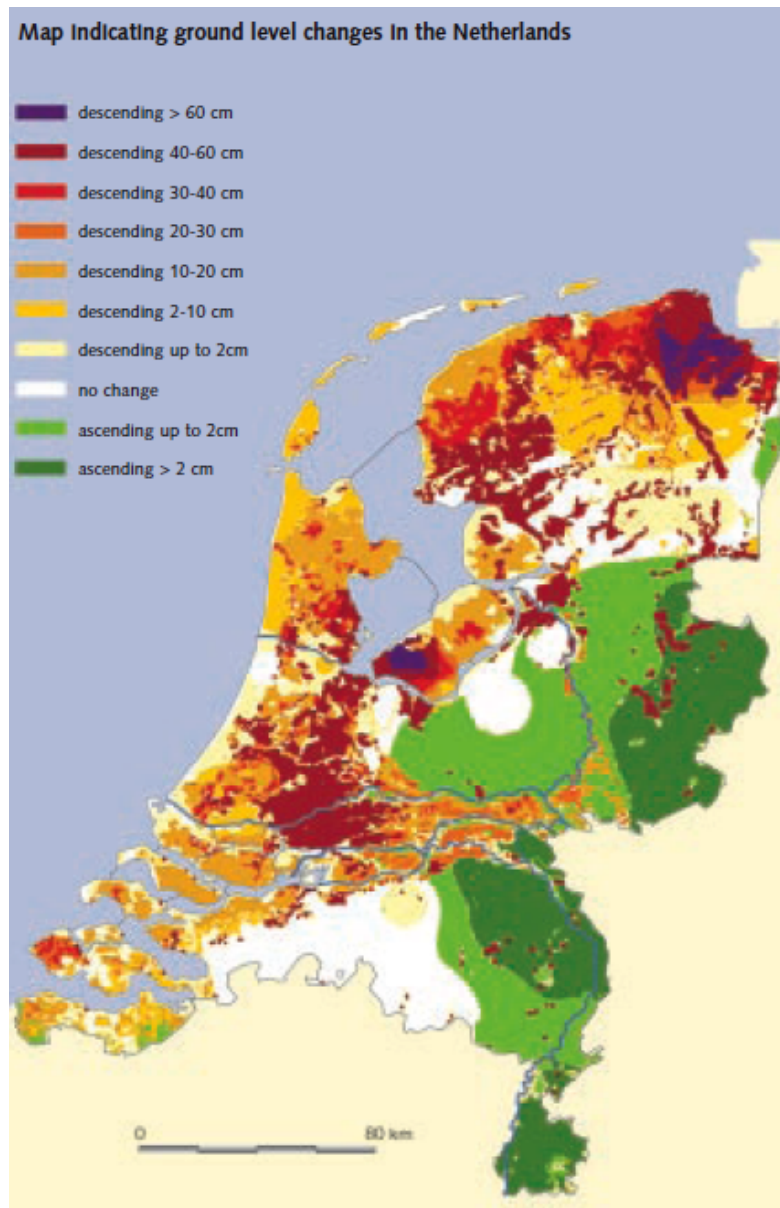
- District water boards (1940: 2,700  $\leftrightarrow$  2010: 27)
  - 90% primary defense
  - Turnover € 2.5 billion
    - € 200 million flood defense
    - € 800 million water quantity
    - € 1,500 million water quality
- National government
  - Turnover € 1,3 billion
- Provinces and municipalities

# 1. Climate change

- (Descending ground level)
- Rising sea level
- Change in rainfall

# 1.1 (Descending ground level)

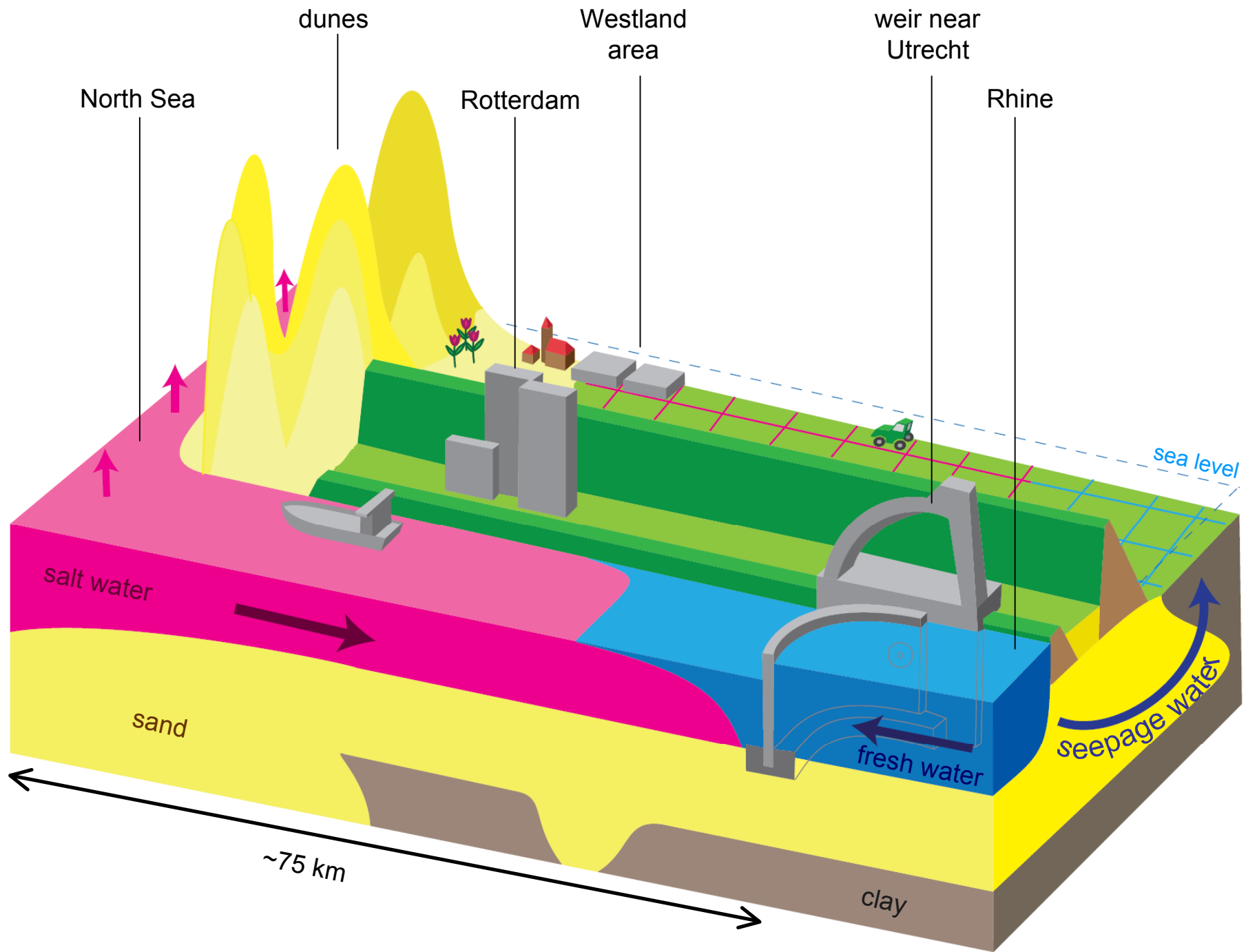
- Western part of the country
  - Dikes along the rivers
  - Peat extraction
  - Draining of peat polders: oxidize and subsides
- Northern part of the country
  - Gas extraction Groningen field: > 60 cm



Source: Directorate-General of Public Works and Water Management,  
NAM

# 1.2 Climate change: rising sea level

- Sea level will rise by about 1 meter
  - No problem considering safety: primary defense strong enough
  - Problem: inland penetration saltwater tongue
    - threat valuable agricultural land
  - Solution: freshwater Lake IJsselmeer



# 1.3 Climate change: rainfall

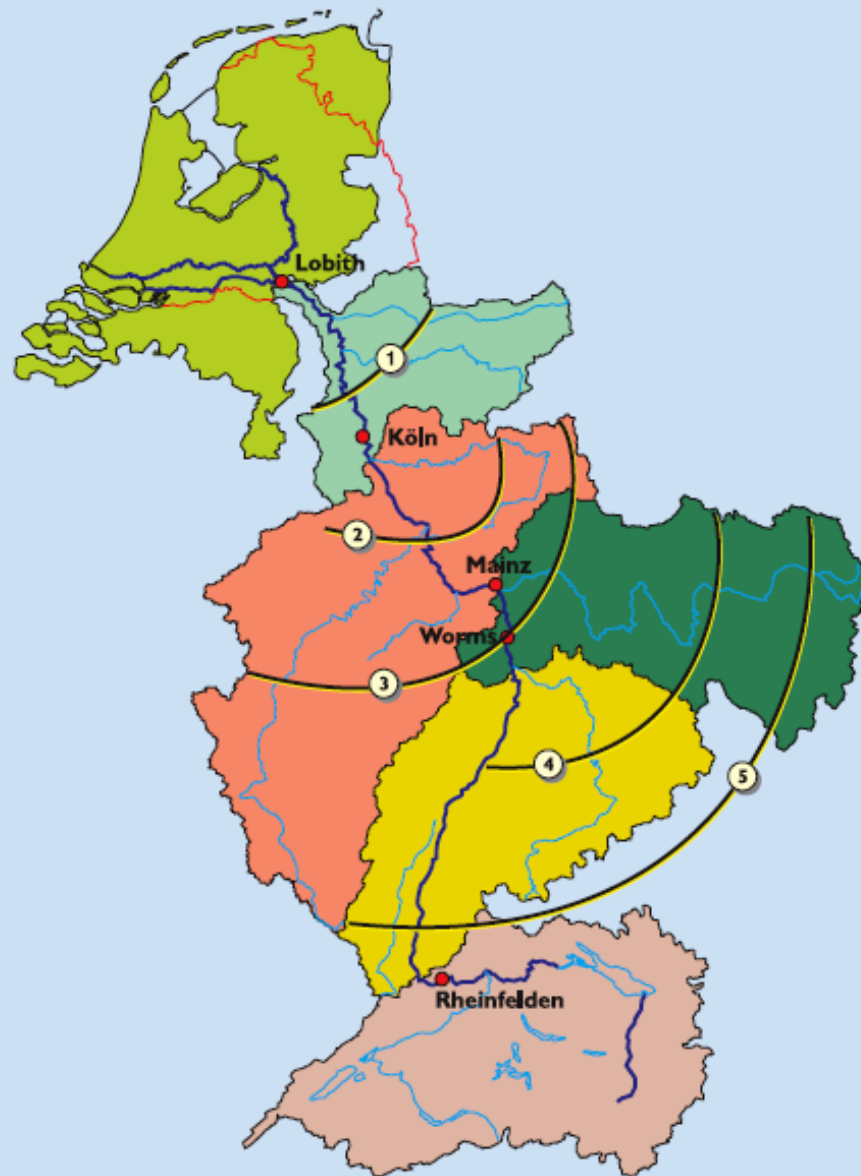
- Winters: wetter & increase extreme rainfall events
- Summers: dryer & increase extreme rainfall events & decrease rainy days
- Excess water rainfall  $\leftrightarrow$  drought



# 1.3a Climate change: excess water

- Room to the river  
(higher dikes, higher water levels → higher risks by breakthrough)
- The Netherlands “drain of Europe”
- 2 sets of measures
  - Enlargement carrying capacity rivers
  - Storage of excess rainwater within the Netherlands

Number of days on which a high water surge reaches the Rhine catchment area in the Netherlands



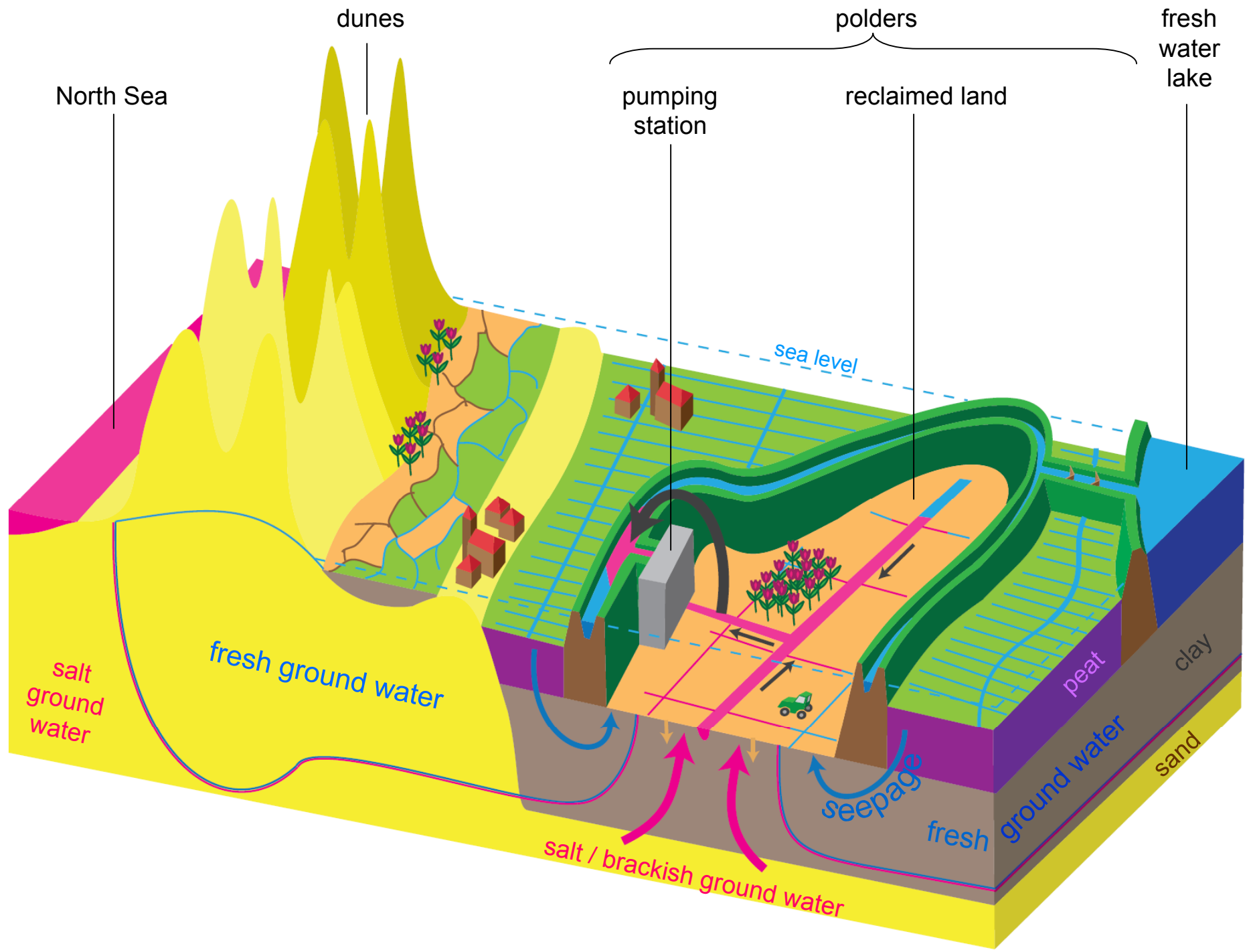
Source: *de Rijn op Termijn*, WL Delft

# 1.3b Climate change: drought

- Occasional water shortage
  - Peat dikes drying out (breakthrough Wilnis, 2003)
  - Irrigation agriculture
  - Cooling water energy supply
  - Inland barges
- Reserves of freshwater
  - Lake IJsselmeer (+ 1.5 meter of 0,3 meter)
  - Deltaworks

## 2. Polders become brackish

- Polders, reclaimed land, ponds
- System of waterways to manage groundwater level
- Freshwater pumped out
- Water too salt for agricultural use
- Nature? Flushing with freshwater?

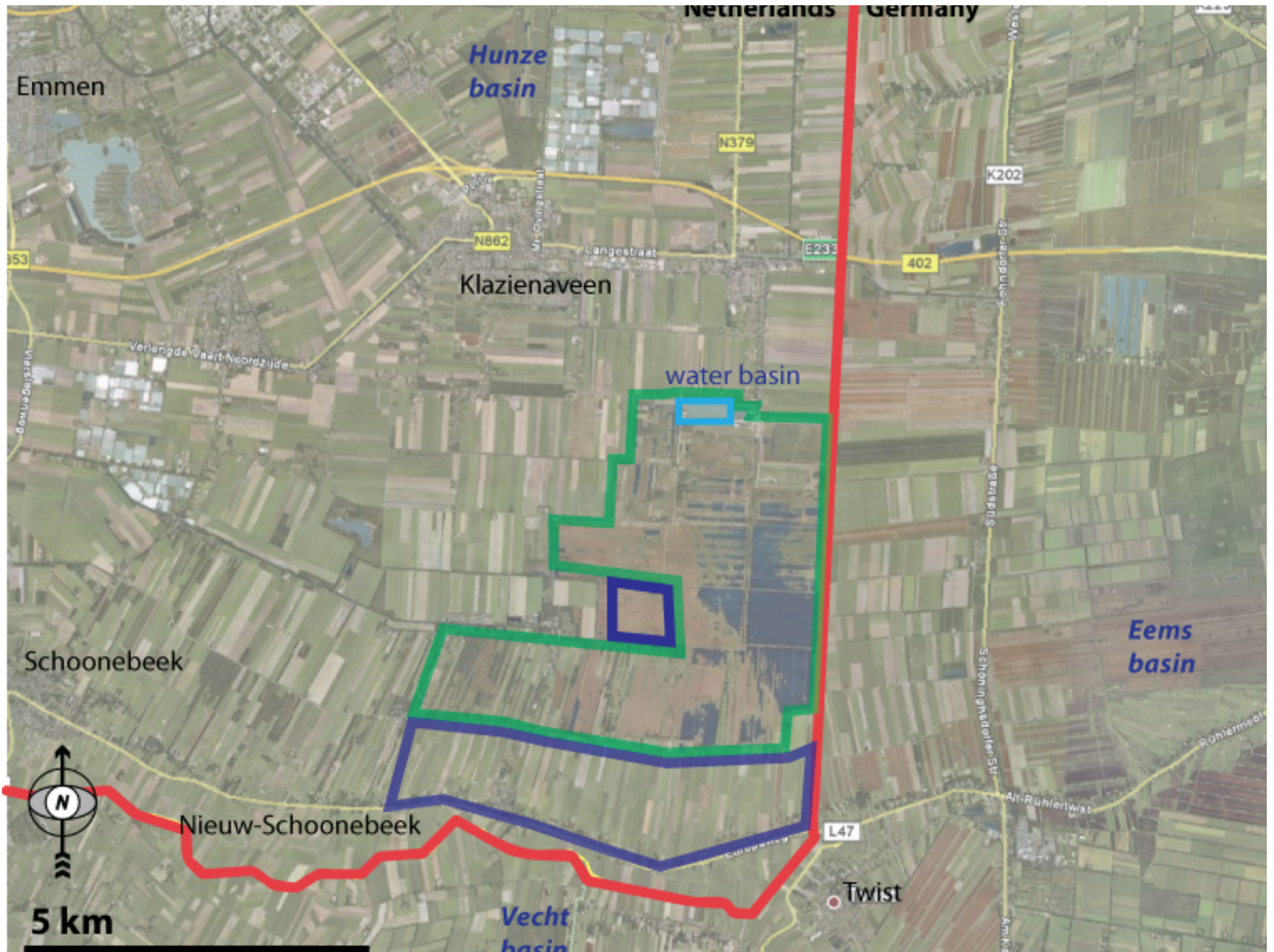


# 3. Transformation rural areas

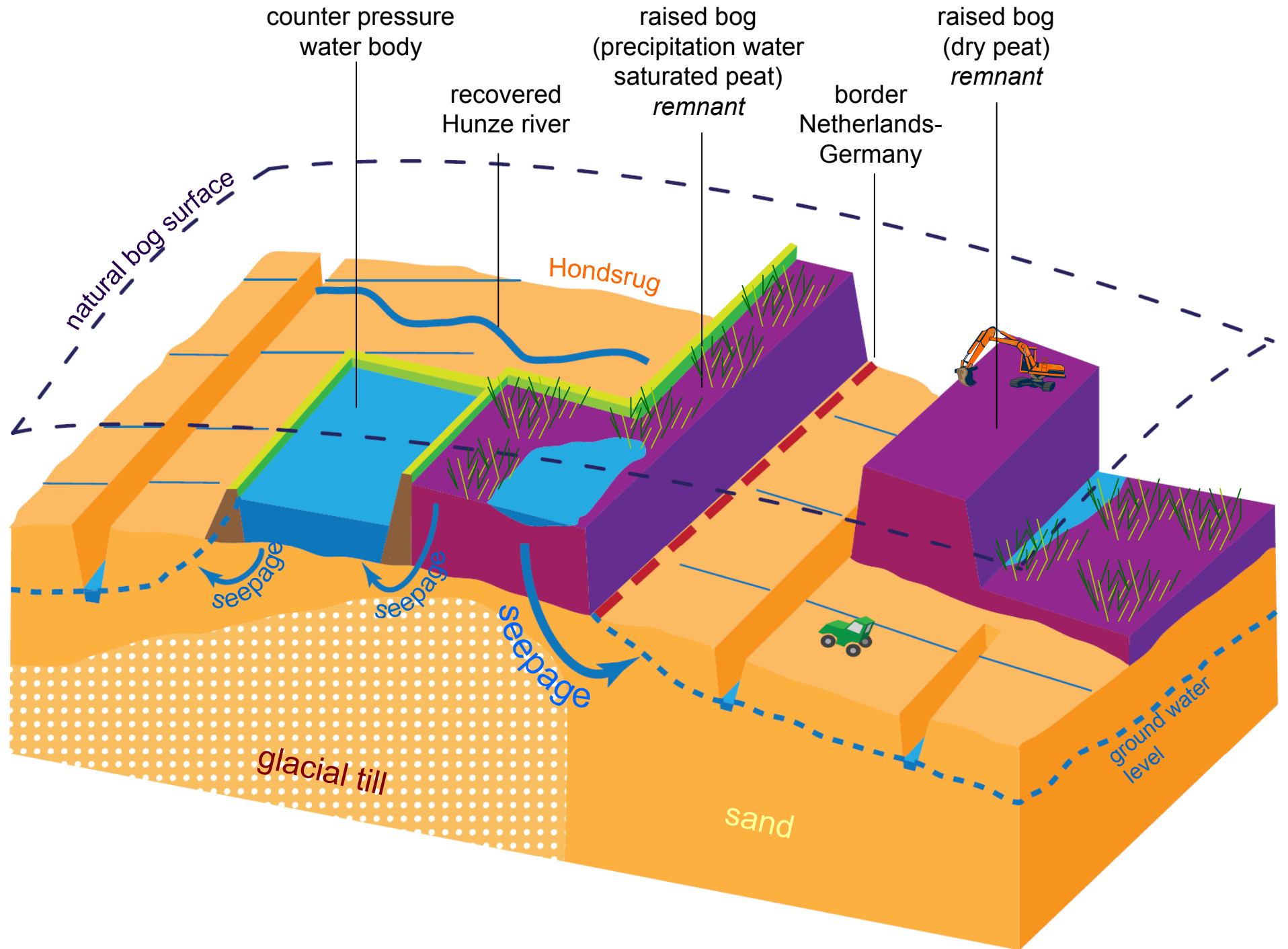
- Agricultural sector:
  - Mechanization / increase in scale agriculture
  - Depopulation → services below critical threshold
  - Non-agricultural activities in rural areas
- Autonomous developments
  - Welfare increase: disposable income, leisure, mobile
  - Recreation, cultural historical landscapes, nature
- From production to consumption area

# 3. Transformation rural areas

- Diversity of actors
- Different spatial claims
- Different claims water management systems
- Subsystems within the present system
- Extension secondary barriers







# Conclusion

- Many challenging tasks water management
  - Climate change
  - Polders too brackish
  - Transformation rural areas
- Central position of District Water Boards
- Present debate governmental reform
- Don't underestimate importance and knowledge district water boards!