‘Climate-resilient peatlandscapes’ in a Dutch perspective

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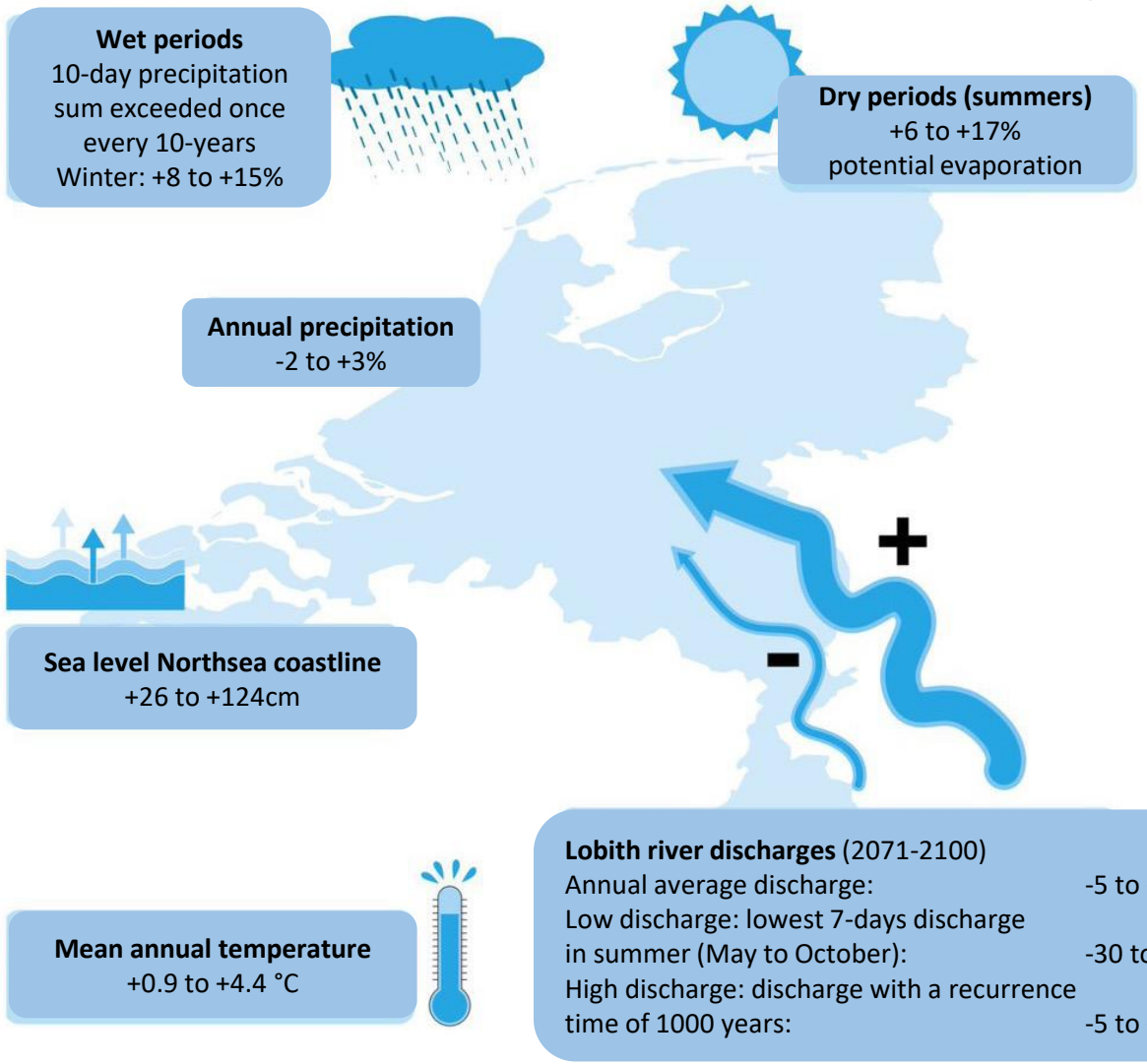
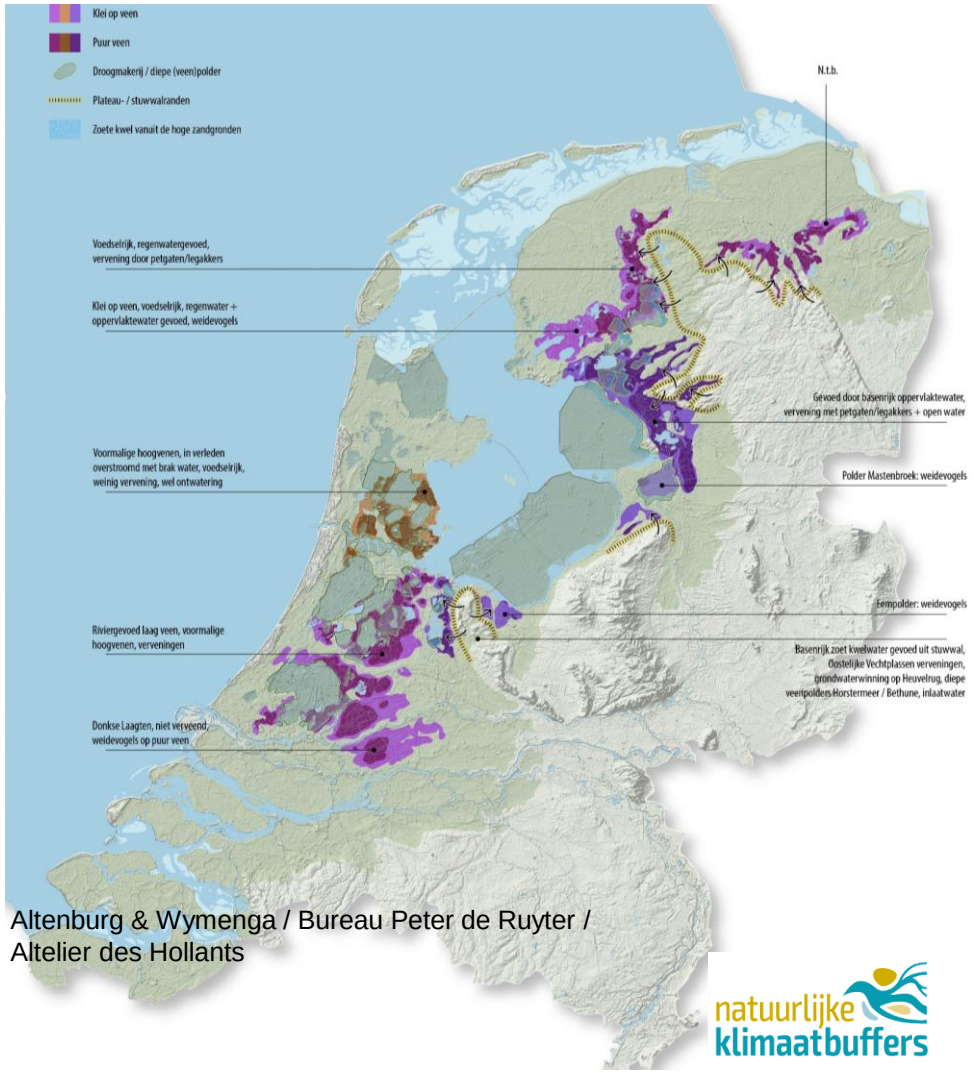
Climate challenges: large and diverse

Due to climate change, sea levels are rising, and weather extremes are increasing (wetter winters and increasingly dry summers with limited freshwater supplies)



Climate-resillient peat landscapes – vision on perspective



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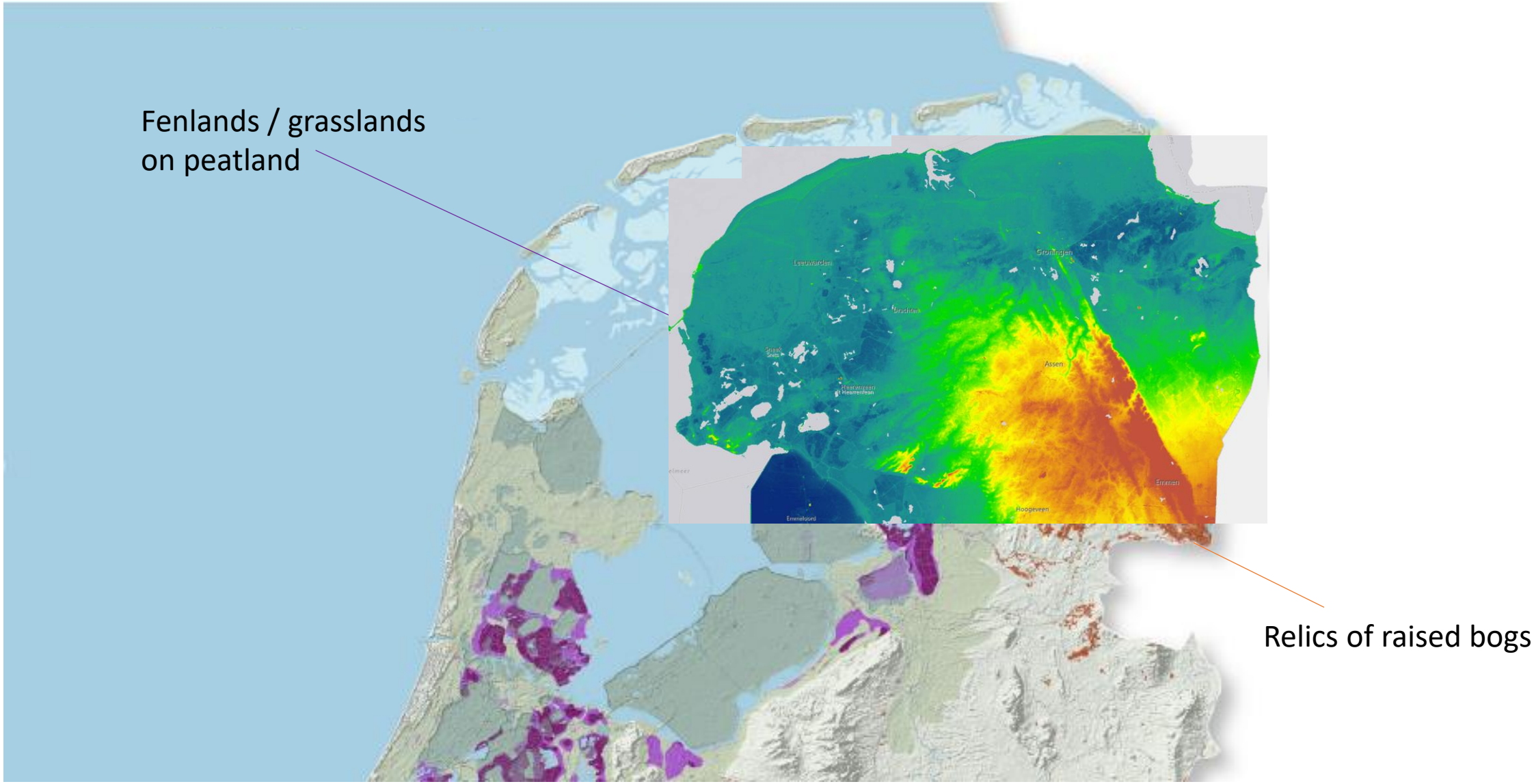
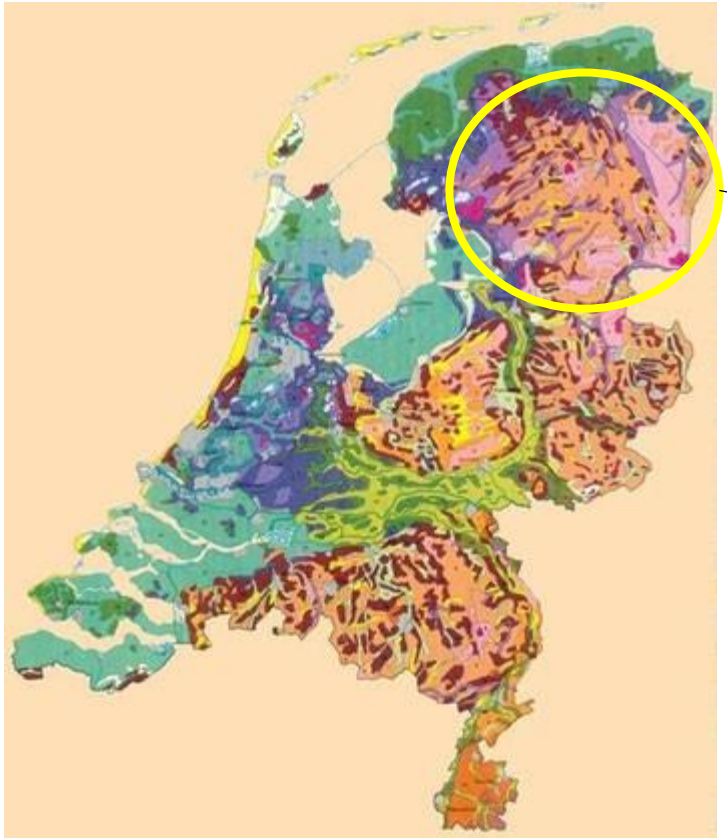
natuurlijke klimaatbuffers

- What can be the buffering role of our peat landscapes to better accommodate weather extremes, and to make our water system more robust? (climate adaptation)
- What can be the role of our peatlands to reduce CO2 emissions or help sequester carbon (climate mitigation)
- What is the significance of our peat landscapes in preserving, restoring and strengthening unique flora and fauna (biodiversity)
- Would a multifunctional spatial use – in terms of land and water use - be an avenue to using peat landscapes as climate buffers?

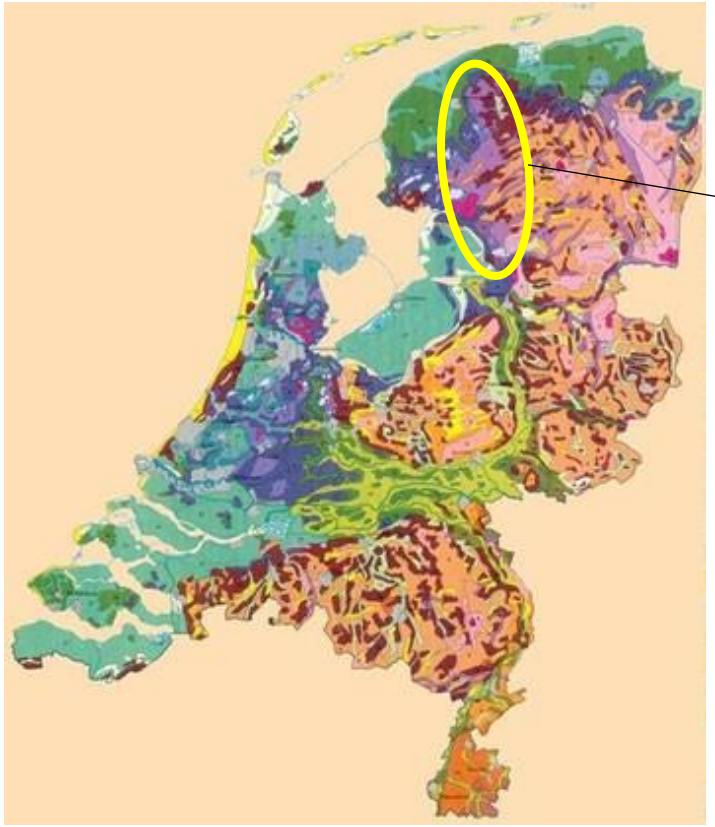
Peat landscapes in the northern part of the Netherlands



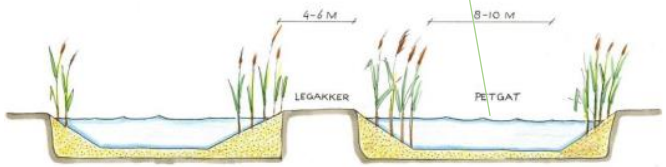
History (18 – early 19th century): large scale open mining to exploit peatlands for fossil fuel. Nearly all raised bogs were excavated



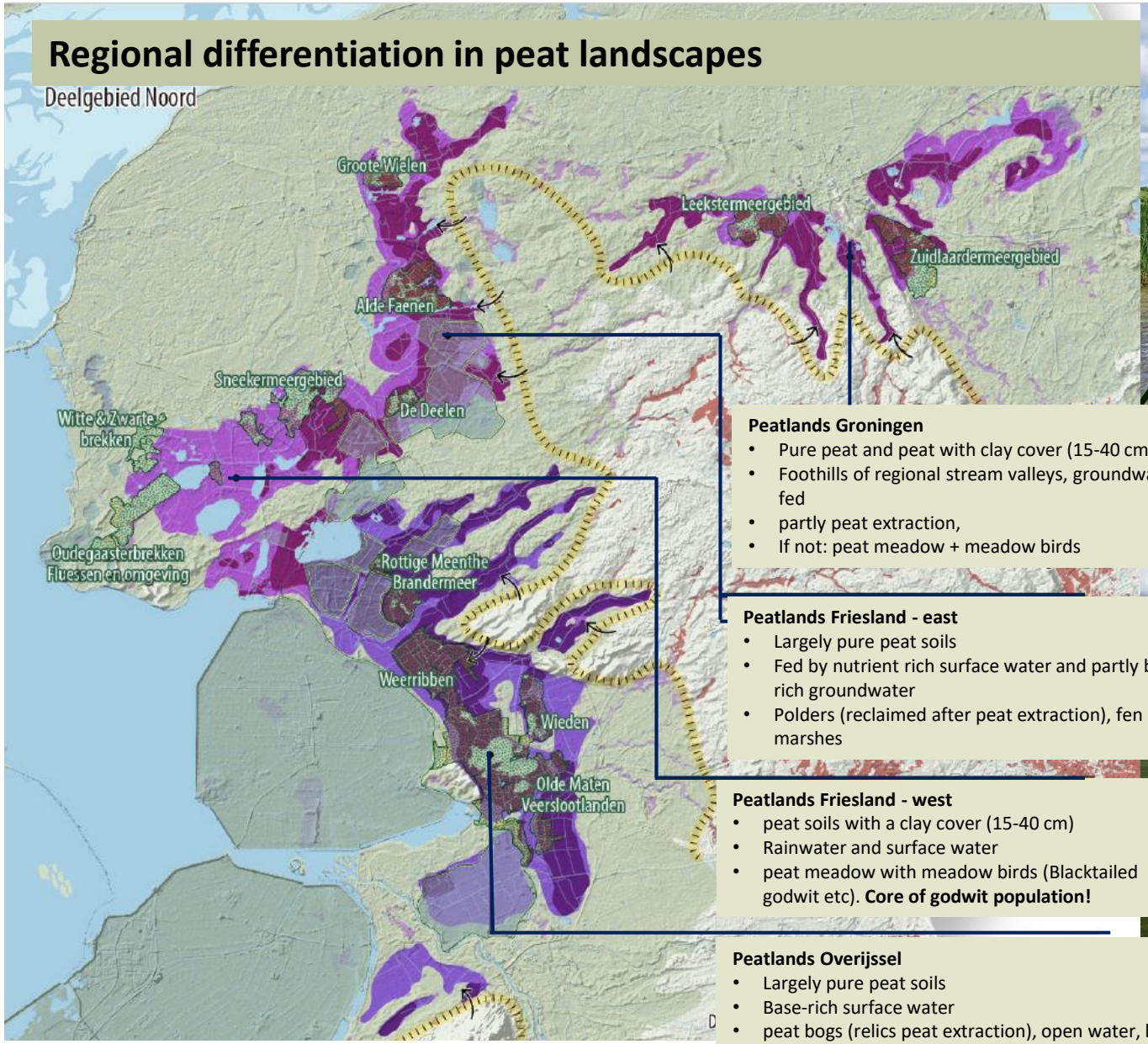
History: large scale open mining to exploit peatlands for fossil fuel
Peat was extracted below water level on a large part of the lowlying peatlands : fenlandscapes



After extraction, renewed peatland development through succescion



Regional differentiation in peat landscapes



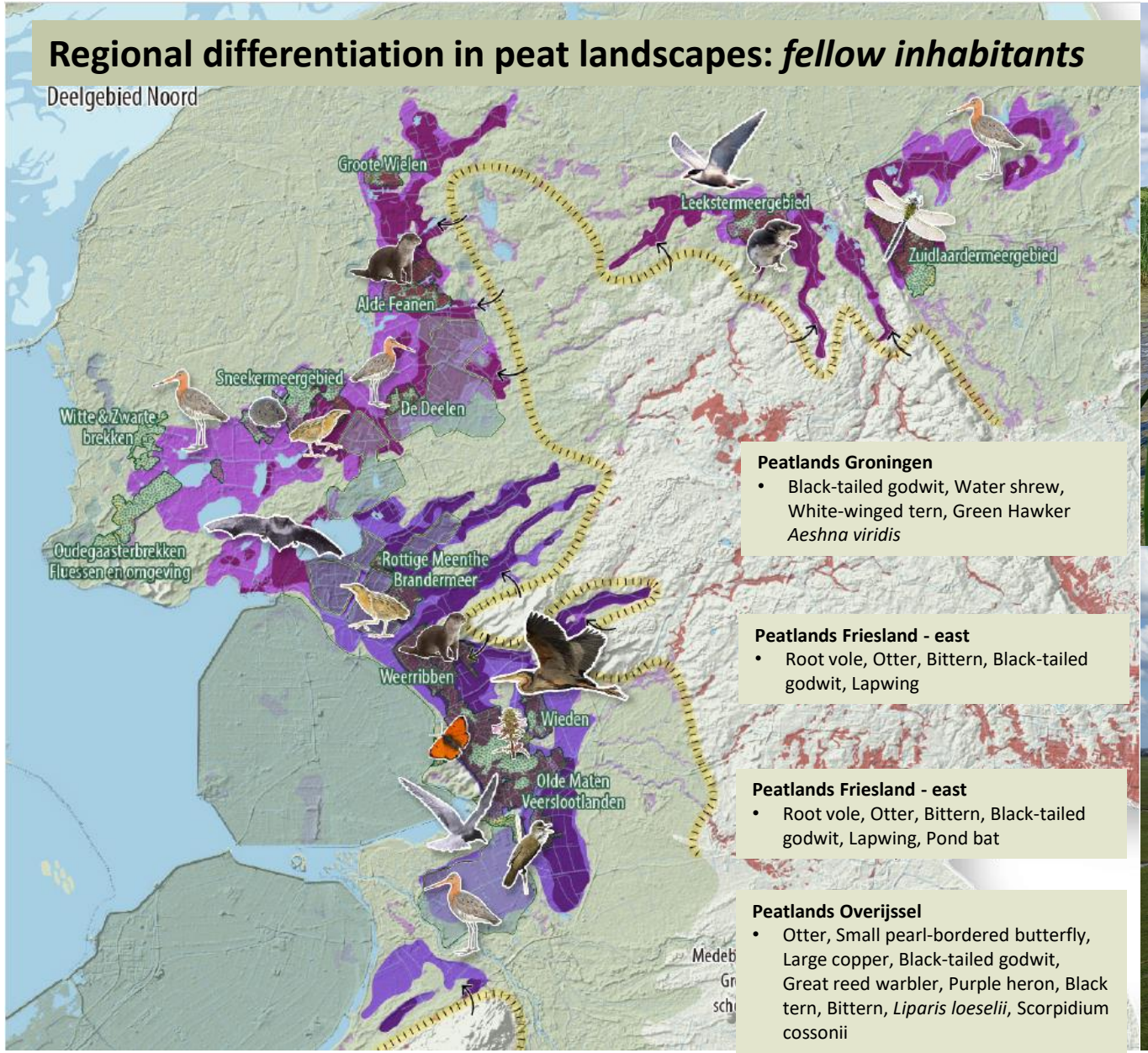
Peatlands Groningen
- Pure peat and peat with clay cover (15-40 cm)
- Foothills of regional stream valleys, groundwater-fed
- partly peat extraction,
- If not: peat meadow + meadow birds

Peatlands Friesland - east
- Largely pure peat soils
- Fed by nutrient rich surface water and partly base-rich groundwater
- Polders (reclaimed after peat extraction), fen marshes

Peatlands Friesland - west
- peat soils with a clay cover (15-40 cm)
- Rainwater and surface water
- peat meadow with meadow birds (Blacktailed godwit etc). **Core of godwit population!**

Peatlands Overijssel
- Largely pure peat soils
- Base-rich surface water
- peat bogs (relics peat extraction), open water, low lying peat grasslands

Regional differentiation in peat landscapes: *fellow inhabitants*



Peatlands Groningen
- Black-tailed godwit, Water shrew, White-winged tern, Green Hawker *Aeshna viridis*

Peatlands Friesland - east
- Root vole, Otter, Bittern, Black-tailed godwit, Lapwing

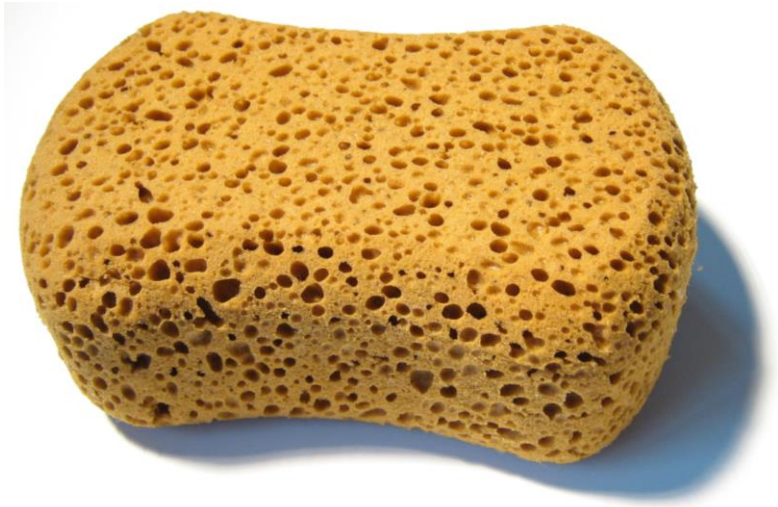
Peatlands Friesland - east
- Root vole, Otter, Bittern, Black-tailed godwit, Lapwing, Pond bat

Peatlands Overijssel
- Otter, Small pearl-bordered butterfly, Large copper, Black-tailed godwit, Great reed warbler, Purple heron, Black tern, Bittern, *Liparis loeselii*, Scorpidium cossonii

‘Buffer’ and ‘sponge effect’

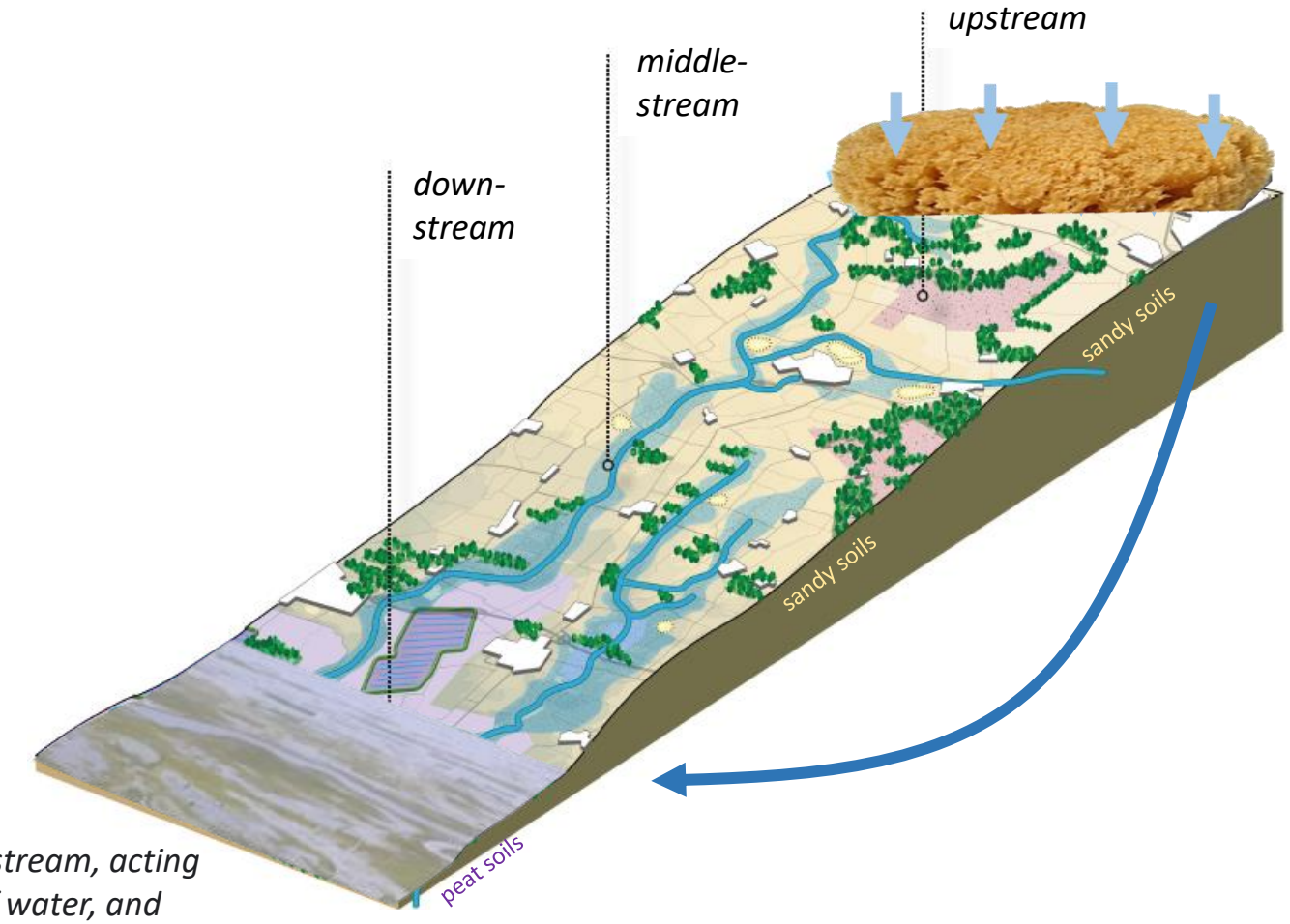
- **Buffer - definition :** a thing (object, area, substance) that absorbs or equalizes disturbances caused by the interaction of two or more other things. Thus, accommodating weather extremes such as major flooding as well as heat and major droughts ....

- **Sponge effect** - the concept of a natural ‘sponge' is drainage retardation. A sponge sucks up a lot of water and releases it slowly. Natural sponges as peatlands act in this way. Peat mosses have unique properties in this respect. A natural peat package swells and shrinks, according to water supply and release



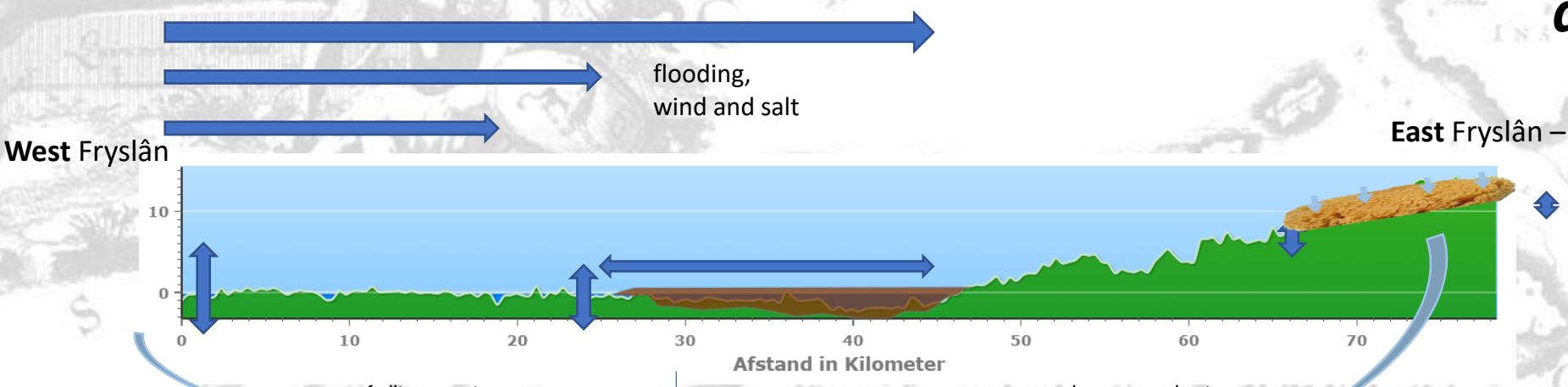
Natural sponges and buffers : principles

Raised bogs situated upstream as major sponges in the landscape. Upstream retention of precipitation and slowing down runoff. Also: infiltration of precipitation feeding the groundwater aquifer



Floodplain-like landscape downstream, acting as buffer through the storage of water, and steady discharge to sea.

distant past

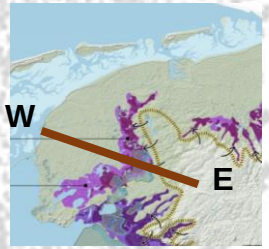


strong coastal dynamics, estuaries, open landscapes

Floodplain dynamics, Buffer in case of large supply of surface water

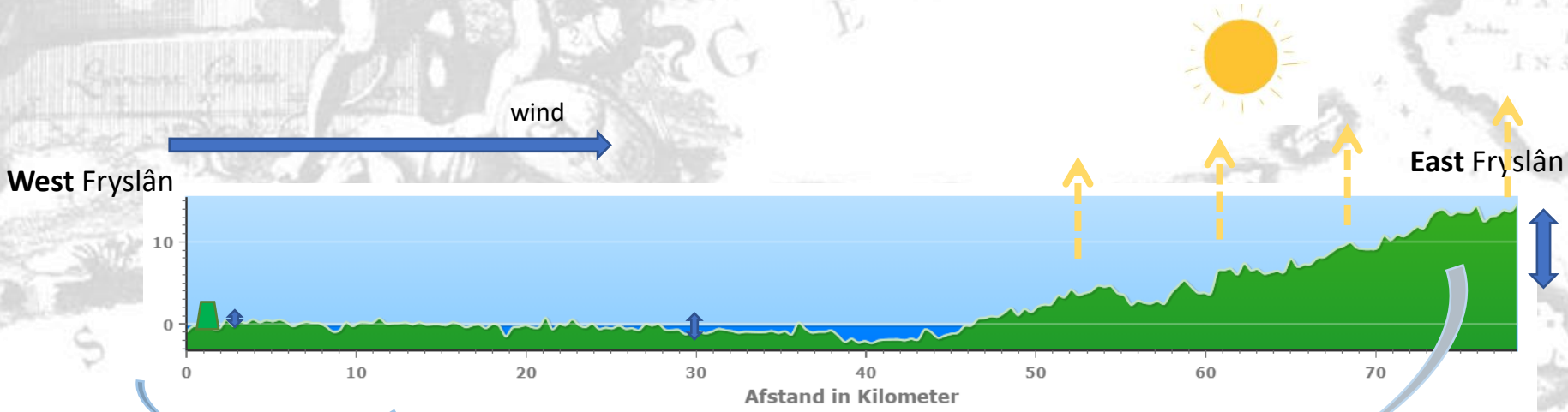
strong peat development at the foothill of higher plateau, excellent wet conditions

Sponge effect raised bogs, enclosed heaths and sandy landscapes



Natural sponges and buffers in historical perspective

present



pressure of silt sea water

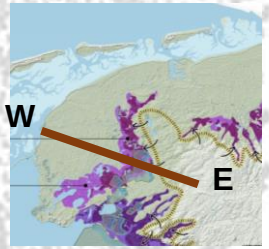
deep groundwater flows and seepage

lack of coastal dynamics, dikes

Floodplain reclaimed and drained, no dynamics

Accelerated runoff, less infiltration, increasing risk on droughts

98% of natural buffer capacity dissapeared through reclamation



- **Reversal of dynamics in water level on landscape scale**
- **dynamics of water, wind and salt replaced in the polder by agricultural use**
- **natural sponges and buffers largely disappeared, replaced by technical measures (pumping)**

‘Buffer’ and ‘sponge effect’ ……

- Lessons learned from recent years :
  - droughts occur frequently - now also in winter and in early spring
  - Precipitation falls in short periods, very locally and in large quantities
  - there is a clear need to retain precipitation, to keep the soils moist and feed the groundwater acquifer

Work on nature based solutions ……

- **Rearrange upstream landscapes to increase natural sponginess** and retain precipitation.

- **Rearrange downstream landscapes to increase natural buffer capacity.**

- **Landscape approach** and **climate-based management of water resources**

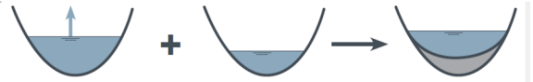
We need a **paradigm shift**: where in the past the environment was adapted to the function (agriculture) and the land use derived from it, in the future the function and associated land use will instead have to be more adapted to the environment, and the changing climate

Upstream landscapes

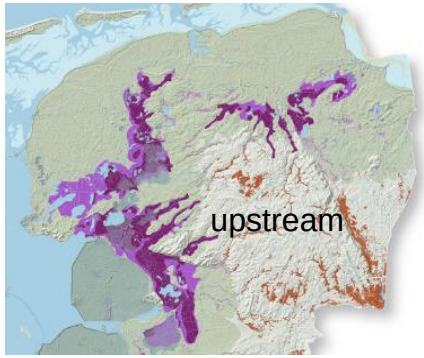
- Allow water to infiltrate and replenish groundwater resources. This refers to water retention in low-lying parts but also to land use/vegetation that retains water better, giving it a chance to infiltrate.

- Research shows, that for raising groundwater levels in the upstream area, 3 measures are effective:

  - filling up ditches;
  - raising ditch bottom (less deep ditches: raising drainage level) and raise water tables
  - slowing down runoff in stream valleys



- (Re)Wetten of remaining peatlands (often nature reserves: relics of raised bogs, moors, brooks, stream valleys), including a buffer zone. Adapt land use in the buffer zone to improve the natural sponge effect



1. Sources : *Projectteam Droogte Zandgronden Nederland 2020. Deltares cs.*

Sources: STOWA.nl, https://www.hunzeenaas.nl/projecten/beekbodemverhoging/, https://edepot.wur.nl/548571

- It is promising that already several pilots are being carried out. The next step is **upscaling** of these local pilots to a landscape approach: design and build large scale infiltration landscapes, targeting on water retention and enhancing infiltration in order to replenish groundwater resources.

- It is important to go for an integrated approach, including land and water use, biodiversity as well as economic and cultural functions as drivers of the regional economy.

- All these challenges need to be accommodated together and coherently in the landscape. This is relevant to many stakeholders. For this, a multi stakeholder proccess is needed.

- Size and precise design is something we need to learn. But do start now!

  Buffer+ is an important initiative in this respect

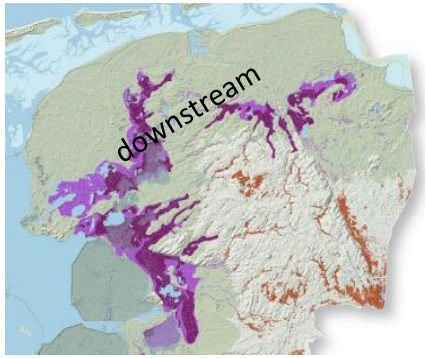
Downstream landscapes

- On paper it is not do difficult to formulate what to do: store water when there's a surplus, and supply in case of shortage. But how can this be done in practice?

- But first: To limit CO2 emissions, raise water tables in drained peatlands and keep the peat wet, to at least 20-30 cm below surface level. If this is done on a significant scale, and particularly in the low-lying drained polders, it will contribute to higher groundwater levels.

- Store water during winter (surplus of precipitation) and in case of excessive precipitation: floodplain-like landscapes (as the first slide). Patterns (flood dynamics, timing, volumes) are different from the past but the principle remaines the same

- In a nutshell: storing water during excessive rainfall is possible, but 'preserving water for later' is quite a challenge



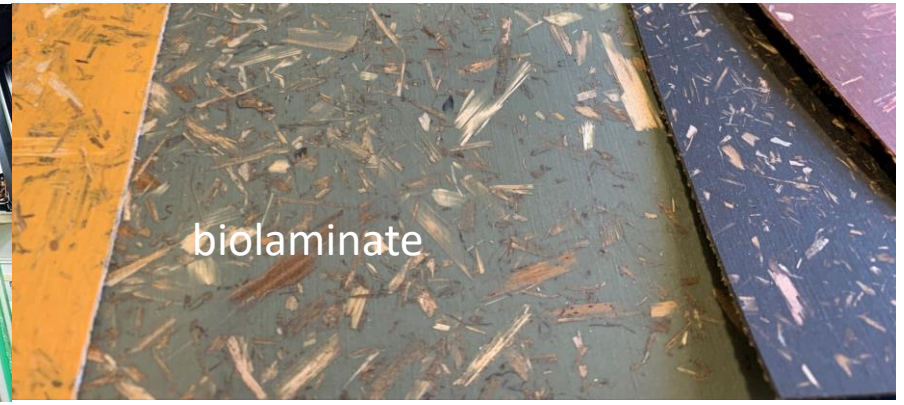
Take action on regional climate adaptation

- The major climate and water challenges demand space. Hence, these can no be realized without support of relevant stakeholders

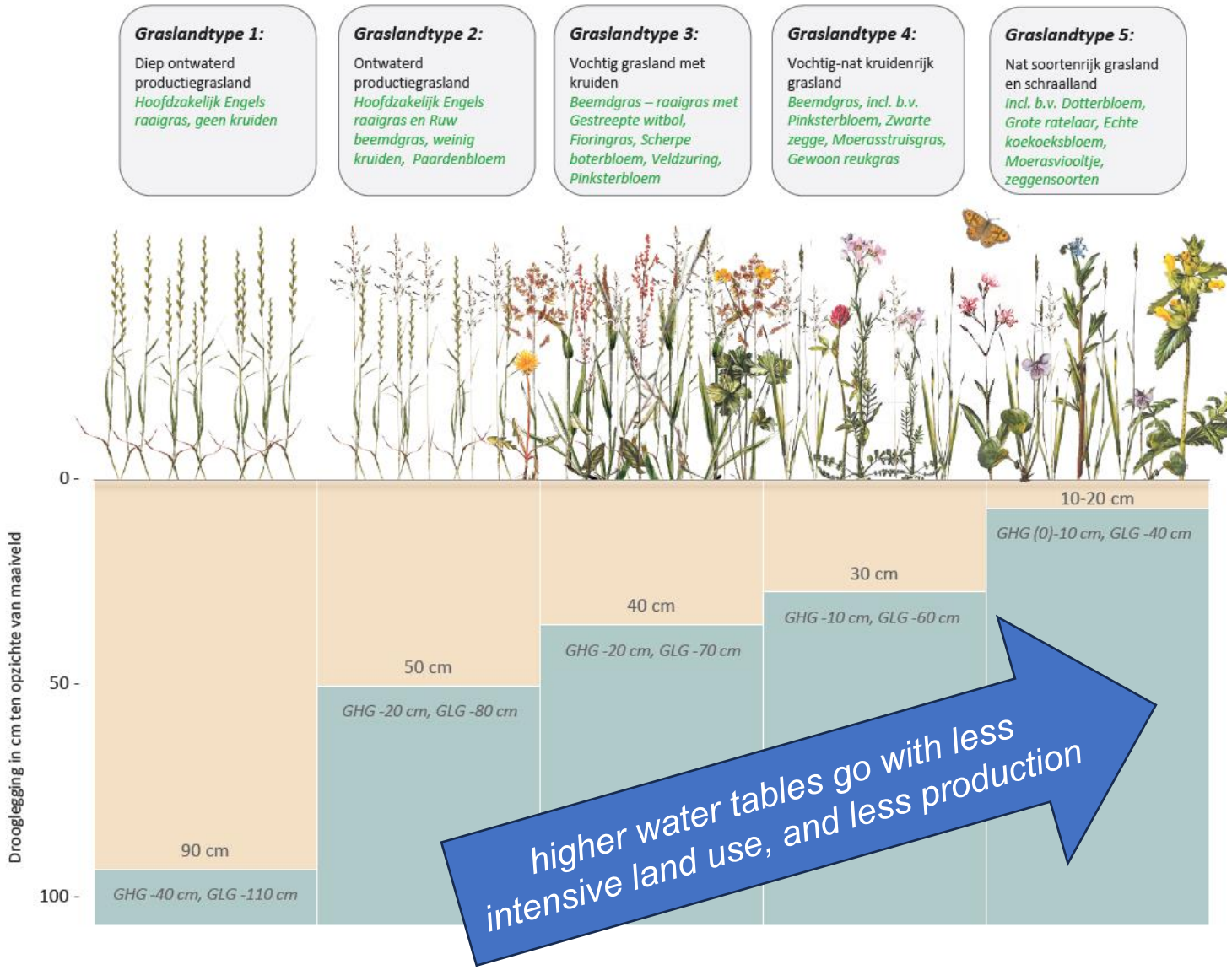
- Support for change is increased when there is a clear perspective for those involved. To work towards that perspective, we are committed to multifunctional land and water use, finding smart combinations of water and land use.

- Focus on economic drivers for the region (income, work, experience, pleasure in living) to increase support for climate adaptation: in short, work on climate adaptation


Cattail *typha* for panels and insulation

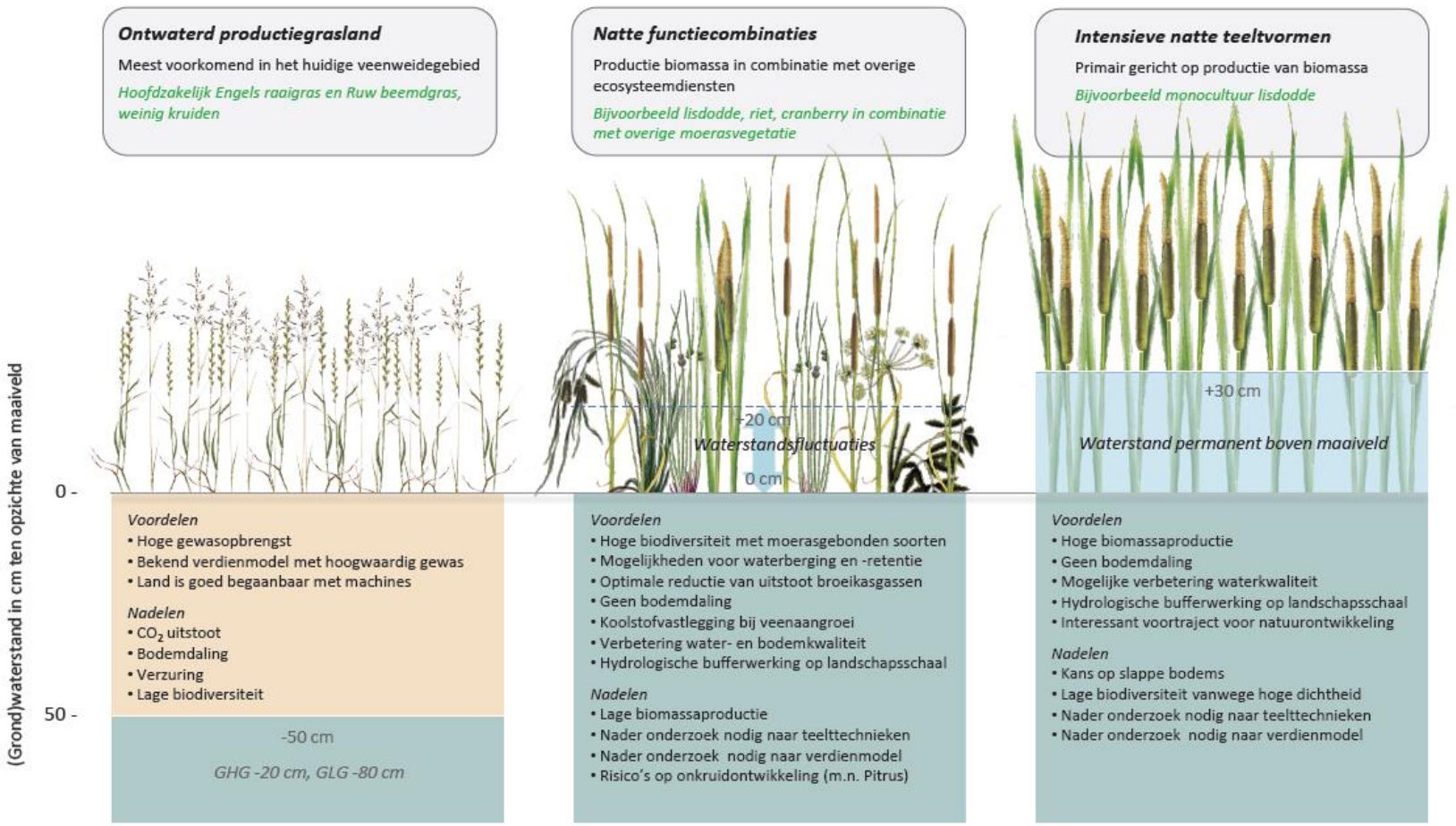

biolaminate

Combination of sustainable, extensive dairy farming and high water tables



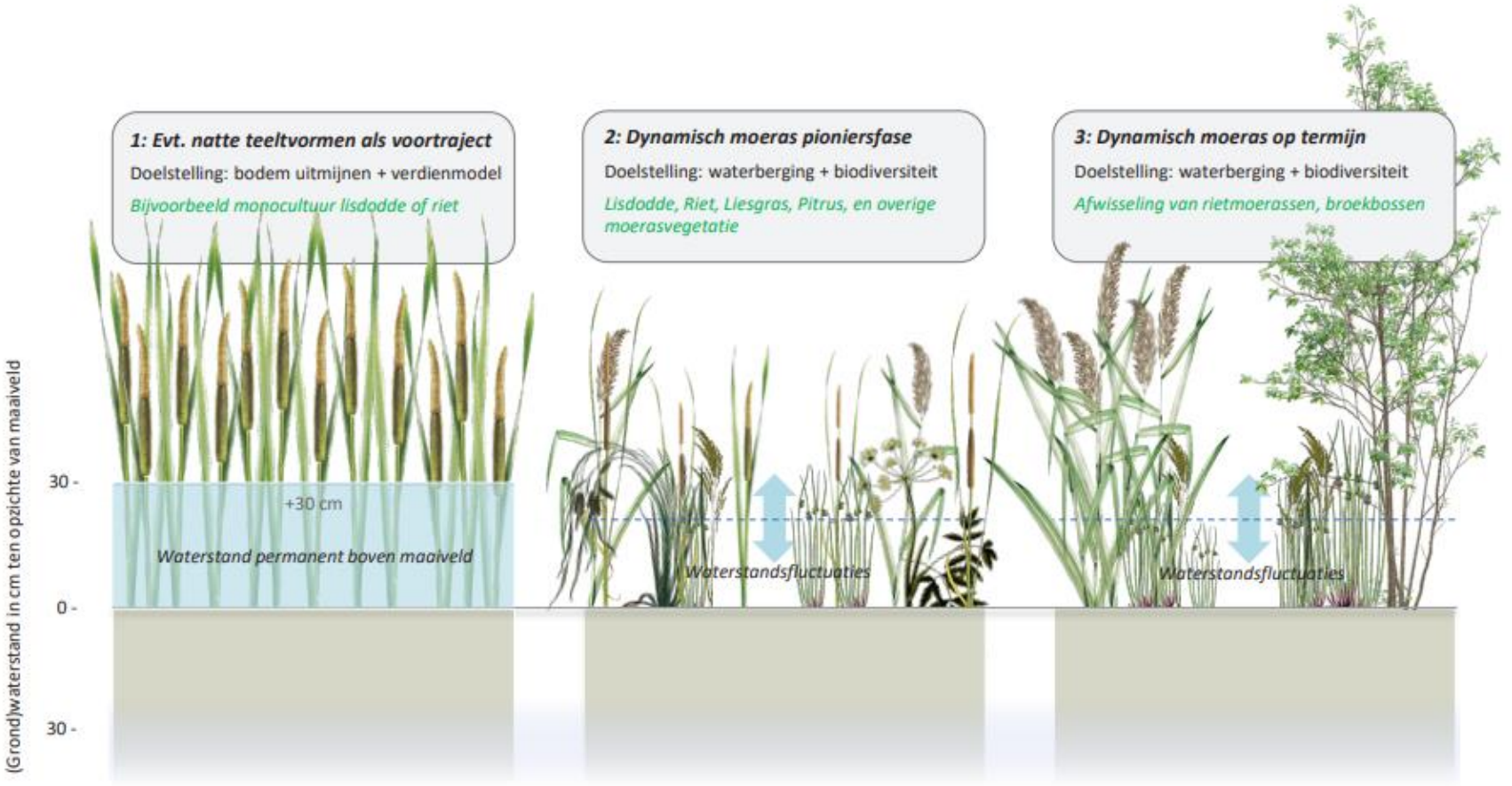
- **Peatlands - High water tables to limit CO2 emission**
- **Grasslands for sustainable, extensive dairy farming, or beef cattle**
- **Biodiversity, tourism**
- **Compensation needed for farmers**

Development of paludicultures for circular economy



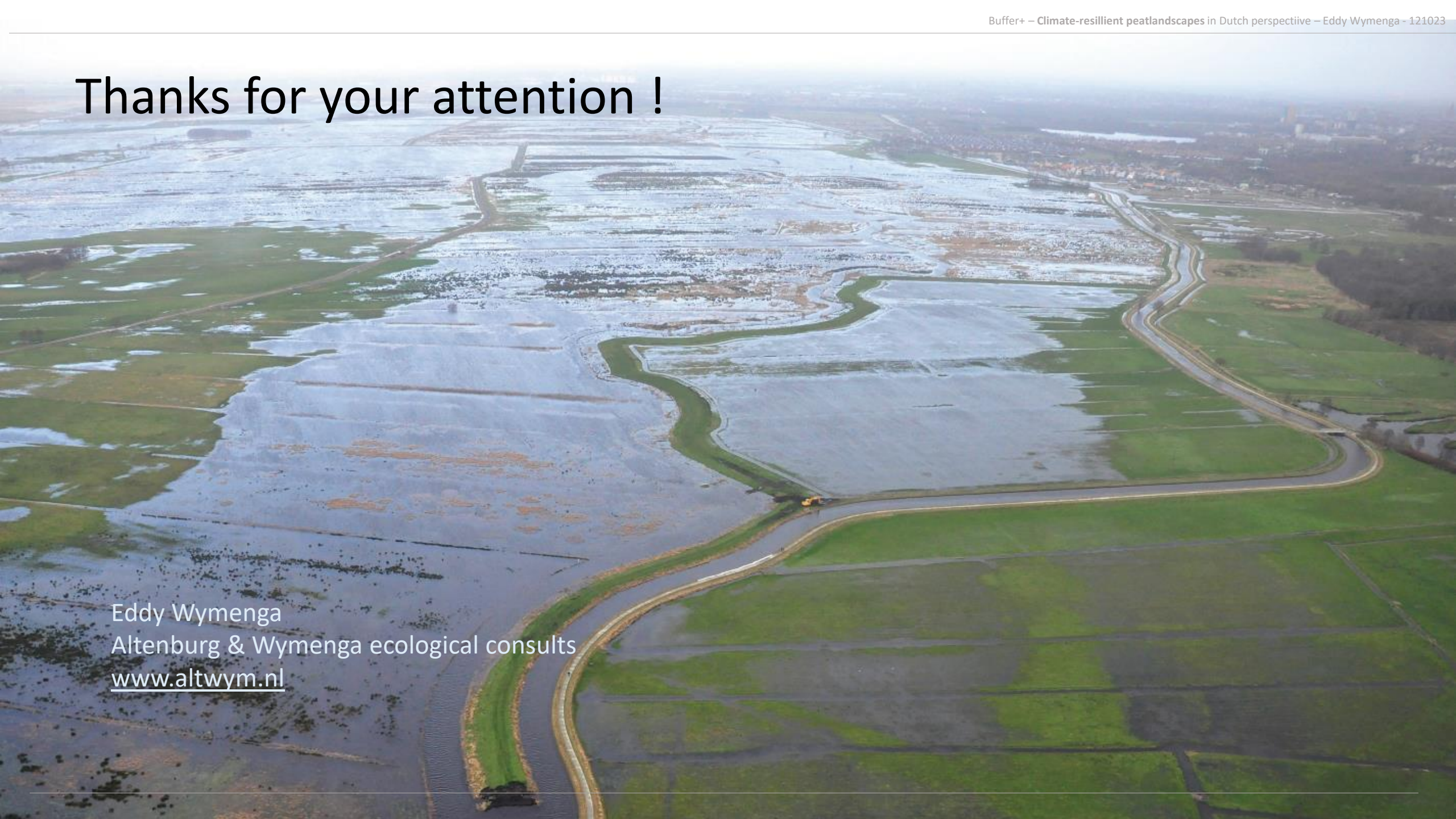
- **Convert low-lying polders into floodplains (upstream: forest?)**
- **Multifunctional use, water storage combined with wet crops (including reed marshes), sustainable fisheries**
- **Compensation needed**

Dynamic wetland nature as climate buffers



- **Convert low-lying polders into floodplains**
- **Multifunctional use with recreation and tourism - National Park incl. paludiculture, sustainable fisheries**

Thanks for your attention !



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