



# VALUATION OF THE IMPACTS OF CLIMATE CHANGE ON ECOSYSTEM SERVICES PROVIDED BY DRY HEATHLAND

**CMK**  
CENTRE FOR  
ENVIRONMENTAL SCIENCES

▶▶ **UHASSELT**

Nele Witters <sup>a</sup>  
Sebastien Lizin <sup>a</sup>  
Michele Moretti <sup>a</sup>  
Natalie Beenaerts <sup>b</sup>  
Jan Clerinx <sup>b</sup>  
Francois Rineau <sup>b</sup>  
Robert Malina <sup>a</sup>

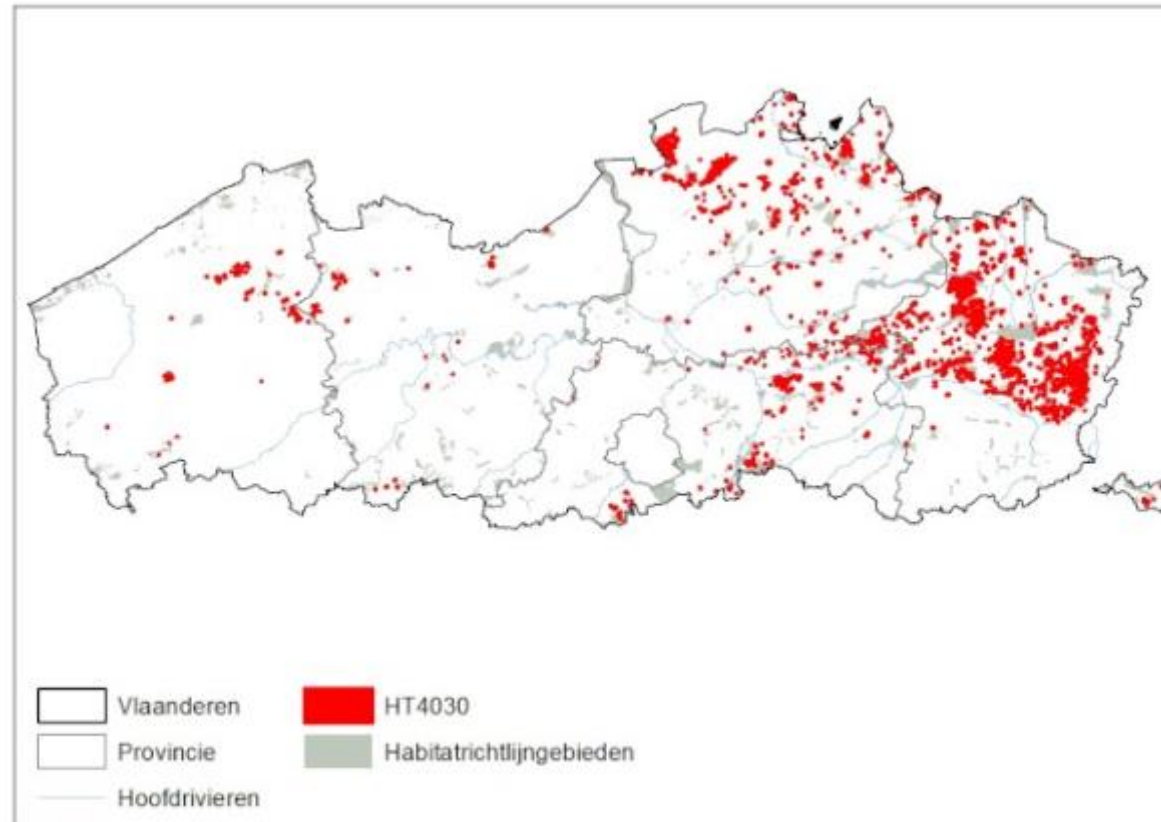
a Environmental economics group  
b Biodiversity group

# Prevalence of heathland in Europe, long ago



**FIG. 1.1** Estimates of the surface of heathland in the early 19<sup>th</sup> century derived from CORINE categories natural grassland, moors and heathlands, pine forest (categories 3.2.1, 3.2.2, 3.2.3 and 3.1.2, respectively) and mostly drained (Milne and Brown 1997). Later Improved heathlands in figure 1.2 are also included.

# An ecosystem that got massively fragmented in the last centuries



# Heathland provides services to society



**Climate regulation**

**Recreation & tourism**

**Water quality**

**Pollination**

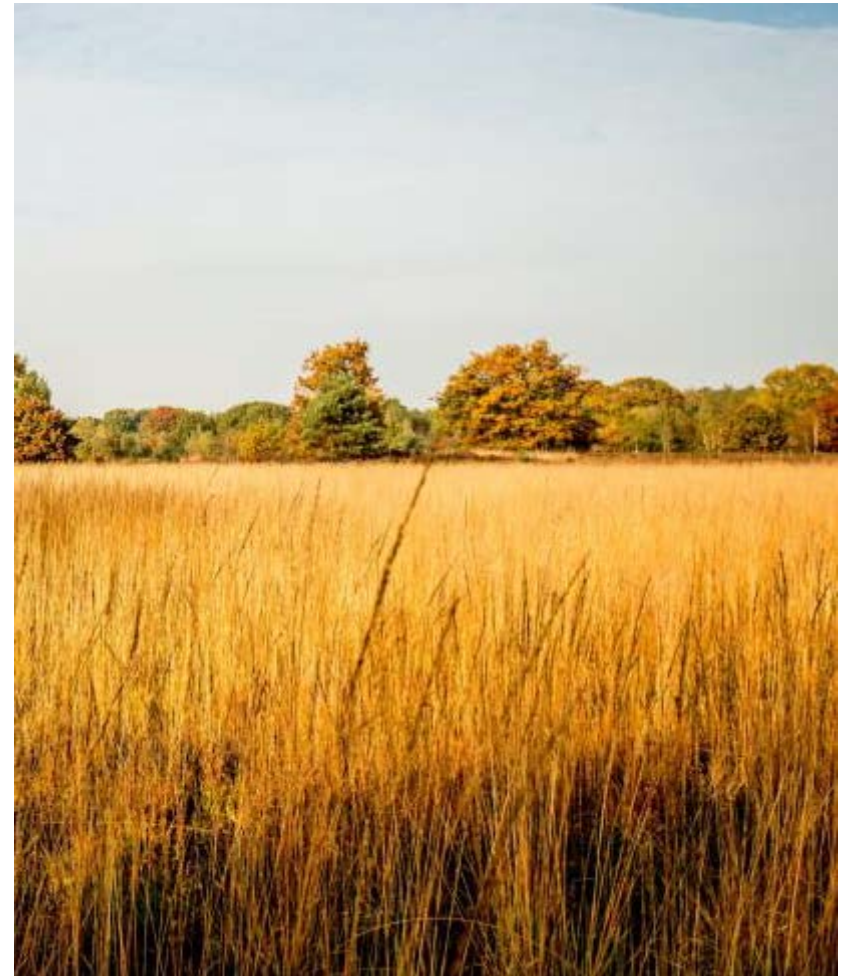
...

# Service #1: Climate regulation



Biome	Carbon density (MgC/ha)			
	WBGU <sup>a</sup>		MRS <sup>b</sup>	IGBP <sup>c</sup>
	Plants	Soil	Plants	Soil
Tropical forests	120	123	194	122
Temperate forests	57	96	134	147
Boreal forests	64	344	42	247
Tropical savannas & grasslands	29	117	29	90
<b>Temperate grasslands &amp; shrubland</b>	<b>7</b>	<b>236</b>	<b>13</b>	<b>99</b>
Deserts and semi deserts	2	42	4	57
Tundra	6	127	4	206
Croplands	2	80	3	122
Wetlands <sup>g</sup>	43	643	–	–

**This ecosystem will be subject to climate change**

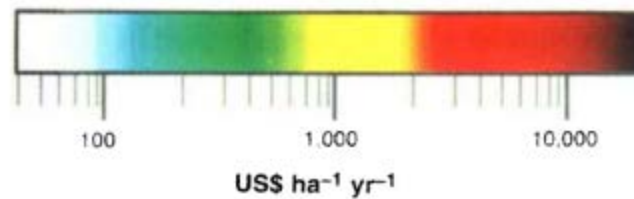
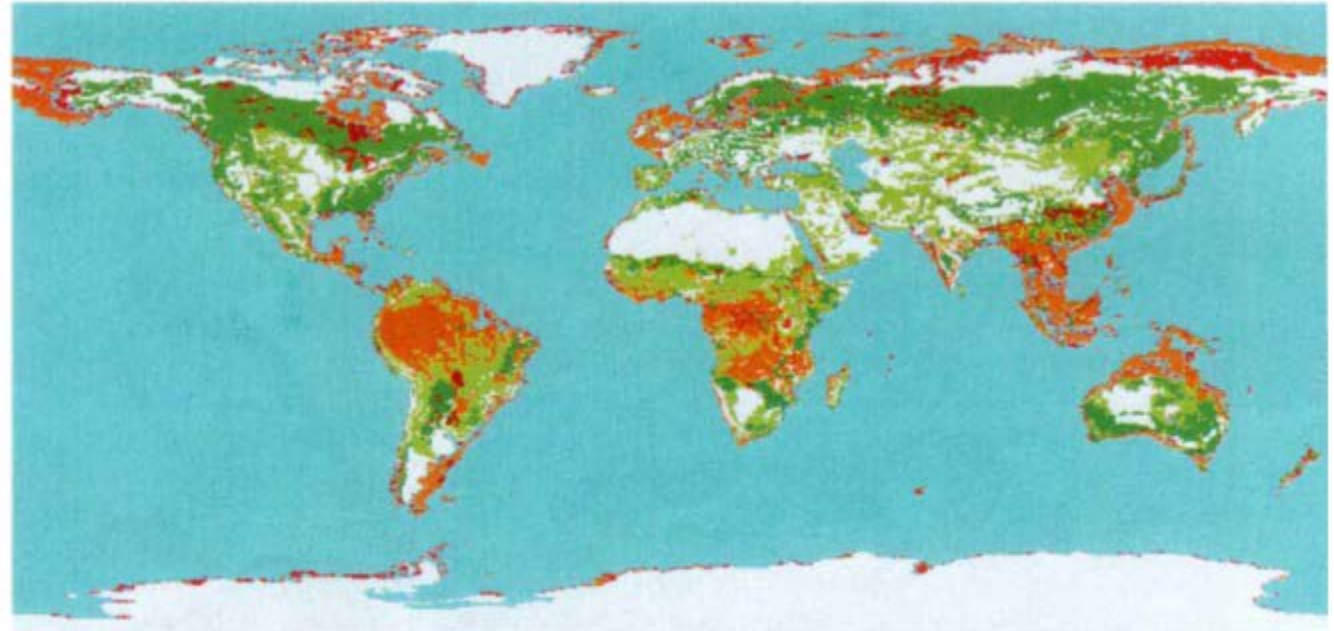


... And so will be its ecosystem services

# It will have a societal impact

... Because ecosystem services have an economic value

**Figure 2** Global map of the value of ecosystem services. See Supplementary Information and Table 2 for details.



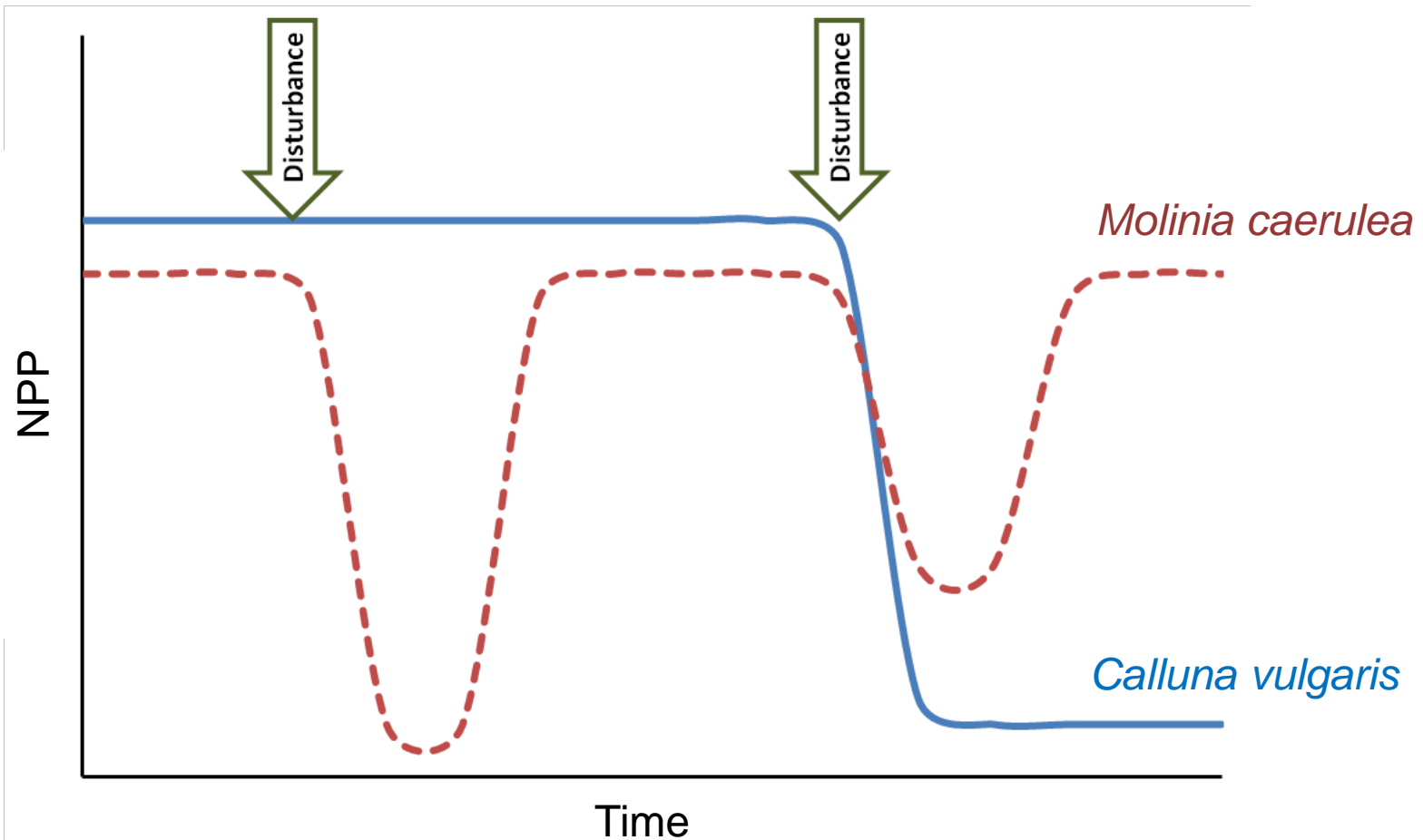
# Hypotheses



- Evaluate the economic value of heathland ecosystem services
- Assess how this value will be impacted by climate change

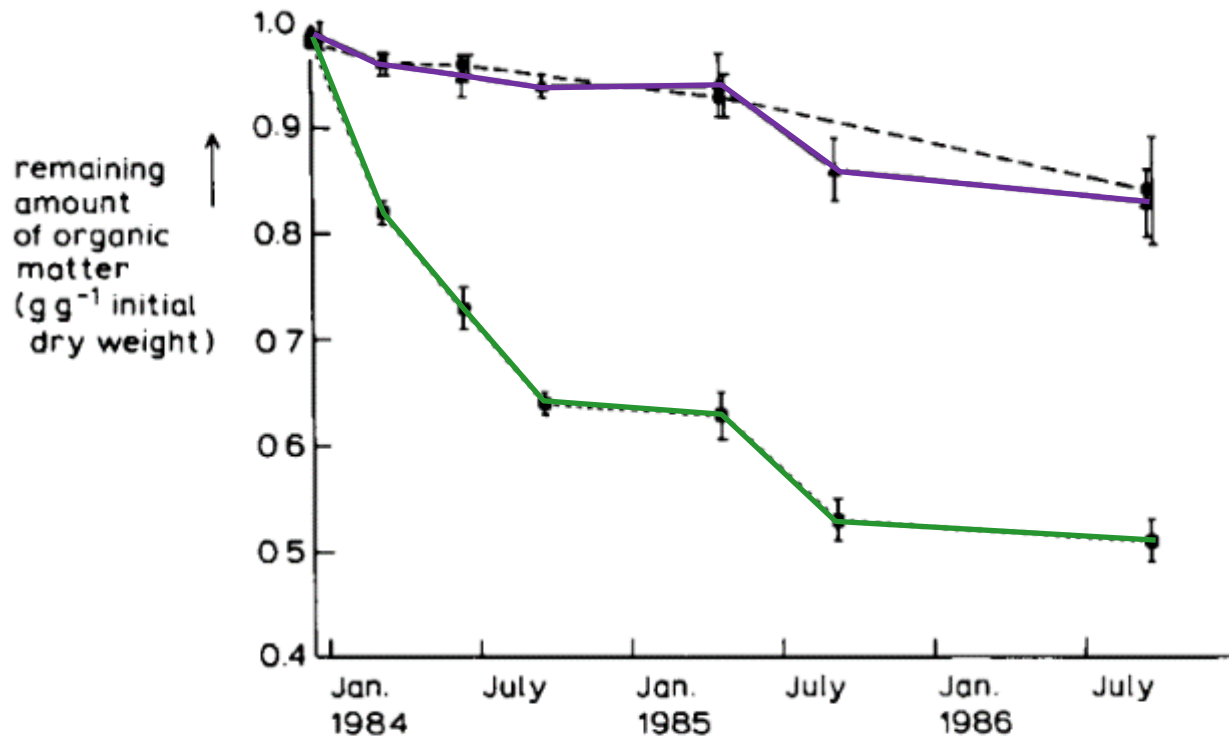


# General hypothesis: heathland and climate change

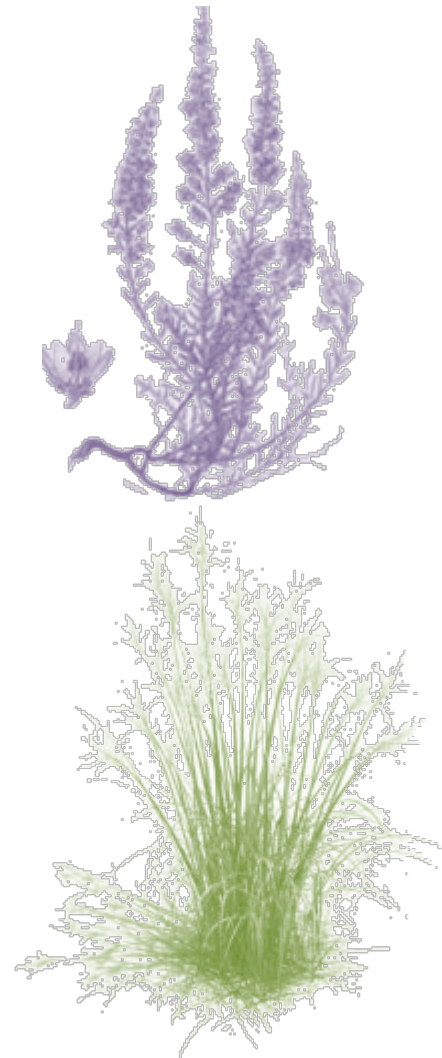


Ecology of the two dominant plants: resistant VS resilient  
Disturbances: droughts, floods, heatwaves

# Detailed hypothesis: C sequestration (1 of 2)

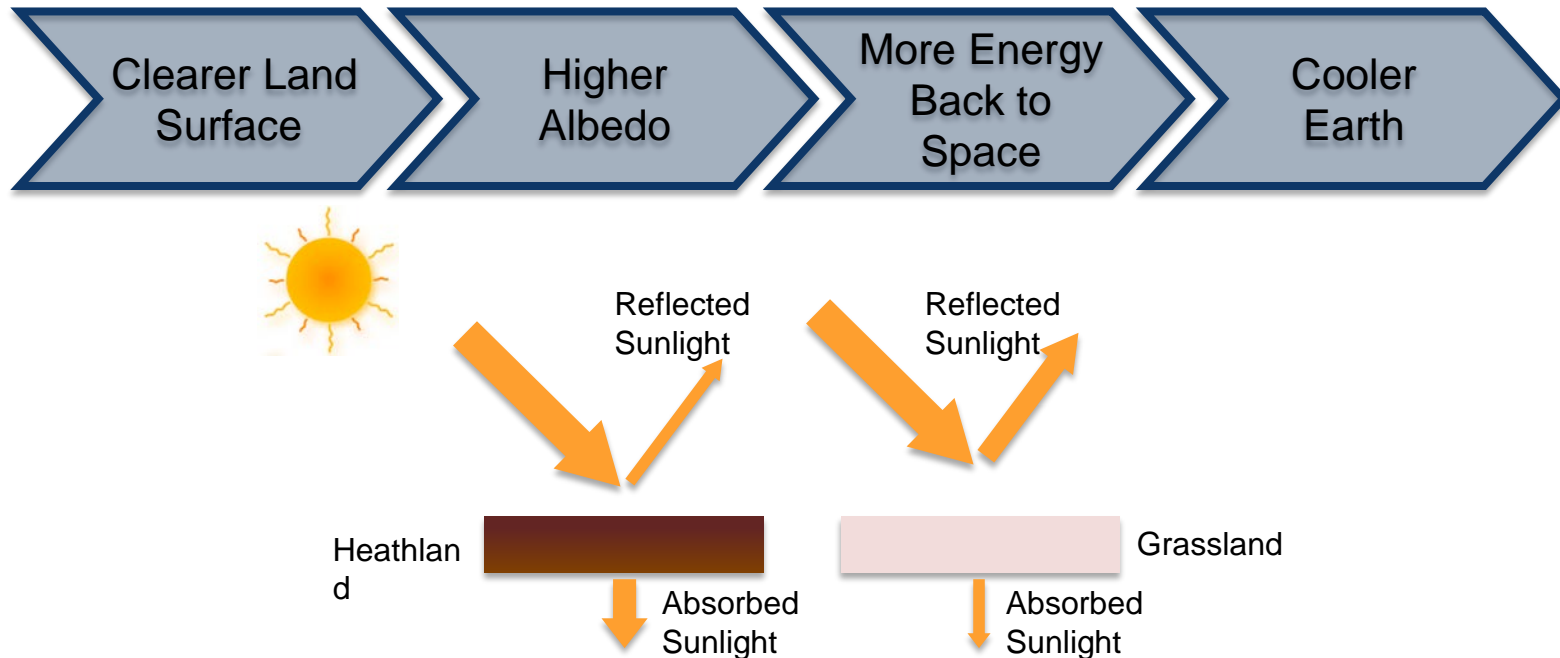


**Fig. 5.** The remaining amount of organic matter relative to the initial dry weights in *Molinia* roots (■), *Erica* fine roots (▲) and *Erica* coarse roots (●). Bars indicate standard errors of the mean



# Detailed hypothesis: albedo change

- Higher Albedo due to vegetation change



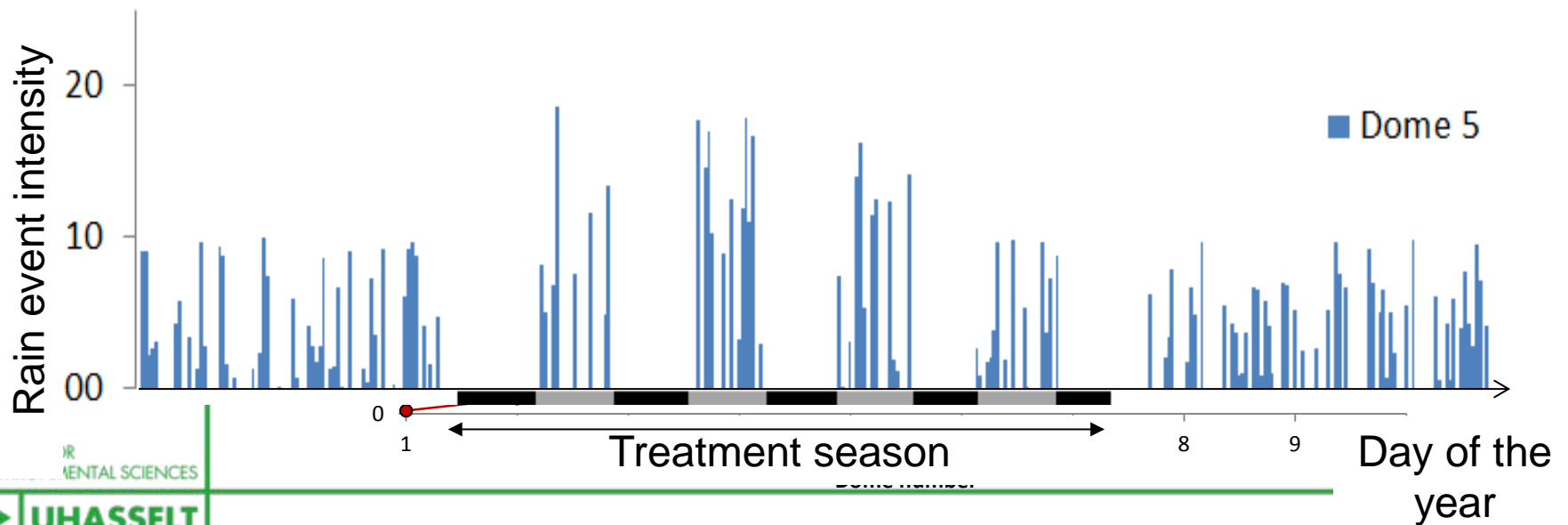
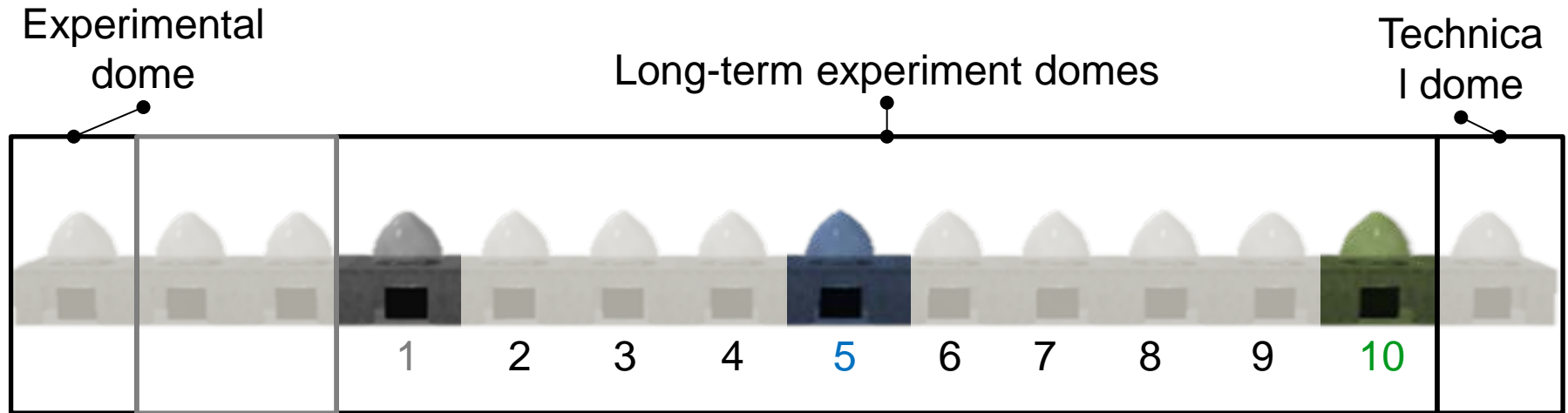
# Methods

- Ecotrons to measure changes in ecosystem processes



# Methods

- Setup of climate change experiment



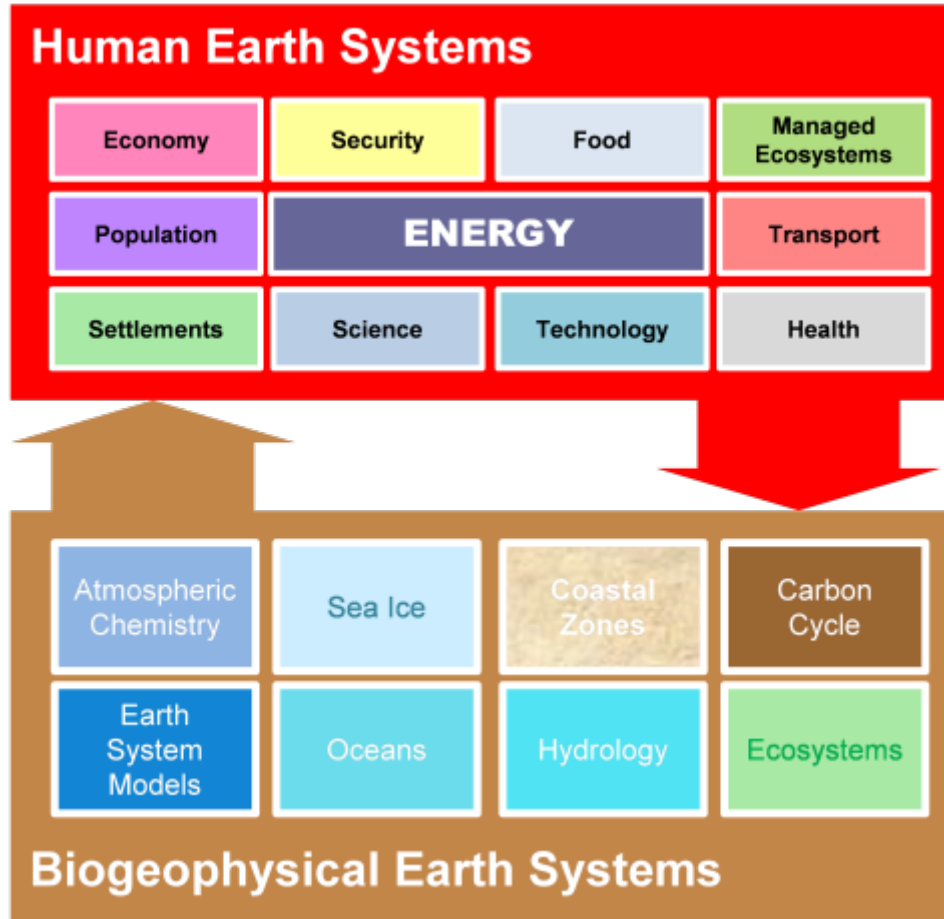
# Methods



## C sequestration

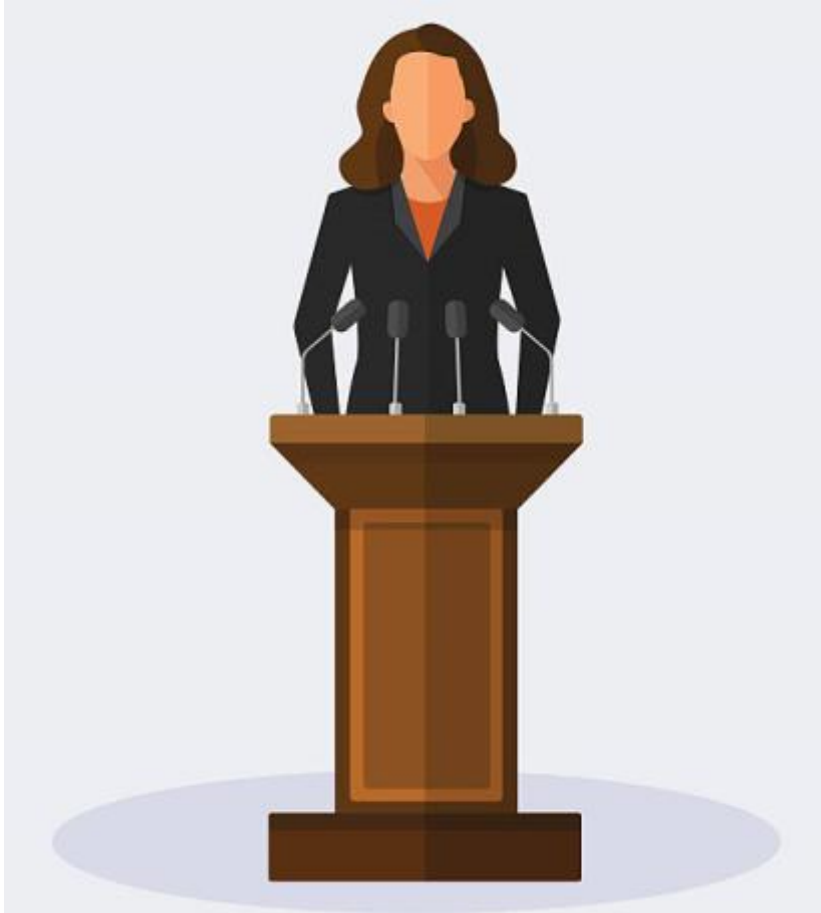
- > NPP
- > Soil biochemical analyses
- > In/out shortwave radiation

# Methods



- Changes in **carbon sequestration** converted into economic damages using **integrated assessment model**
- Changes in **surface albedo** converted into changes in radiative forcing and then inputted into **integrated assessment model**

# Impact



- **Society**
  - Microclimate regulation
  - Radiative forcing
- **Policymakers**
  - Decision tools for sensible management



# Team

## ■ CMK:

- Phd Student: Anne Nobel
- Staff: Natalie Beenaerts, Sebastien Lizin, Robert Malina, Michele Moretti, Francois Rineau, Nele Witters

## ■ **Supporting Organizations:**

- Forschungszentrum Jülich: for nitrate assimilation measurements
- Vlaamse Milieu Maatschappij: for hydrological model
- Massachusetts Institute of Technology: for economic valuation of carbon sequestration changes

# Questions?

**CMK**

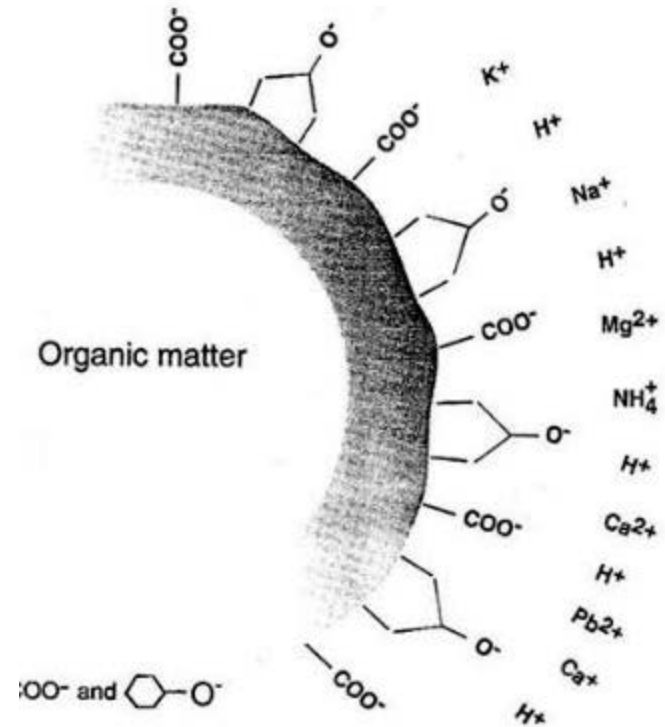
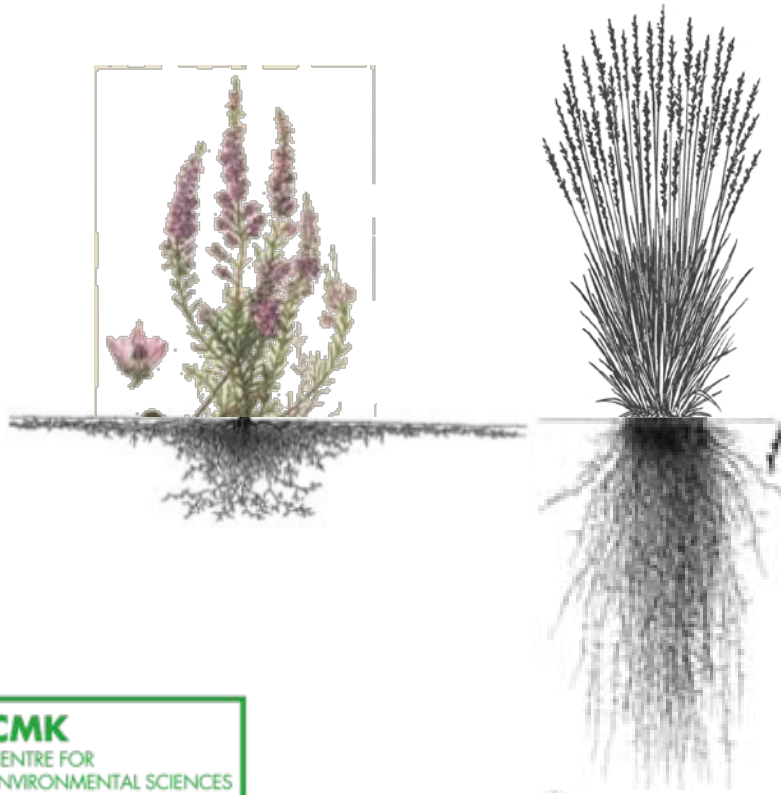
CENTRE FOR  
ENVIRONMENTAL SCIENCES



**UHASSELT**

# Detailed hypothesis: change in water purification

- Change in root density and architecture
- Change in properties of the organic matter



## Detailed hypothesis: change in recreational value

- Heathland is a rare ecosystem and has high recreational value
- Our hypothesis is that recreational value is partially dependent on presence of heath, i.e. that visitor numbers would decrease

