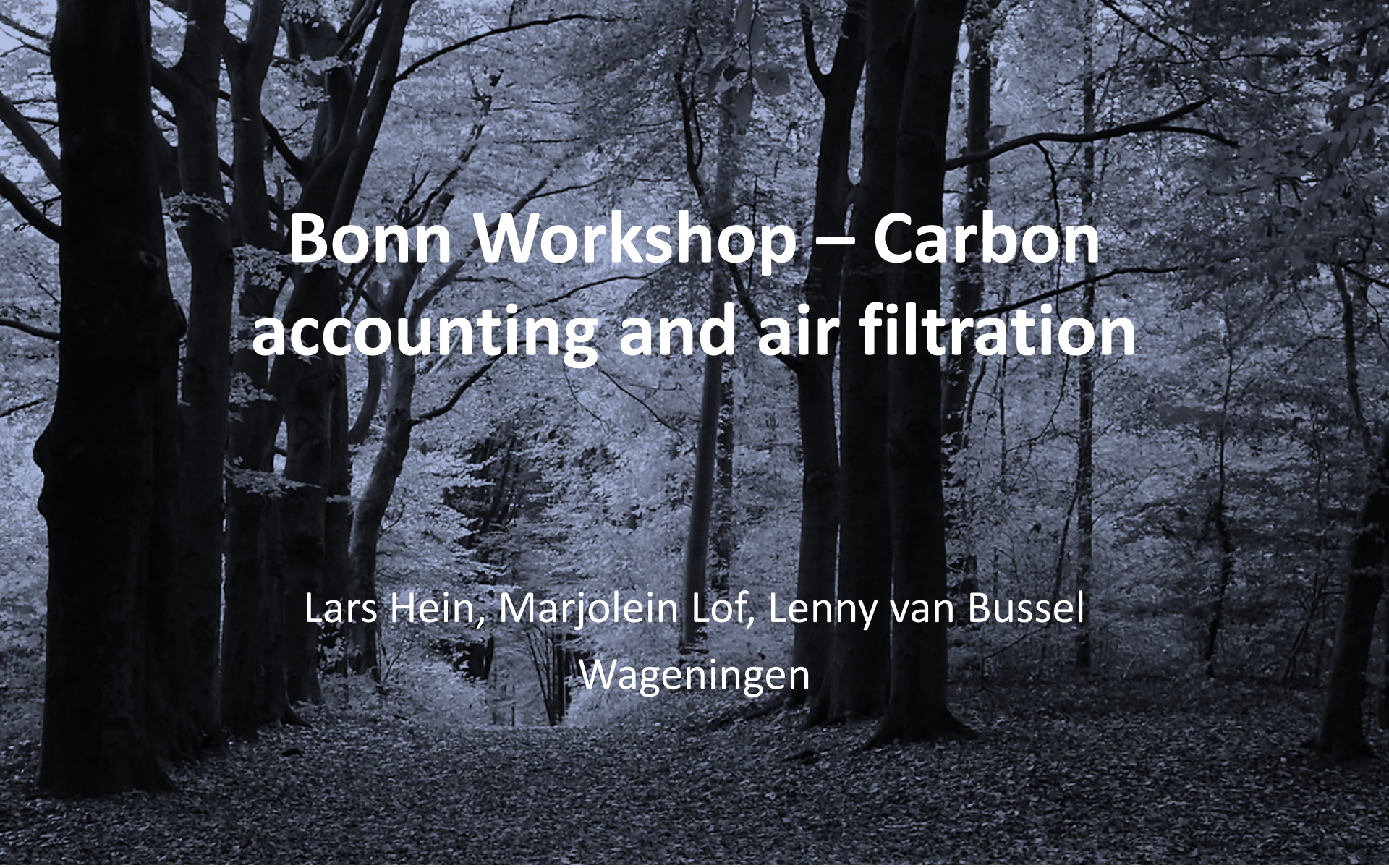

# Bonn Workshop – Carbon accounting and air filtration

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Wageningen

# Natural capital accounting in the Netherlands

- ongoing work –

- 3 year project, financed by Ministry of Economic Affairs and Ministry of Infrastructure and the Environment
- National pilot for the Netherlands
- Testing the SEEA EEA
  - Extent account
  - Condition account
  - Physical ecosystemservices supply and use accounts
  - Monetary ecosystem services supply and use accounts
  - Preliminary testing of asset and capacity accounts

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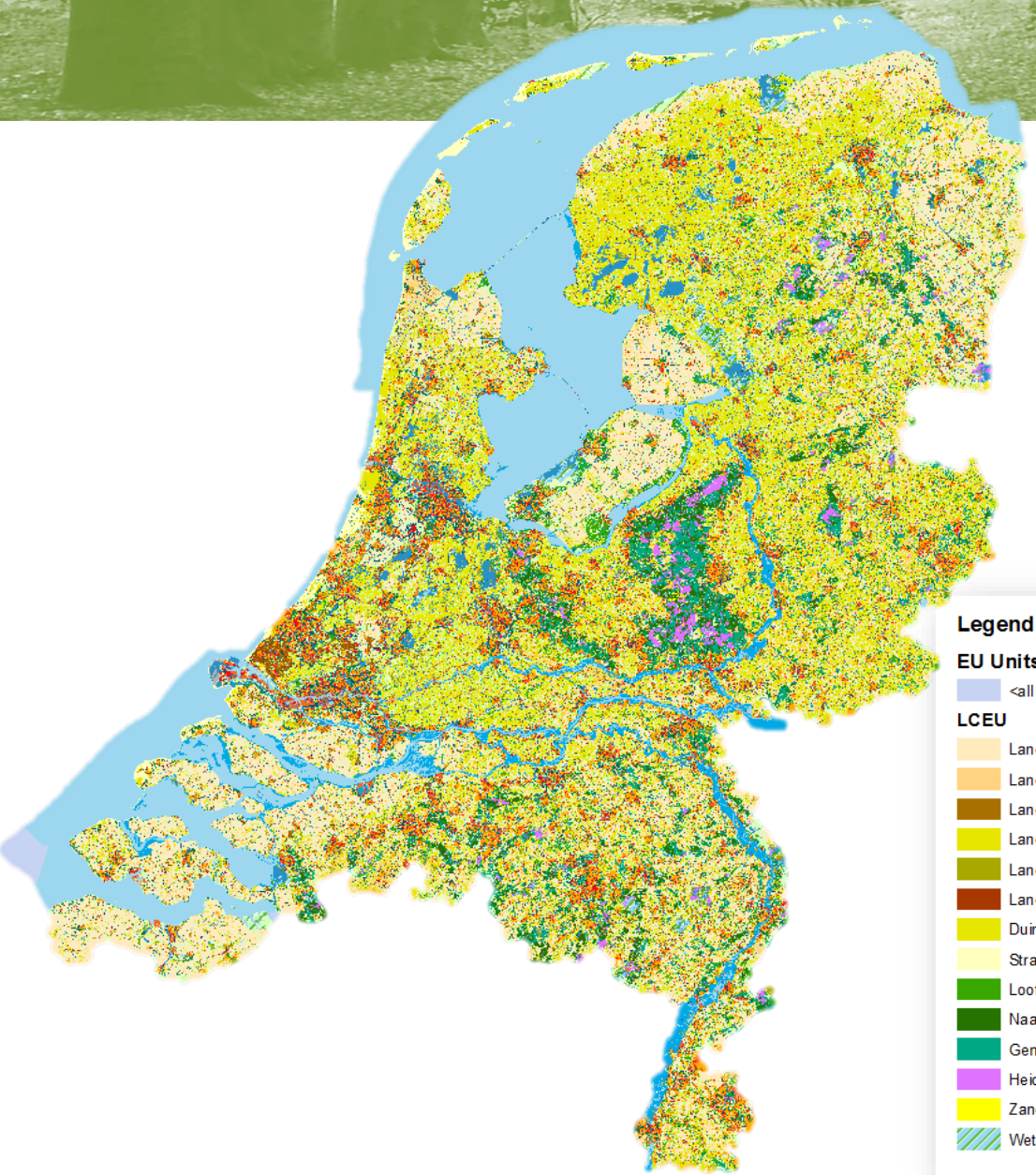
# Methodology

## Ecosystem type map of the Netherlands

Based on 5 basemaps from CBS and cadastre



**Legend**

**EU Units**

- <all other values>

**LCEU**

- Landbouw: eenjarige gewassen
- Landbouw: meerjarige gewassen
- Landbouw: kassen
- Landbouw: grasland voor veeteelt
- Landbouw: faunarand
- Landbouw: bebouwd
- Duinen met vaste begroeing
- Strand, droogvallend zand en actieve duinen
- Loofbos
- Naaldbos
- Gemengd bos
- Heide
- Zand
- Wetlands
- Grasland, geen weiland
- Openbaar groen
- Overig onverhard terrein
- Uiterwaarden
- Kwelders
- Woongebied
- Kantoren en bedrijven; industrie
- Kantoren en bedrijven; services
- Kantoren en bedrijven; overheid
- Wegen, parkeerterrein, overig verhard terrein
- kantoren en bedrijven; bosbouw
- Kantoren en bedrijven; visserij
- Kantoren en bedrijven; niet-commerciële dienstverlening
- Zee
- Meren, plassen, overig binnenwater
- Rivieren
- Onbekend

# Ecosystem services (NLs)

## Provisioning services

- Crop production
- Fodder production
- Timber production
- Other biomass
- Water supply

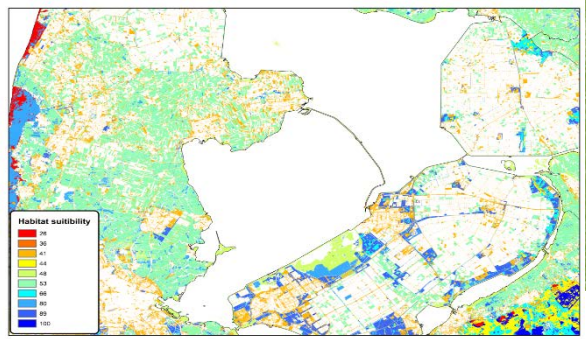
## Regulating services

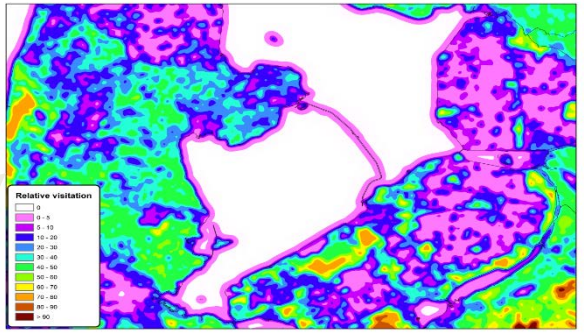
- Carbon sequestration
- Erosion control
- Air filtration
- Water infiltration
- Pollination
- Pest control

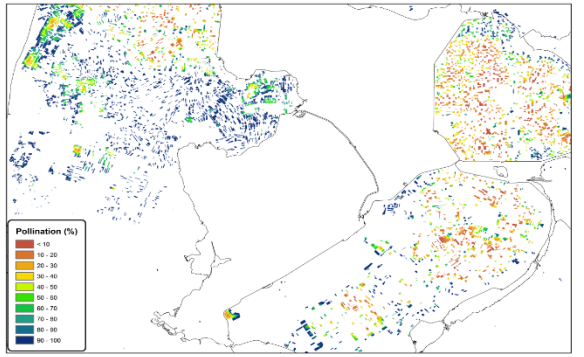
## Cultural services

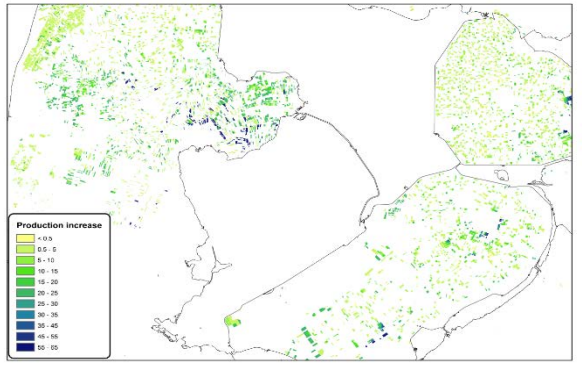
- Nature recreation (hiking)
- Nature tourism

Multiple datasets and models per service

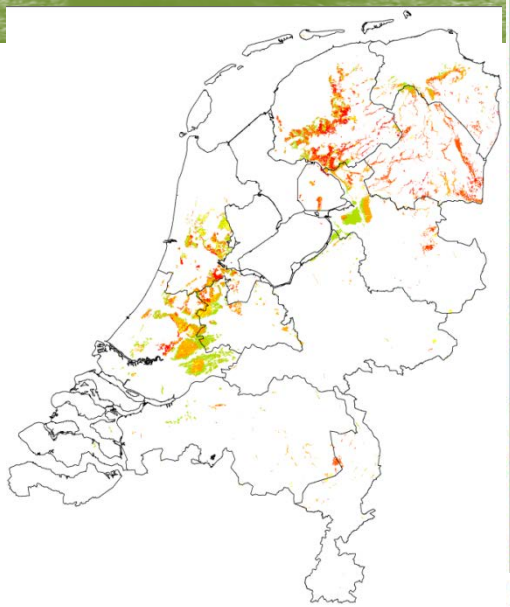


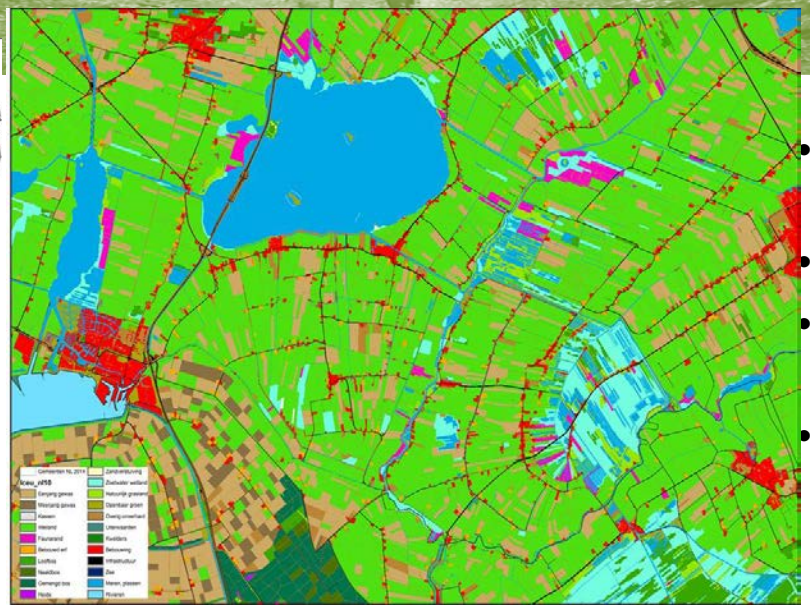



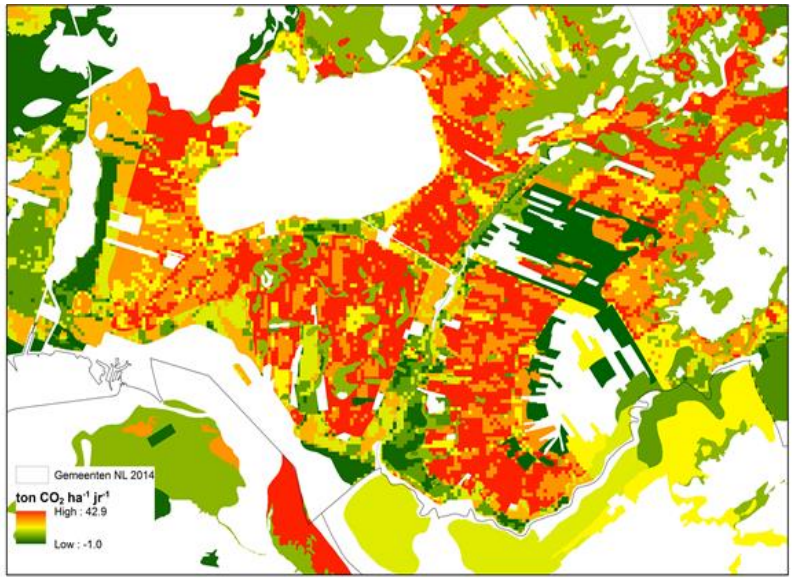



# From accounts to policy support








**Carbon emission by peat**

**t C ha$^{-1}$ yr$^{-1}$**

- 0 - 0.25
- 0.25 - 2.5
- 2.5 - 5
- 5 - 7.5
- 7.5 - 10
- 10 - 12.5

- $CO_2$ emission peat ~4% of national emissions
- Depend upon drainage
- Different management leads to major emission reductions
- Accounts can facilitate local actions

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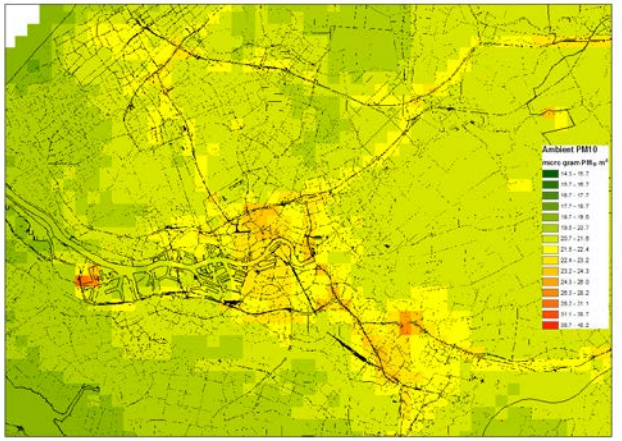
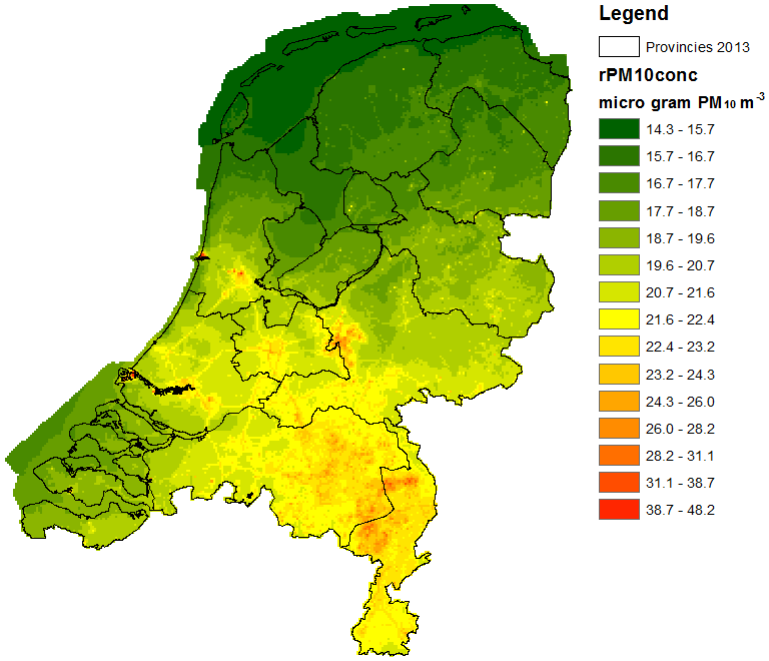
# Air filtration in the NLs - material

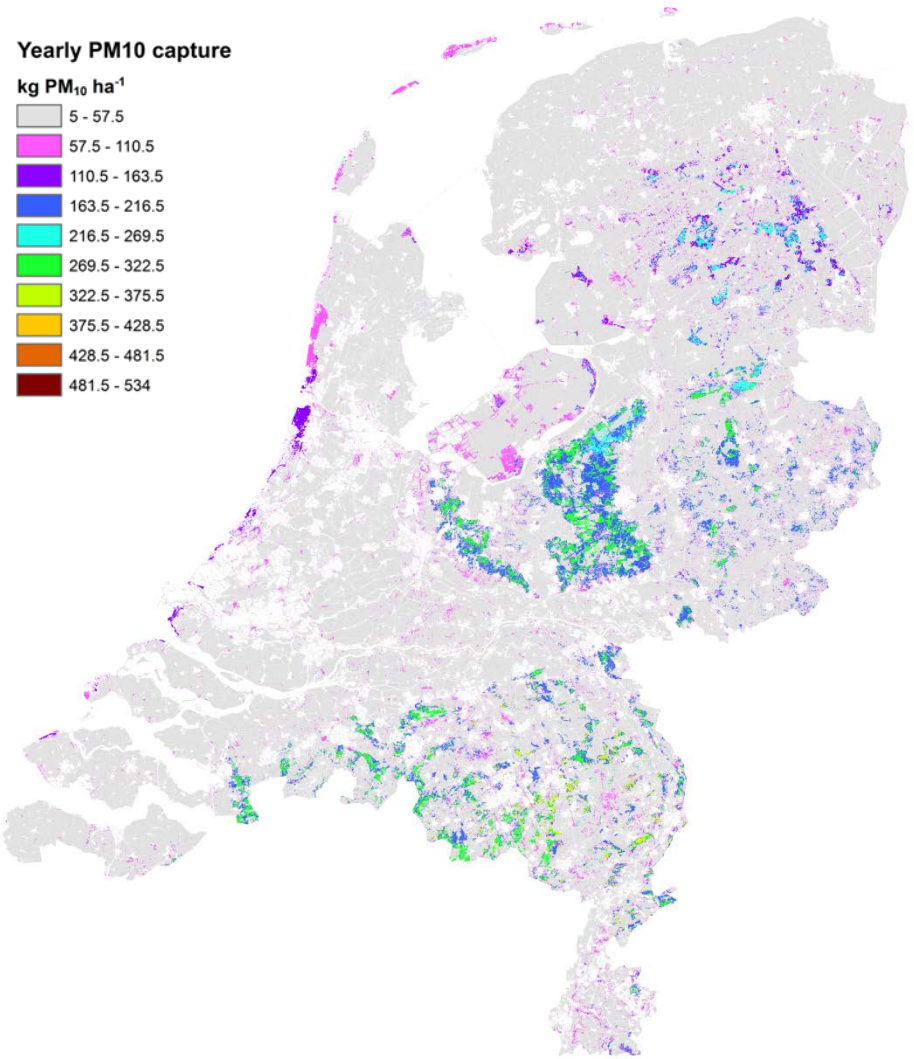
- Data
  - Ambient $PM_{10}$ concentration
  - Ecosystem type map



- Model parameters:
  - LUT deposition velocity (ET)
  - LUT surface area (ET)
  - Length growth season (ET)
  - Rainy days



# $PM_{10}$ capture




- Input: ambient $PM_{10}$ concentration
- Largest contribution by coniferous trees
- Mean capture: 27 kg $PM_{10}$ $yr^{-1}$ $ha^{-1}$
- Total capture: 72,500 tonne $PM_{10}$ $yr^{-1}$

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# Valuation of air filtration

- Building upon work by Remme et al. – avoided damage cost approach
  - requires modelling reduction in exposure due to air filtration – question: which distance applies?

| Health impact categories | Physical impact per person per µg $PM_{10}$ ($1/(\mu g/m^3)$) | Treatment costs per case for 2010 (€) |
|---|---|---|
| Work loss days | $1.39 * 10^{-2}$ | 362 |
| New case chronic bronchitis | $1.86 * 10^{-5}$ | 22748[a] |
| Respiratory hospital admission | $7.03 * 10^{-6}$ | 2453 |
| Cardiac hospital admission | $4.34 * 10^{-6}$ | 2453 |
| Medication/bronchilator use child | $4.03 * 10^{-4}$ | 1.23 |
| Medication/bronchilator use adult | $3.27 * 10^{-3}$ | 1.23 |
| Lower respiratory symptoms adult | $3.24 * 10^{-2}$ | 47 |
| Lower respiratory symptoms child | $2.08 * 10^{-2}$ | 47 |
| Total avoided costs per person per avoided $PM_{10}$ concentration increase | | |

[a] Adapted from RIVM (2012).

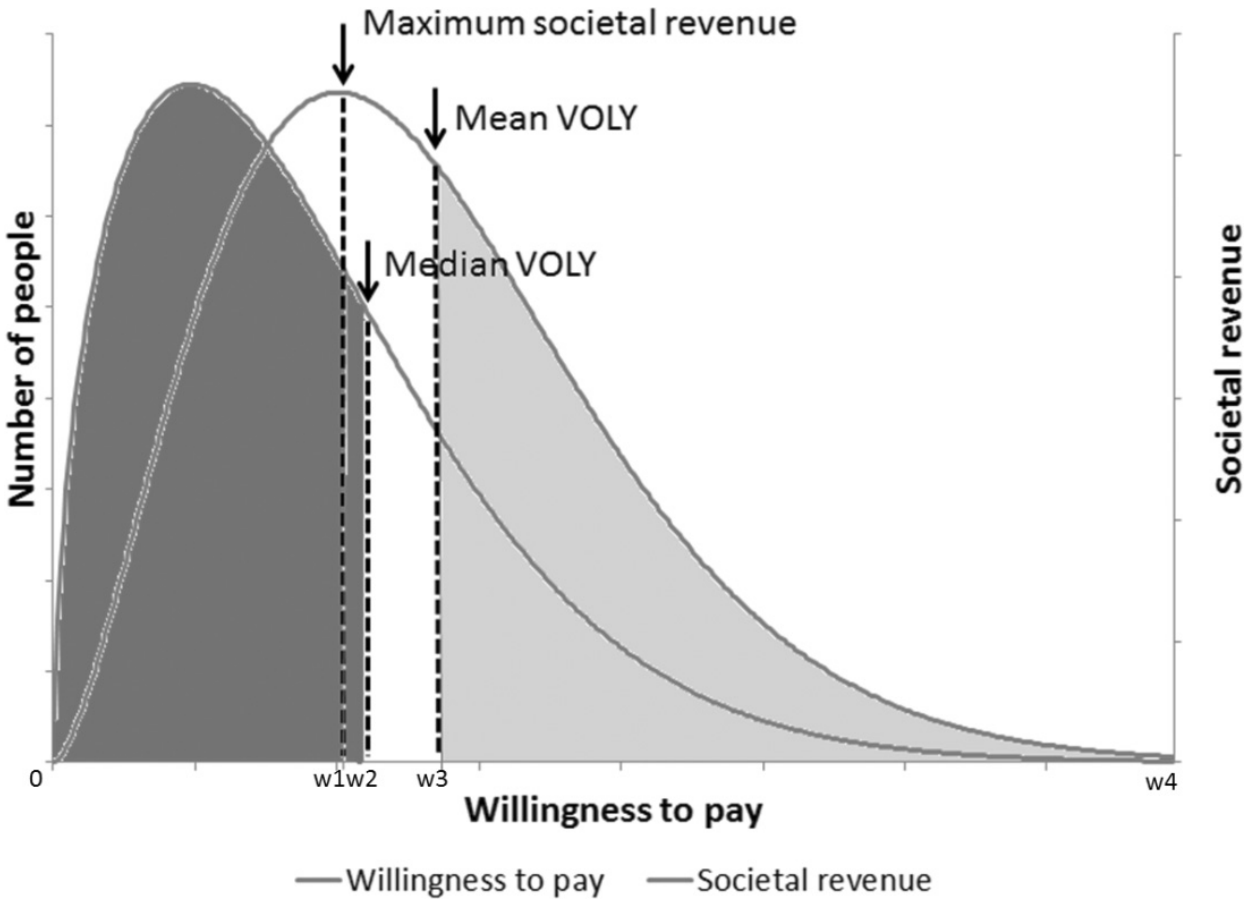
# Valuing air filtration

- Large difference in valuing air filtration with exchange value approach and welfare-based approach
- Limburg province: exchange values: €2 million/year, i.e. approximately €900/ton PM10 avoided.
- When compared to air quality regulation studies reviewed in Gómez-Baggethun and Barton (2013), our results (in €/ton PM10 avoided) are between a factor2 to 20 lower.
- If all welfare-related health damage categories are included, the air quality regulation value would be about €4900/ton PM10 avoided and the provincial value of this service would be nearly €11 million.

# Valuation approaches

- Strict interpretation of exchange value
- Simulated exchange value
- Welfare based

# Akin to SEV




- WTP for increased life expectancy as it can be related to air filtration based on Hein et al., 2016

# Discussion questions

- Any further insights in the spatial relation between PM deposition and reduced exposure?
  - Note: NO2 seen as being more rapidly diluted
- Does the valuation approach appear sound?
  - Based on avoided damage costs related to medical costs, loss of working days
  - Note that this approach would not change GDP
- And/or is the SEV approach applicable?
  - Note that this approach would change GDP if the value of ES would be added to other goods and services