Data sources for ecosystem accounting

Examples from the Netherlands

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Overview

- Overview of ecosystem accounting in the Netherlands
- Overview of data sources used for compiling the accounts
- Use of big data for ecosystem accounting

Ecosystem accounts in the NL

- **Aim:** *To test and develop detailed physical ecosystem accounts for the Netherlands and to experiment with the monetary ecosystem accounts.*

- Conform the international guidelines of SEEA-EEA

- National and regional level

- Financed by the ministry of Economic affairs and the ministry of infrastructure and environment

- By Statistics Netherlands and Wageningen university

- Four year project (2016-2020) in 3 phases (2 have been approved)

The SEEA-EEA Framework

1. Extent
   - (spatial)
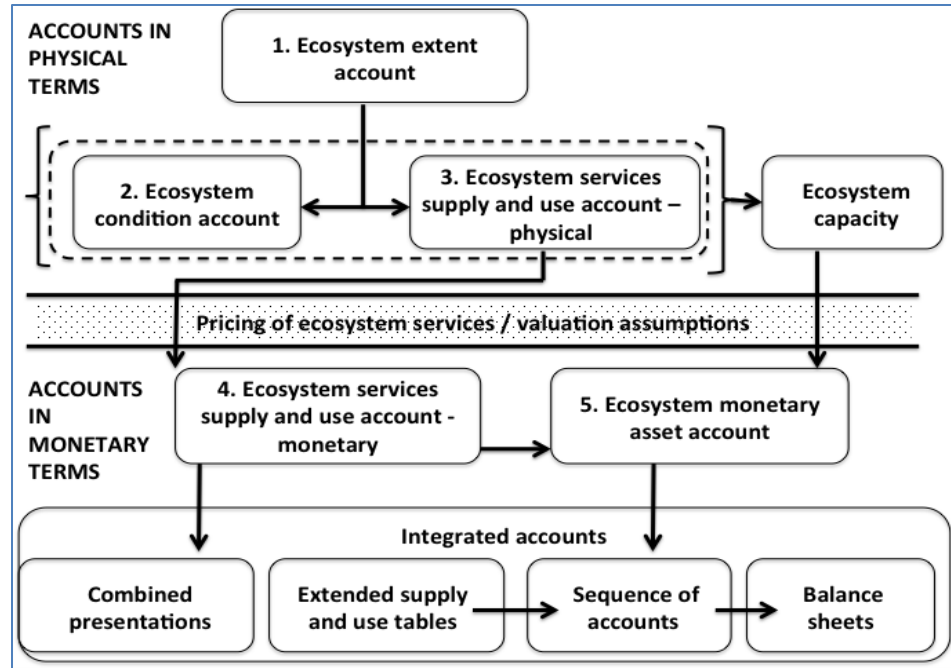
2. Condition
   - (indicators)

3. ESS Supply/use
   - (physical)

4. ESS Supply/use
   - (monetary)

5. Asset account
   - (monetary)

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Ecosystem accounts NL

- Extent account ✓
- Carbon account ✓
- ESS supply/use – physical ✓
- Condition account ✓
- Biodiversity account 🕐
- ESS supply/use – monetary ✓
- Asset account ✓

Overview data sources for ecosystem accounting

SNA / SEEA CF

SEEA EEA

Official statistics

Survey data

Kadastre data

Administrative data sources

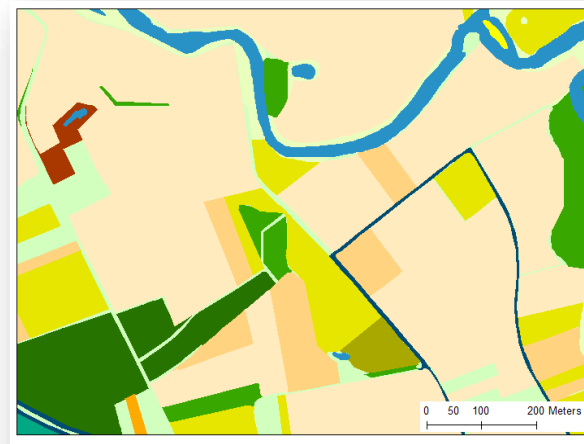Remote sensing data

(Other) spatially explicit data sets

Look up tables

Big data

Data sources for the extent account

SNA / SEEA CF

SEEA EEA

Official statistics ————————————————▶

Survey data

Kadastre data ————————————————▶

Administrative data sources ——————————▶

Remote sensing data

(Other) spatially explicit data sets ————————▶

Look up tables

Big data

Extent account

Ecosystem Units map

Non-perennial plants	Public green space
Perennial plants	Other unpaved terrain
Greenhouses	Riverflood basin
Meadows (grazing)	Salt marsh
Bushes and hedges bordering fields	Residential area
Farmyards and barns	Industry: offices and businesses
Dunes with permanent vegetation	Services: offices and businesses
Active coastal dunes	Publica administration: offices and businesses
Beach	Roads, parking lots, runway, other
Deciduous forest	Forestry: offices and businesses
Coniferous forest	Fishery: offices and businesses
Mixed forest	Non-commercial services: offices and businesses
Heath land	Sea
Inland dunes	Lakes and ponds
Fresh water wetland	Rivers and streams
(semi) Natural grassland	Other

Data sources for the condition account

SNA / SEEA CF

SEEA EEA ⟶

Official statistics ⟶

Survey data

Kadastre data

Administrative data sources

Remote sensing data ⟶
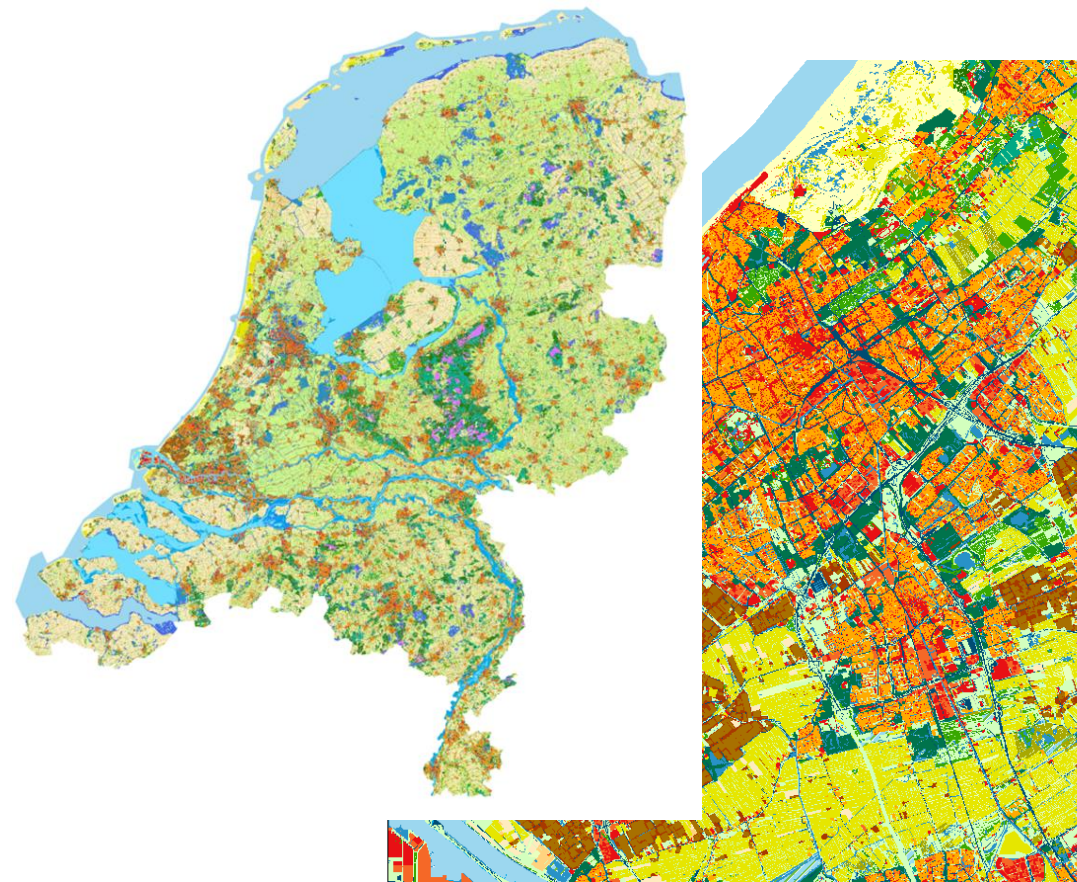
(Other) spatially explicit data sets ⟶

Look up tables ⟶
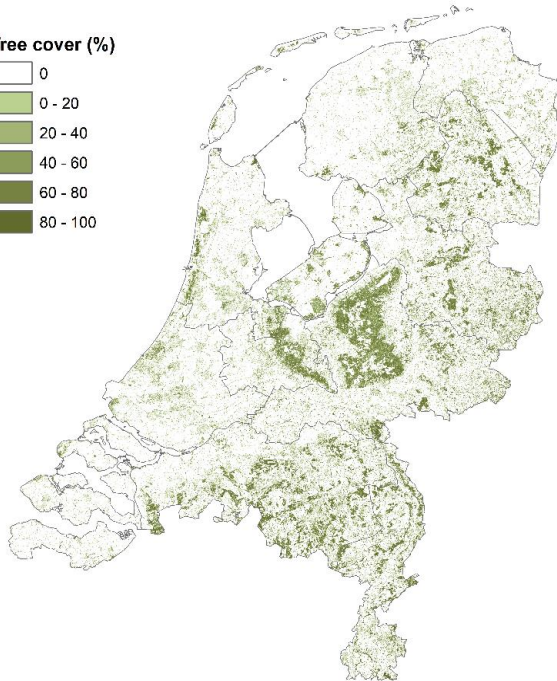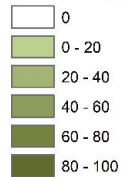
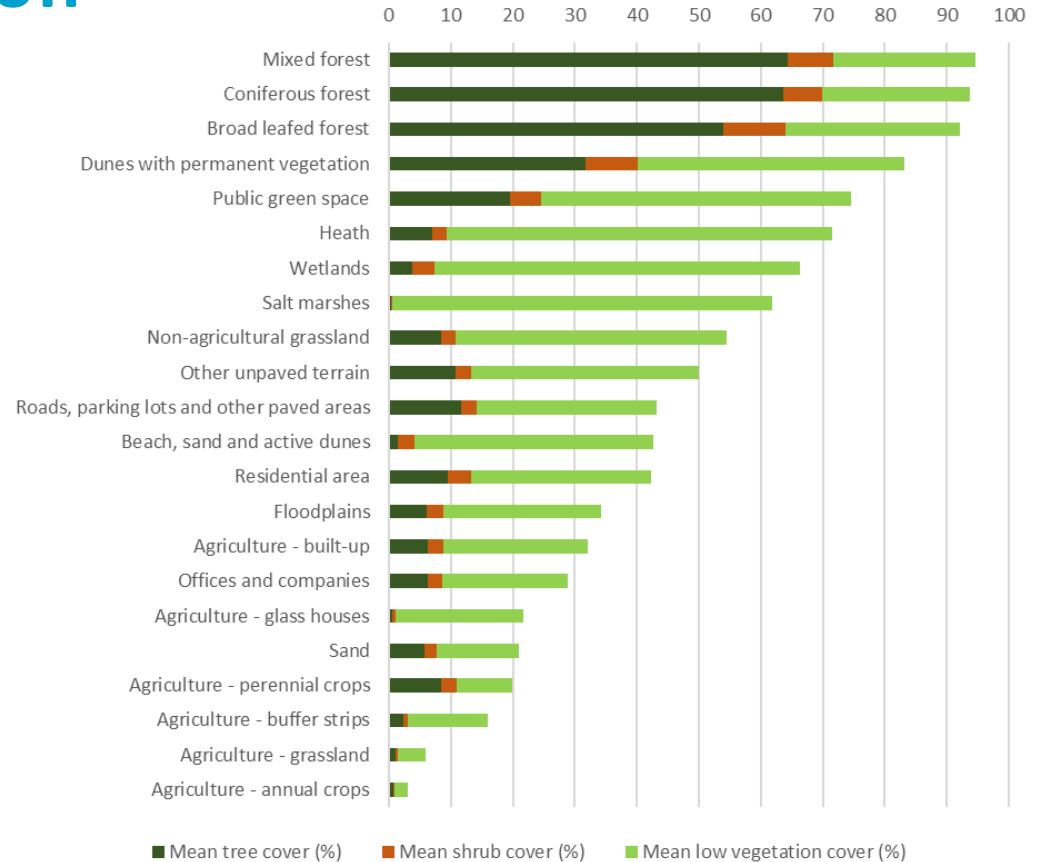Big data

Condition account

Example from condition account: vegetation

Tree cover (%)
- 0
- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100

Mean vegetation cover (%)

- Mean tree cover (%)
- Mean shrub cover (%)
- Mean low vegetation cover (%)

Data sources for the physical ecosystem services supply use tables

SNA / SEEA CF

SEEA EEA

Official statistics

Survey data

Kadastre data

Administrative data sources

Remote sensing data

(Other) spatially explicit data sets

Look up tables

Big data

Physical supply use tables

Physical ecosystem services

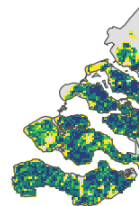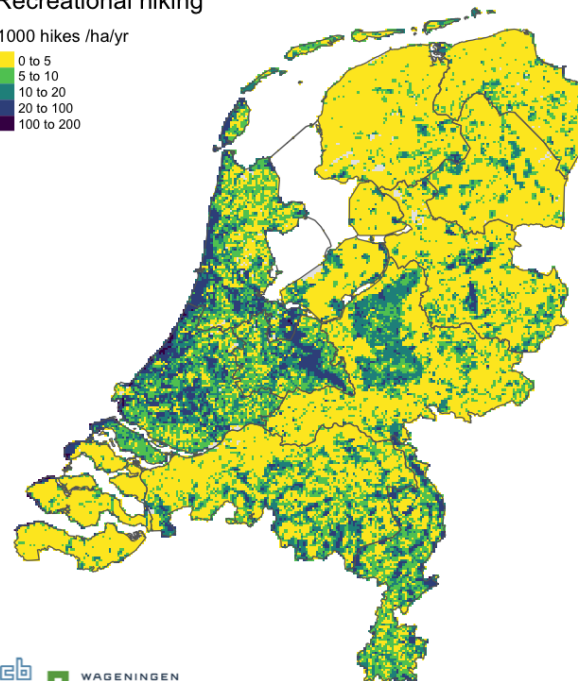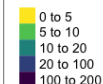| Ecosystem services |
| --- |
| **Provisioning services** |
| Crop production |
| Fodder production |
| Wood production |
| Biomass from non-agricultural sources |
| Drinking water |
| **Regulating services** |
| Carbon sequestration in biomass and soil |
| Pollination |
| Natural pest control |
| Erosion control |
| Air filtration |
| Protection against flooding |
| **Cultural services** |
| Nature recreation (hiking) |
| Nature tourism |

Foodcrop production

ton/ha/yr
- 0 to 5
- 5 to 10
- 10 to 20
- 20 to 50
- 50 or more

Yearly PM10 capture

kg PM10 /ha/yr
- 0 to 2
- 2 to 5
- 5 to 10
- 10 to 20
- 20 to 50
- 50 or more
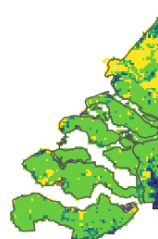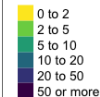
Recreational hiking

1000 hikes /ha/yr
- 0 to 5
- 5 to 10
- 10 to 20
- 20 to 100
- 100 to 200

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Data sources for the monetary accounts

SNA / SEEA CF ————————————→

SEEA EEA ————————————→

Official statistics ————————————→

Survey data

Kadastre data

Administrative data sources ————————————→

Remote sensing data

(Other) spatially explicit data sets ————————————→

Look up tables ————————————→

Big data

Monetary supply use tables / asset account

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Results monetary accounts

		Provisioning services	Regulating services	Cultural services	Total	Share in total value
		mln euro	mln euro	mln euro	mln euro	%
Agriculture		1264	219	3483	4966	38,4%
Dunes and beaches		2	94	2228	2324	18,0%
Forest		41	212	1781	2035	15,7%
Heath land and inland dunes		0	9	259	268	2,1%
Fresh water wetlands		0	7	139	146	1,1%
(Semi) Natural grassland		0	21	195	217	1,7%
Public green space		0	27	864	891	6,9%
Other unpaved terrain		3	113	1029	1145	8,8%
River flood basin and salt marshes		21	54	185	260	2,0%
Built-up terrain		0	23	50	74	0,6%
Water		0	6	617	623	4,8%
Other		0	0	1	1	0,0%
TOTAL		1332	784	10833	12949	100,0%

all_assets
keuro/ha
- 0
- < 50
- 50-100
- 100-150
- 150-200
- 200-250
- > 250
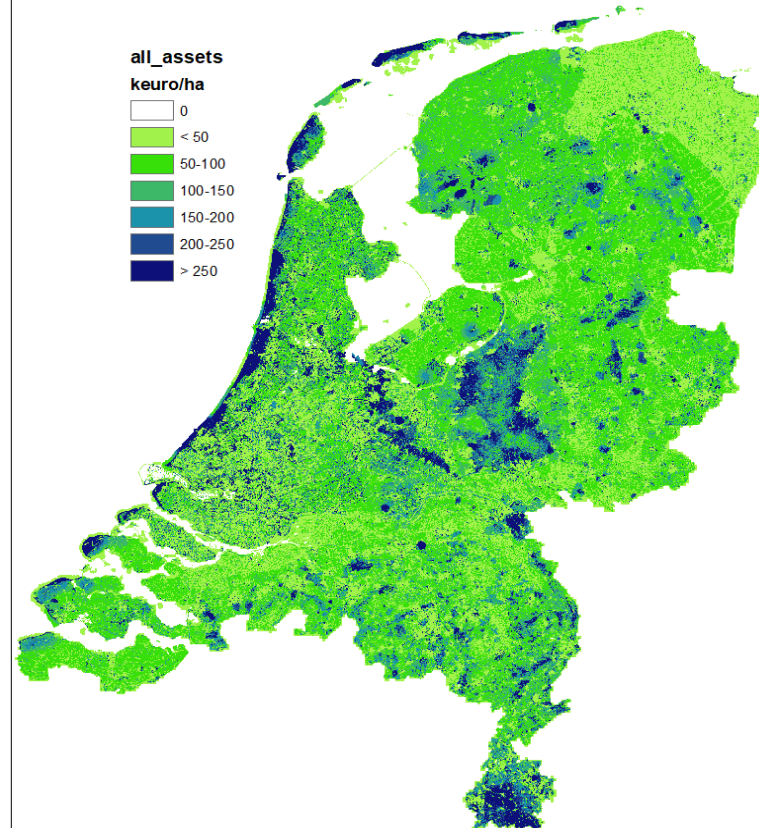
A typology for cultural services

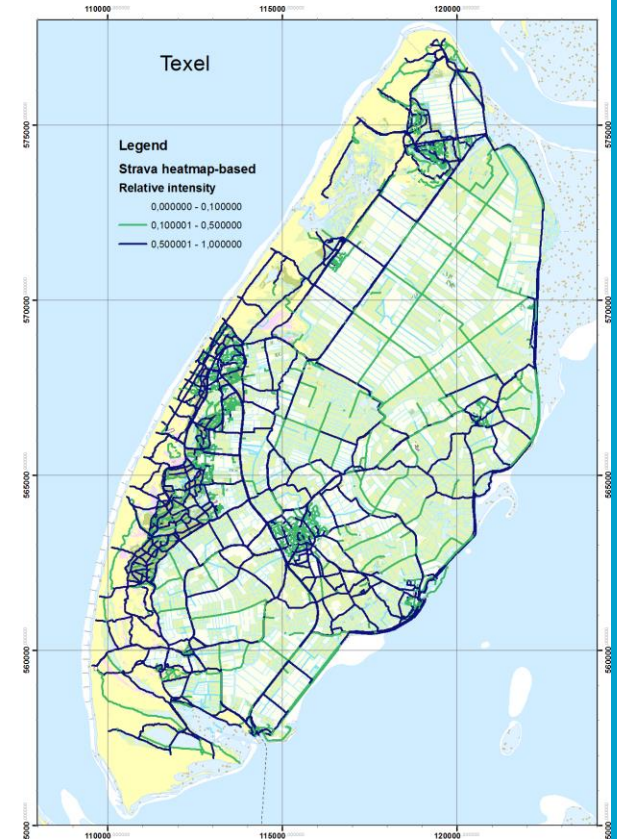| Type of service	Information flow	Sources	Benefit
Activity	Providing an attractive environment for recreation	STRAVA flickr (Twitter)	Recreational activity
Aesthetic	Generating a sensory configuration of beauty	flickr (Twitter)	Scenic view
Amenity	Contributing to the desirability of a place or building		Pleasant living environment
Artistic	Role in the realisation of art	flickr	Artistic expression
Habitat	Conferring a sense of ecological importance	iNaturalist.org eBird	Species record
Heritage	Generating a sense of historic attachment	flickr	Sense of place
Knowledge	Contributing to the development of knowledge	flickr GBIF	Scientific knowledge, educated students
Religious and spiritual	Conferring a sense of spiritual importance	(Twitter) flickr	Spiritual experience

Tourism

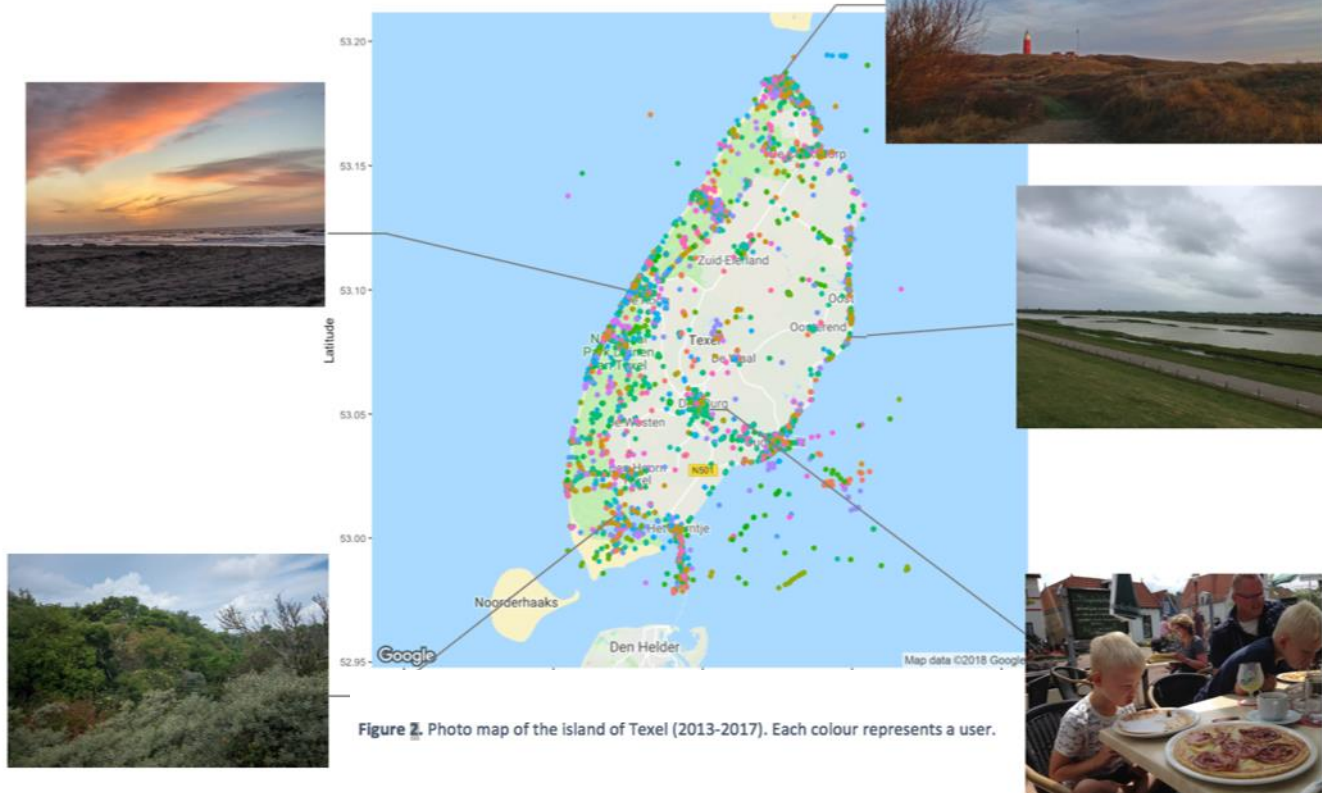# Nature recreation (hiking) – pilot project Strava

- Strava heatmap tiles with hiking intensity

- Statistics on number of hikers for different surroundings per province

- Linked to all road segments of topographical map

Aesthetic services

Figure 2. Photo map of the island of Texel (2013-2017). Each colour represents a user.

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Aesthetic services

Method:
- **ES:** landscape presence
- **Measure:** Photo-User-Day-Viewshed (PUDV)/ m^2
- **Allocation model:** the presence (contribution) of the landscape to a user's photos per day, exponential function to reflect decline with distance
- **Data:** Flickr images, digital surface model (DSM)

Landscape presence (PUDV/m²)
- 0 - 1e-06
- 1e-06 - 2e-06
- 2e-06 - 3e-06
- 3e-06 - 4e-06
- 4e-06 - 5e-06
- 5e-06 - 6e-06
- 6e-06 - 7e-06
- 7e-06 - 8e-06
- 8e-06 - 9e-06
- 9e-06 - 0.04

0   1.25   2.5   5 Kilometers
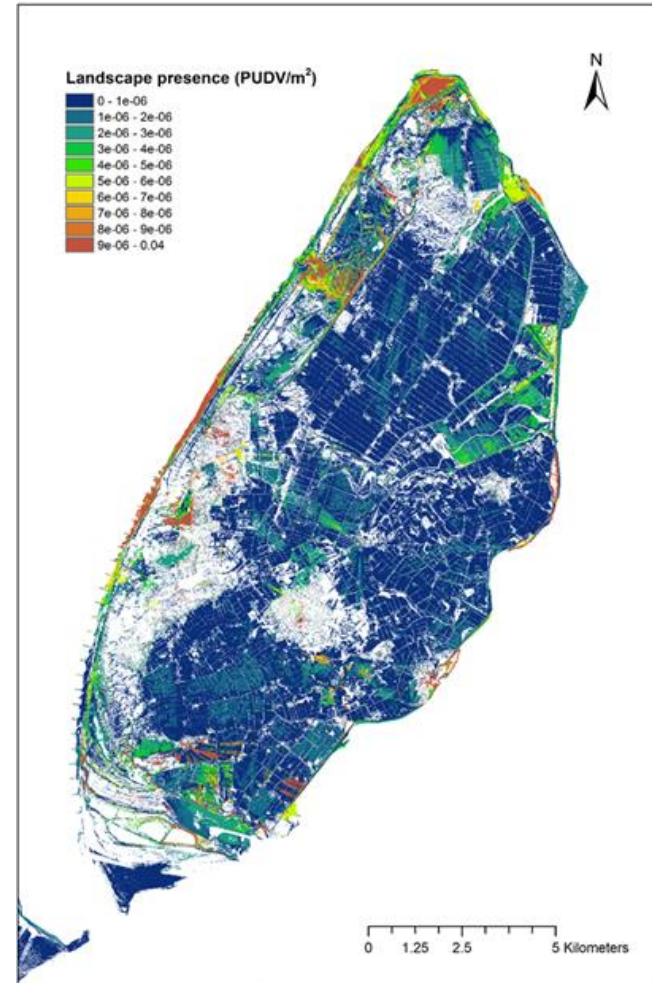
Results

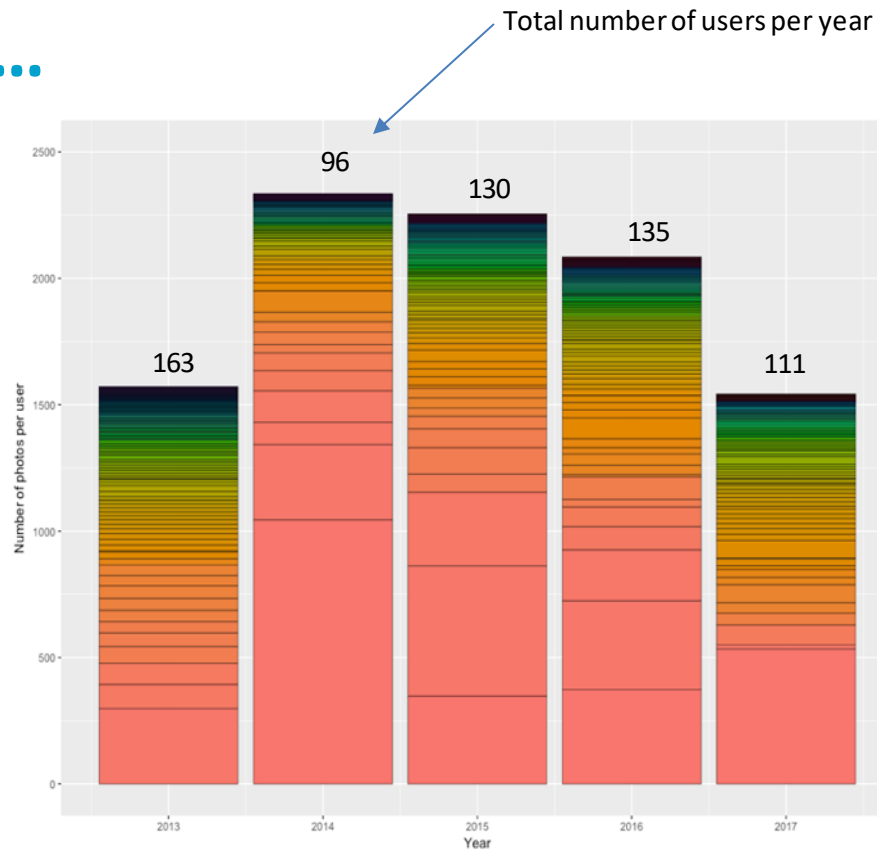| Ecosystem type	EU CODE1	EU CODE2	Min (PUDV / m²)	Average (PUDV / m²)	Max (PUDV / m²)	Total area (ha)	Total PUDVs
Agriculture							
Perennial and non-perennial plants	1, 2		0	6.0e-07	7.5e-05	4,254	25
Greenhouses	3		n.a.	n.a.	n.a.	n.a.	n.a.
Meadows (grazing)	4		0	7.0e-07	2.3e-04	3,924	27
Bushes and hedges bordering fields	5		0	7.5e-07	3.1e-05	164	1
Farmyards and barns	6		0	7.3e-07	6.1e-05	115	1
Dunes and beaches							
Dunes with permanent vegetation		11	0	9.1e-07	3.3e-04	831	8
Active coastal dunes		12	0	1.4e-06	2.3e-04	2,996	42
Beach		13	0	1.9e-06	6.8e-05	1,065	20
Forests and other (semi) natural, environments incl. unpaved terrain							
Deciduous forest	21		0	1.3e-06	2.5e-04	135	2
Coniferous forest	22		0	2.3e-06	2.8e-04	56	1
Mixed forest	23		0	4.9e-06	4.2e-04	21	1
Heath land	24		0	8.6e-08	2.9e-06	3	0
Inland dunes	25		0	4.6e-07	1.6e-05	27	0
Fresh water wetland	26		0	1.0e-06	8.9e-05	209	2
(semi) Natural grassland	27		0	7.3e-07	6.1e-05	391	3
Public green space	28		0	1.6e-06	4.2e-04	493	8
Other unpaved terrain	29		0	8.0e-07	2.7e-04	910	7
Temporarily inundated lands							
River flood basin		31	n.a.	n.a.	n.a.	n.a.	n.a.
Salt marsh		32	0	1.5e-06	5.6e-05	69	1
Built up and paved areas							
Residential area	41		0	6.0e-07	2.1e-04	757	5
Offices and businesses	42, 43, 44, 46, 47, 48		0	5.7e-06	2.3e-04	572	13
Roads, parking lots, runways, other	45		0	1.3e-06	5.3e-04	598	8
Water							
Sea	51		0	1.2e-07	1.0e-02	26,607	32
Lakes and ponds	52		0	4.3e-07	1.0e-02	423	2
Rivers and streams	53		n.a.	n.a.	n.a.	n.a.	n.a.
Total			**0**	**2e-06**	**9e-04**	**44,621**	**209**

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Some issues however…

– **Representativeness**

- Highly active users
- Bias towards demographic groups

Total number of users per year

Facts that matter