A learning path
for HE students and professors

Luc Zwartjes, Ghent University & EUROGEO
Veerle Van Eetvelde, Ghent University

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UN-GGIM | United Nations Commitee of Experts on Global Geospatial Information Management

Geoland goals

Main goals of the GEOLAND: develop

- an **Educational Handbook for monitoring European Landscape**,
- a **Web based GIS platform** where numerous geospatial data may be uploaded and analysed and students' opinion about landscape will be obtained through questionnaires and crowdsourcing
- **Policy outreach** of the ELC in European countries & legislation

Geoland handbook

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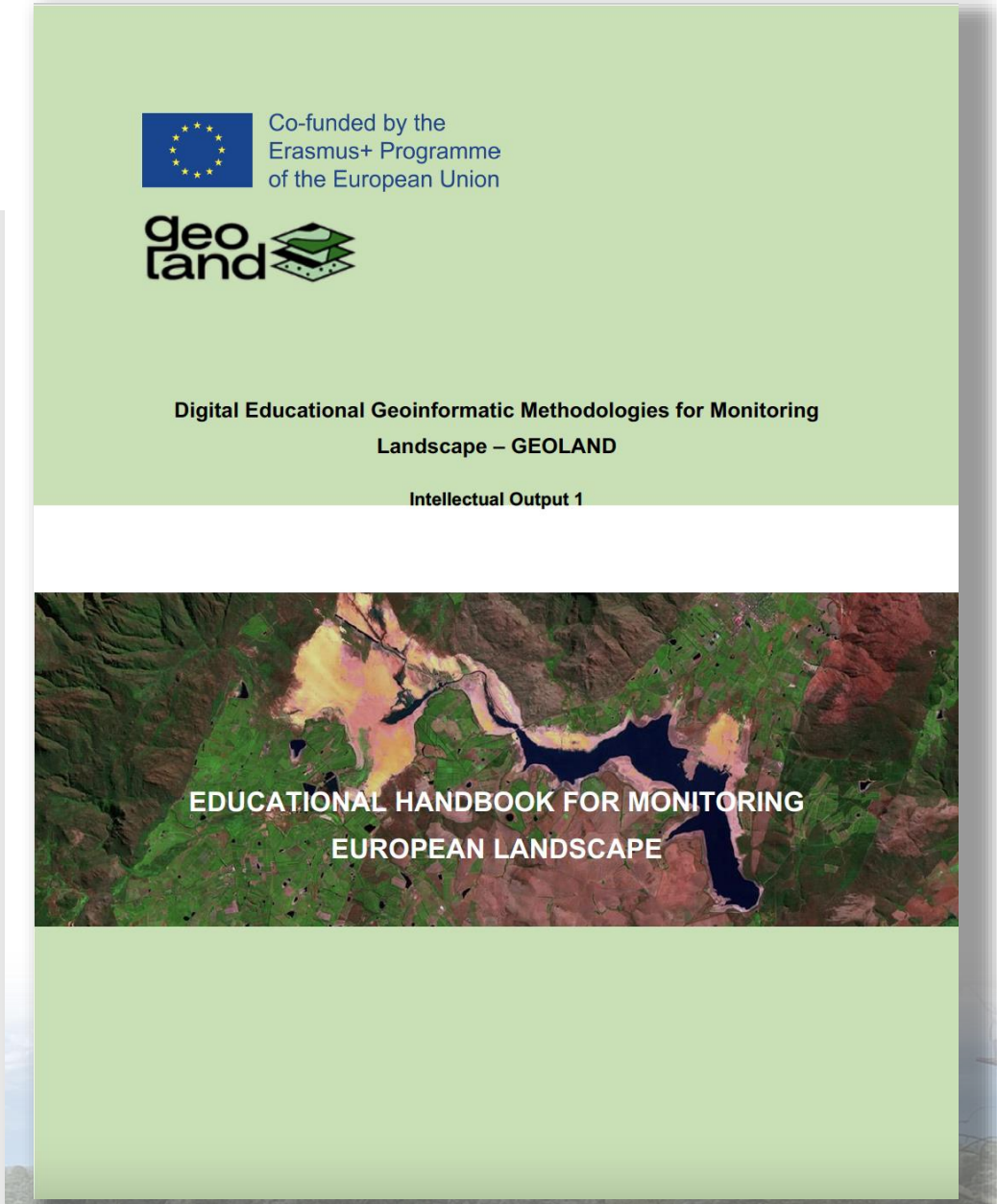

https://www.geolandproject.eu

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Geoland technical guide annex handbook

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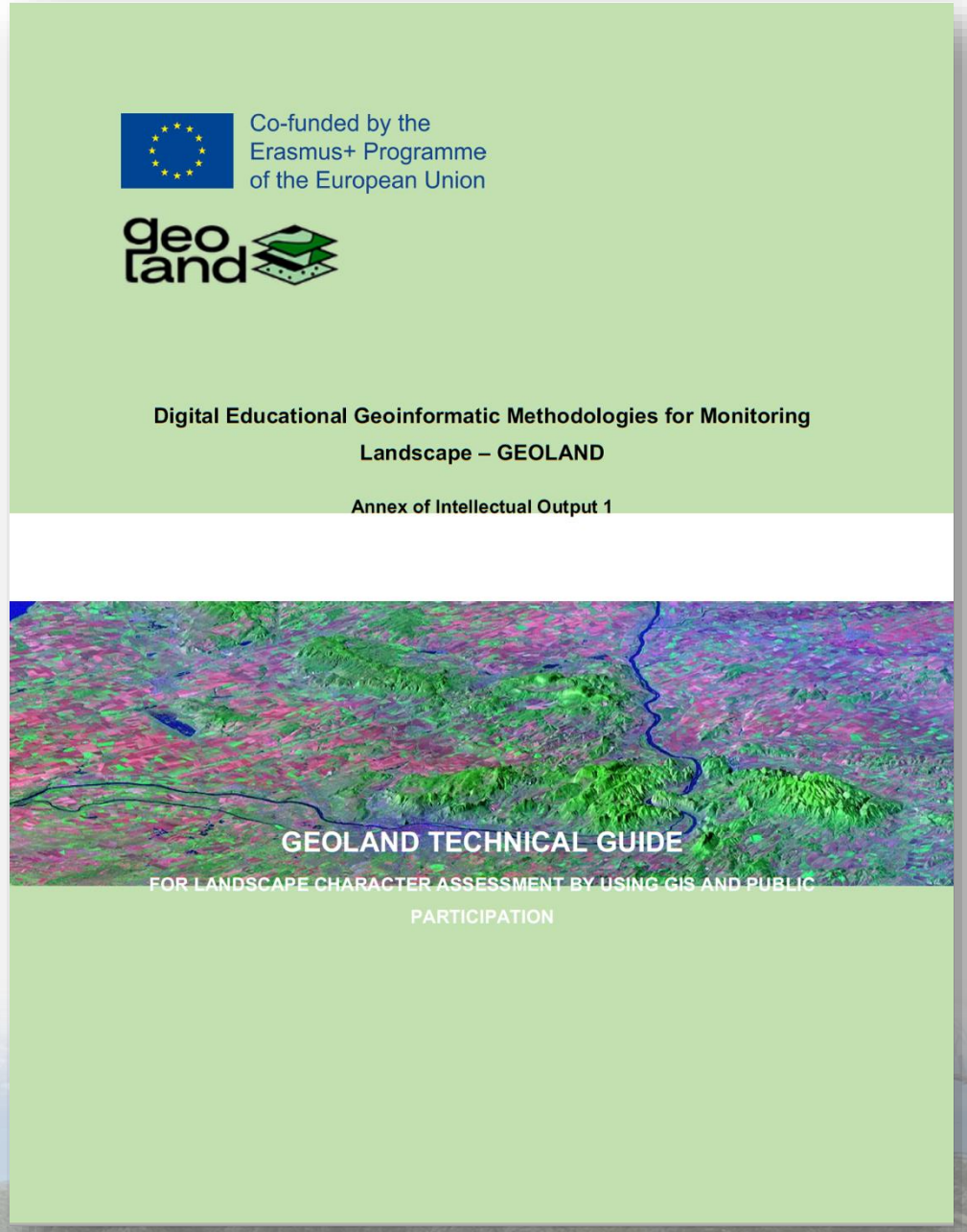

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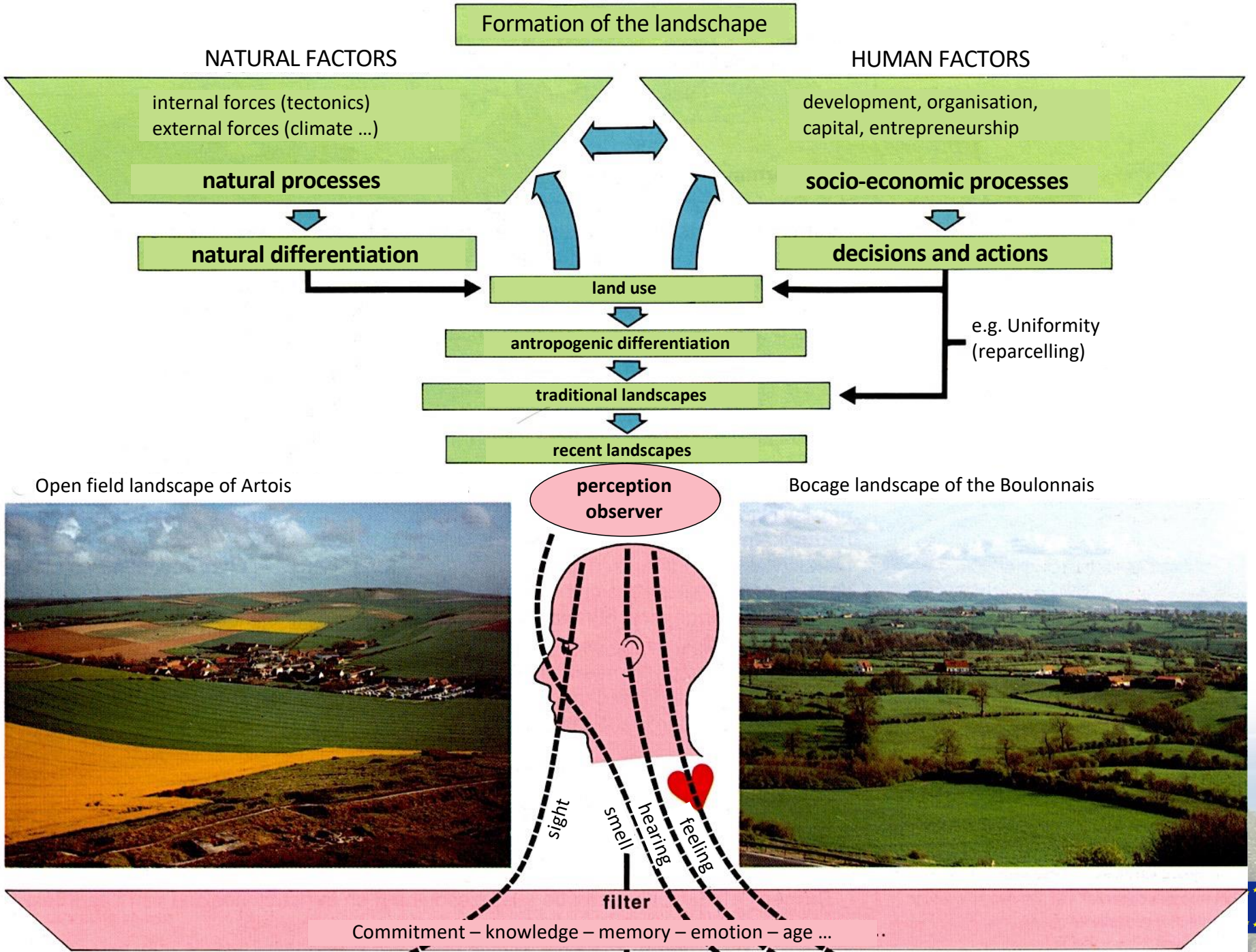
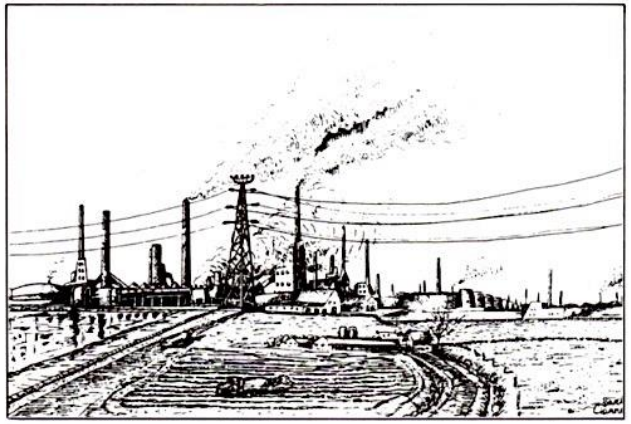

Formation of the landschape
NATURAL FACTORS
HUMAN FACTORS
internal forces (tectonics)
external forces (climate …)
development, organisation,
capital, entrepreneurship
natural processes
socio-economic processes
natural differentiation
decisions and actions
land use
antropogenic differentiation
traditional landscapes
recent landscapes
e.g. Uniformity
(reparcelling)
Open field landscape of Artois
Bocage landscape of the Boulonnais
perception
observer
sight
smell
hearing
feeling
filter
Commitment – knowledge – memory – emotion – age …

filter

Commitment – knowledge – memory – emotion – age …

recorded image → **recorded experience** ← **other sensations**



Monotonous production landscape

measurements (objective value)	**perception** (subjective value)
relief morphology	panoramic feeling
degree of building	attractiveness
variation	security
spatial structure	sense of space
transparancy	naturalness

Intricate and varied residential landscape

landscape values

spatial value

panoramic opportunities – openess – transparancy – scale – relational structure

socio-economic value	**natural value**	**aesthetic value**	**historical value**
- habitability - opportunities for agriculture, recreation, traffic	- natural variation - ecological richness - biological dynamic	- diversity of forms - colorfulness - compostion - light variation	- evoking memories - association woth expreriences - showing the past

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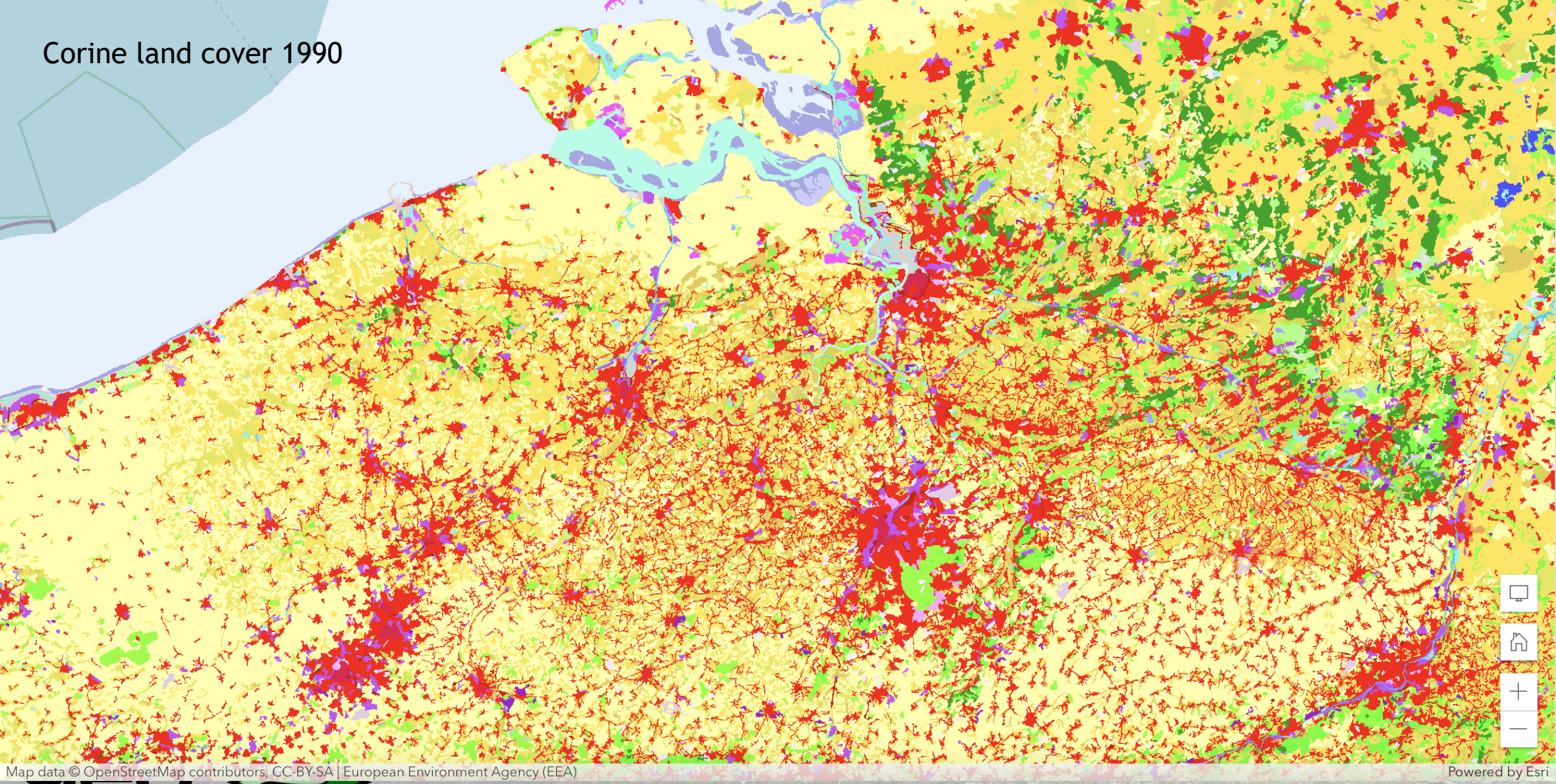
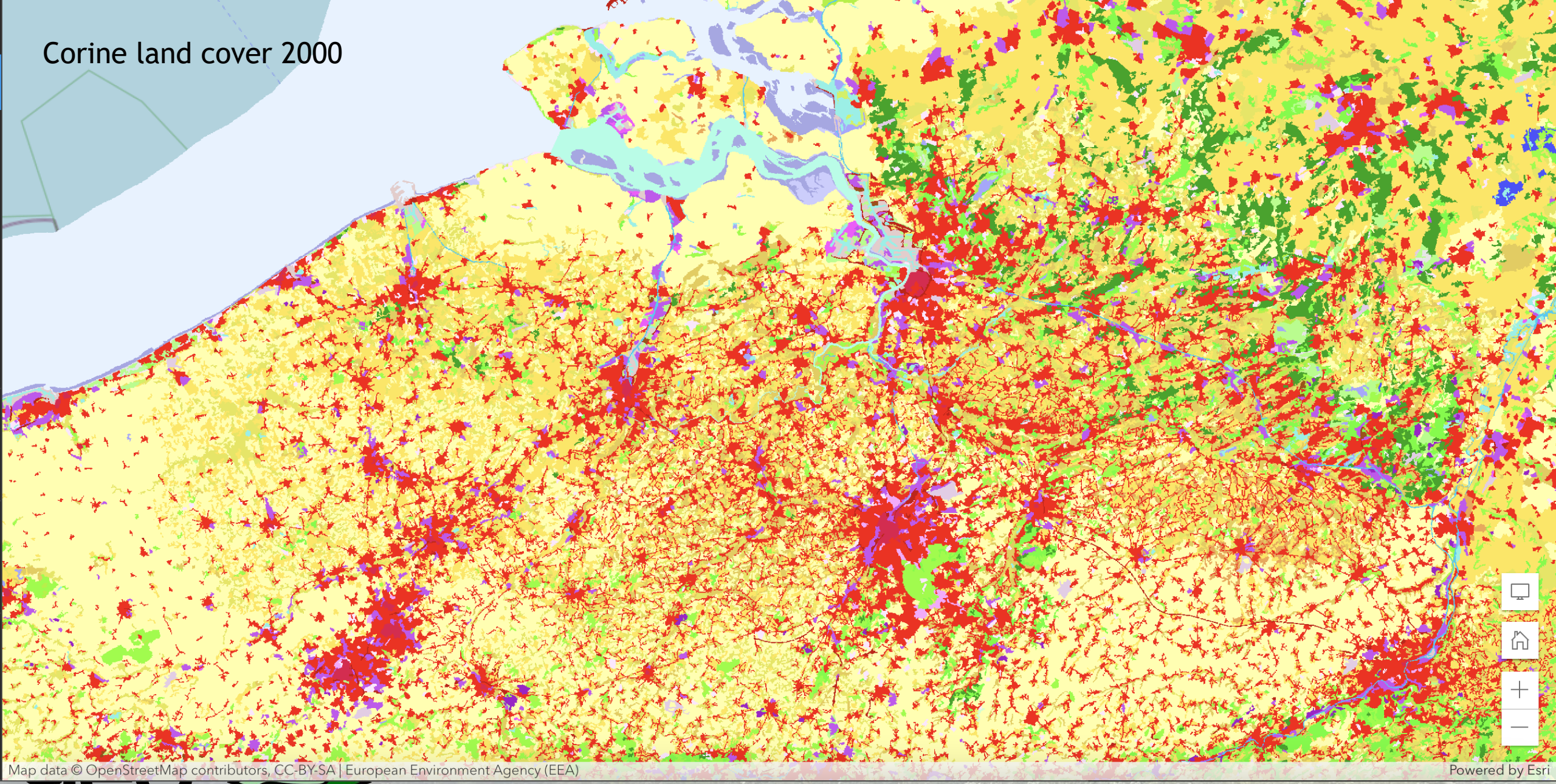

Corine land cover 1990
Map data © OpenStreetMap contributors, CC-BY-SA | European Environment Agency (EEA)
Powered by Esri


Corine land cover 2000
Map data © OpenStreetMap contributors, CC-BY-SA | European Environment Agency (EEA)
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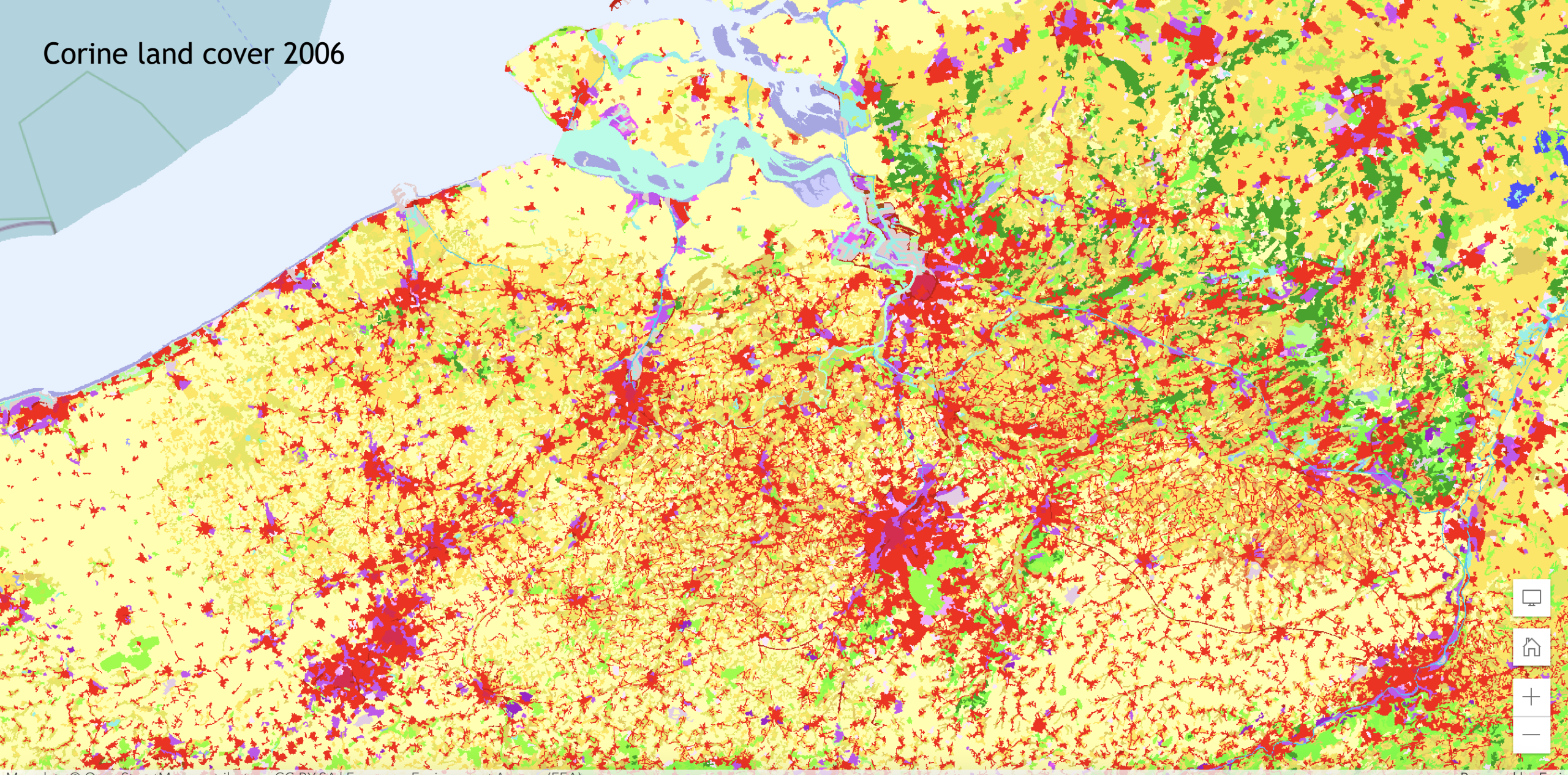
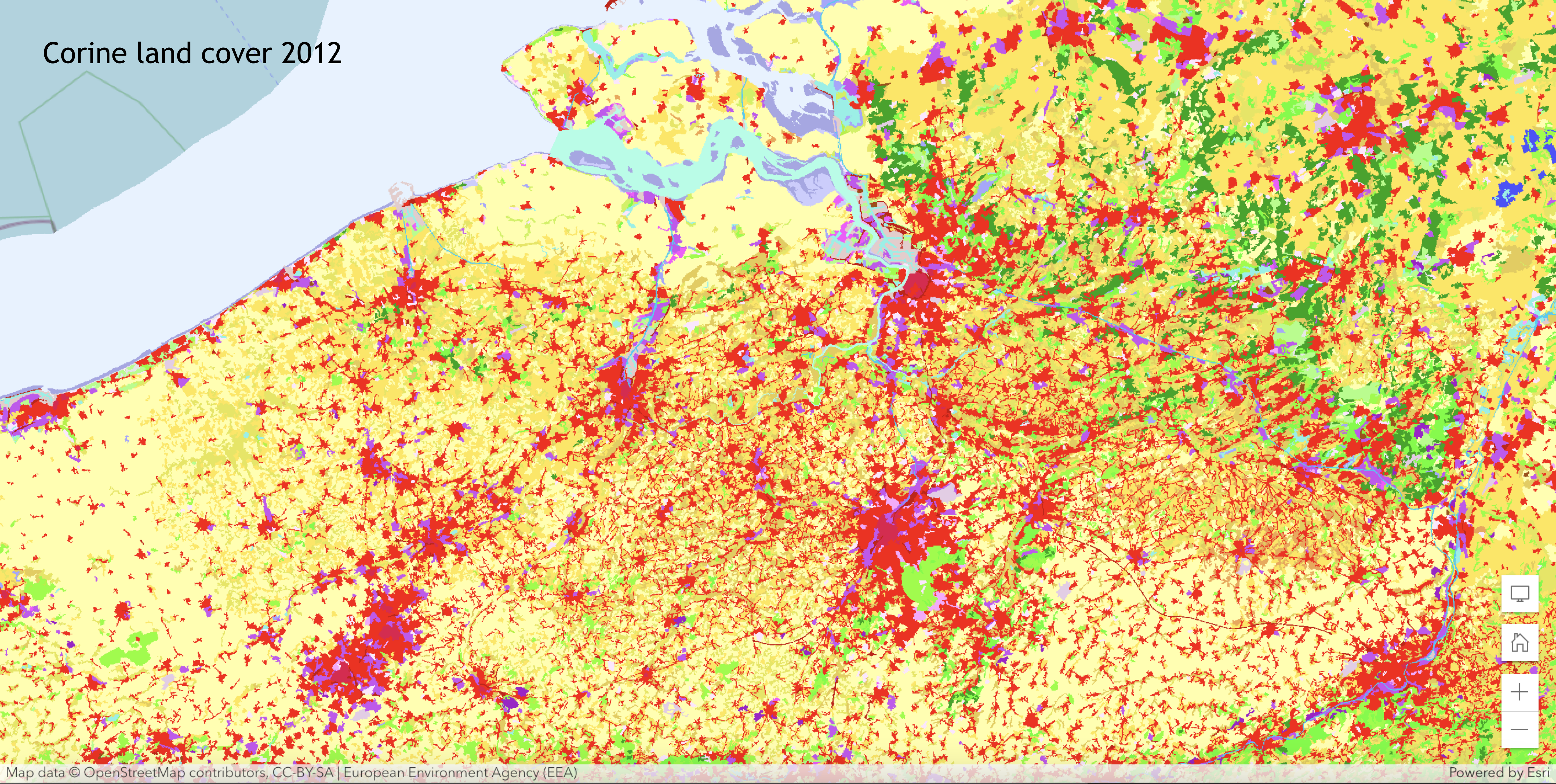
Corine land cover 2006



Corine land cover 2012



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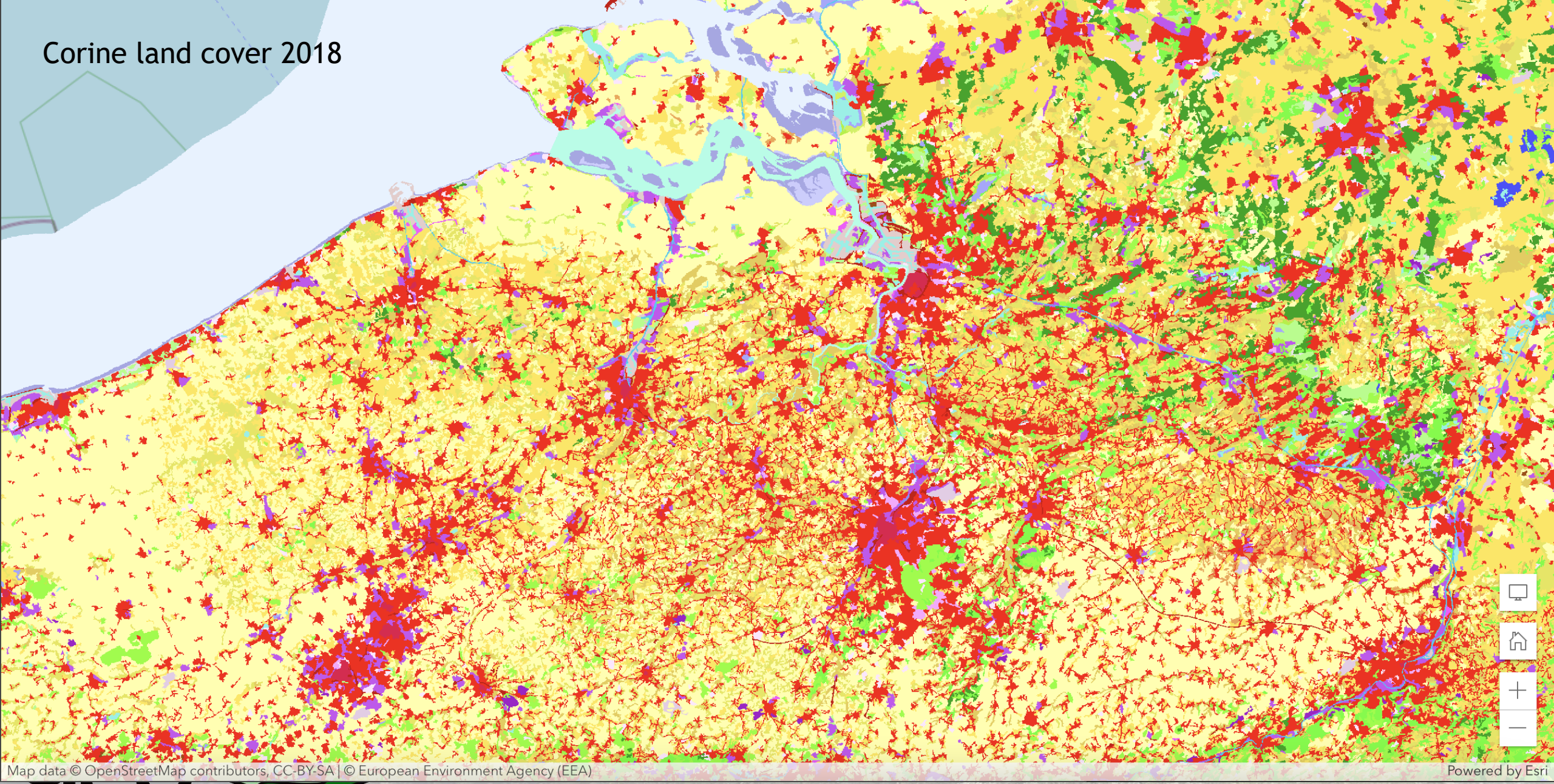
Corine land cover 2018
Map data © OpenStreetMap contributors, CC-BY-SA | © European Environment Agency (EEA)
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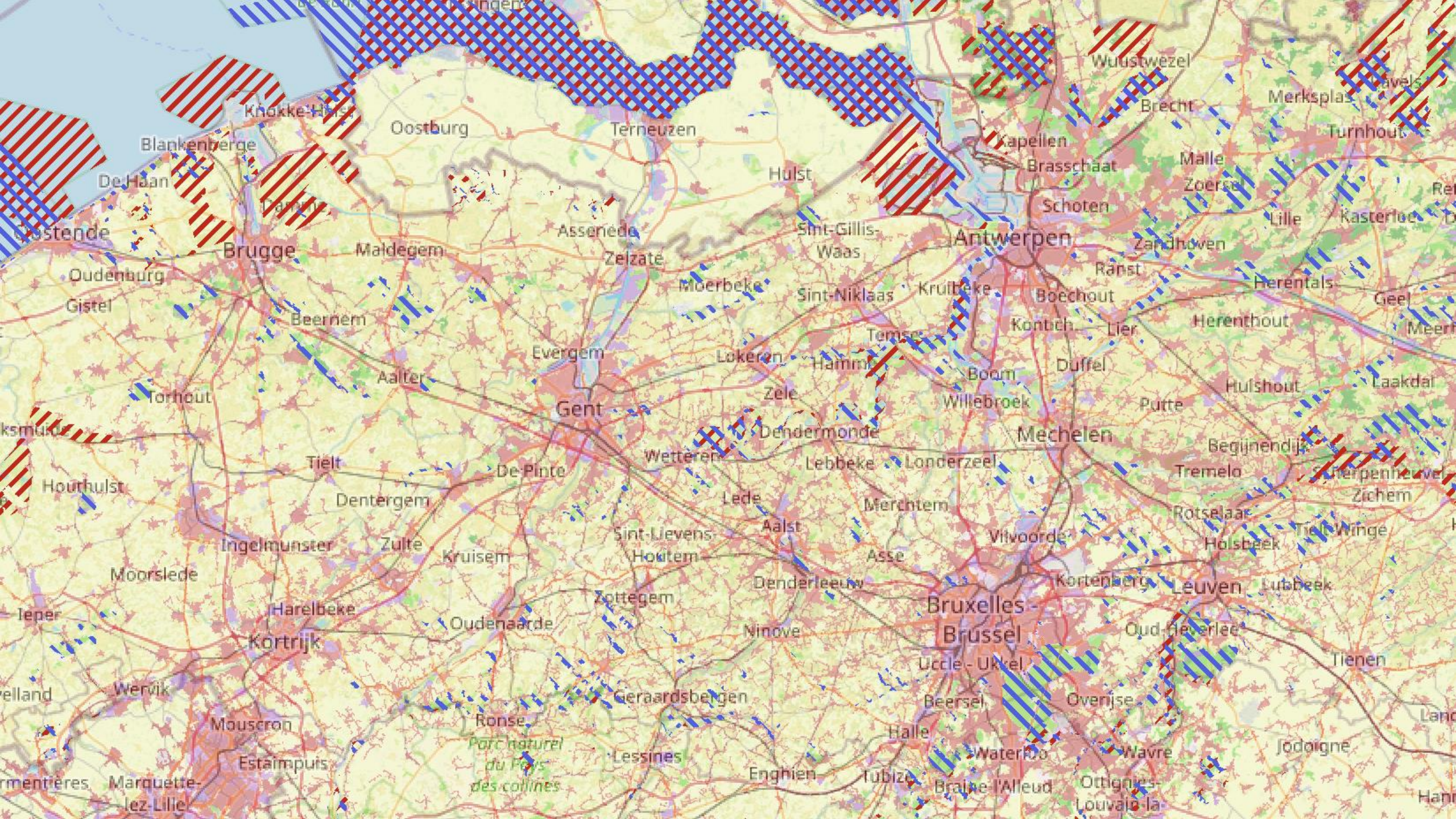
Corine land cover 1990

Corine land cover 2000

Corine land cover 2006

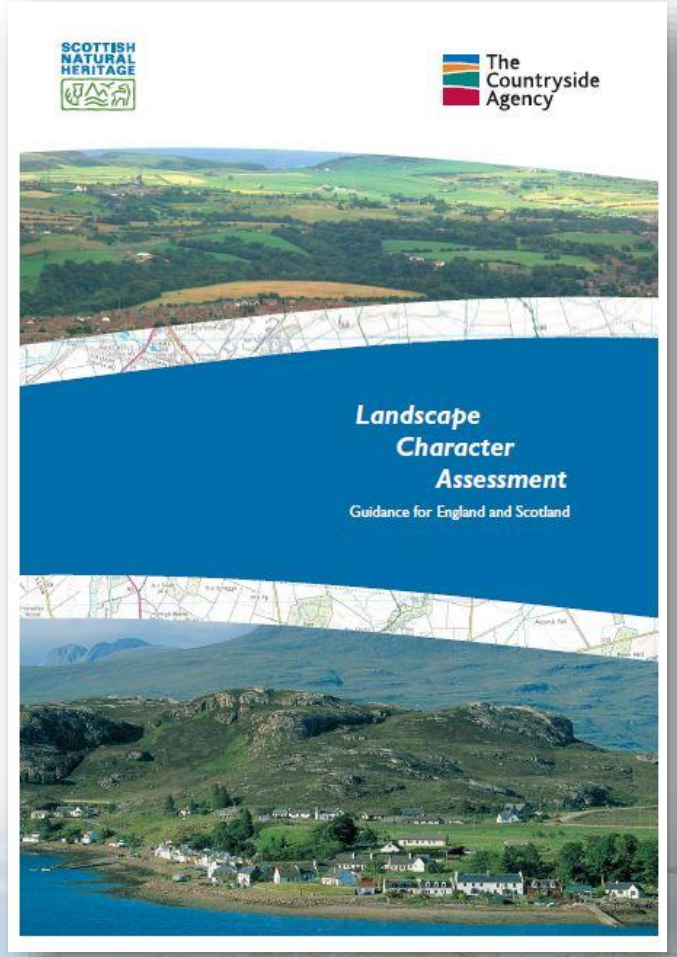
Corine land cover 2012

Corine land cover 2018


Knokke-Heist
Oostburg
Terneuzen
Blankenberge
De Haan
Hulst
Wuustwezel
Brecht
Merksplas
Turnhout
Kapellen
Brasschaat
Malle
Zoersel
Schoten
Lille
Kasterlee
Oostende
Brugge
Assenede
Maldegem
Zelzate
Sint-Gillis-Waas
Antwerpen
Zandhoven
Ranst
Oudenburg
Gistel
Moerbeke
Sint-Niklaas
Kruibeke
Boechout
Herentals
Geel
Beernem
Kontich
Lier
Herenthout
Meer
Temse
Evergem
Lokeren
Haasrode
Duffel
Aalter
Boom
Laakdal
Torhout
Zele
Willebroek
Hulshout
Putte
Gent
Dendermonde
Mechelen
Begijnendijk
Tielt
Wetteren
Lebbeke
Londerzeel
Tremelo
Scherpenheuvel
Houthulst
De Pinte
Zichem
Dentergem
Lede
Merchtem
Rotselaar
Aalst
Ingelmunster
Zulte
Sint-Lievens-Houtem
Vilvoorde
Wingene
Kruisem
Asse
Holsbeek
Moorslede
Denderleeuw
Kortenberg
Leuven
Lubbeek
Zottegem
Ieper
Harelbeke
Bruxelles - Brussel
Oudenaarde
Ninove
Oud-Heverlee
Kortrijk
Uccle - Ukkel
Tienen
Wervik
Beersel
Overijse
Geraardsbergen
Ronse
Halle
Mouscron
Parc naturel du Pays des collines
Waterloo
Wavre
Jodoigne
Estaimpuis
Lessines
Enghien
Tubize
Braine-l'Alleud
Marquette-lez-Lille
Ottignies-Louvain-la-

Landscape character assessment

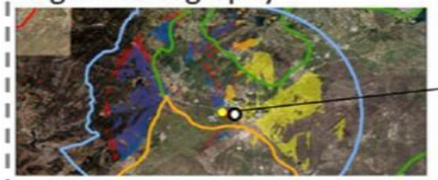
One of the major principles, which ELC is based on, is the identification of landscape character, as well as the pressures and drivers of change, as regards the implementation of strategies for landscape management, planning, and protection. Such principles and strategies require a systematic knowledge of their variation, spanning the full range of spatial scales that define the landscape level, i.e., in landscape typologies (Terkenli et al., 2021).



The purpose of landscape classification is to initially identify areas of distinct character, and then classify and map them.

specific combinations of natural, socio-cultural and perceptual attributes existing in different areas lead to similar landscape character types

Level of detail

	Map-based Method	Photo-based Method
Data sources	Geodatabase and digital cartography 	Photographs 
Methods	GIS Indicators: ✓ Coherence ✓ Disturbance ✓ Historicity ✓ Visual Scale ✓ Complexity ✓ Naturalness ✓ Ephemera	Attribute valuation: ✓ Physical ✓ Aesthetic ✓ Psychological
Results	Landscape character evaluation. Relationship between roads and territory	Visual landscape quality evaluation

Complementarity between methods:
✓ Spatial Reference
✓ Theoretical Framework

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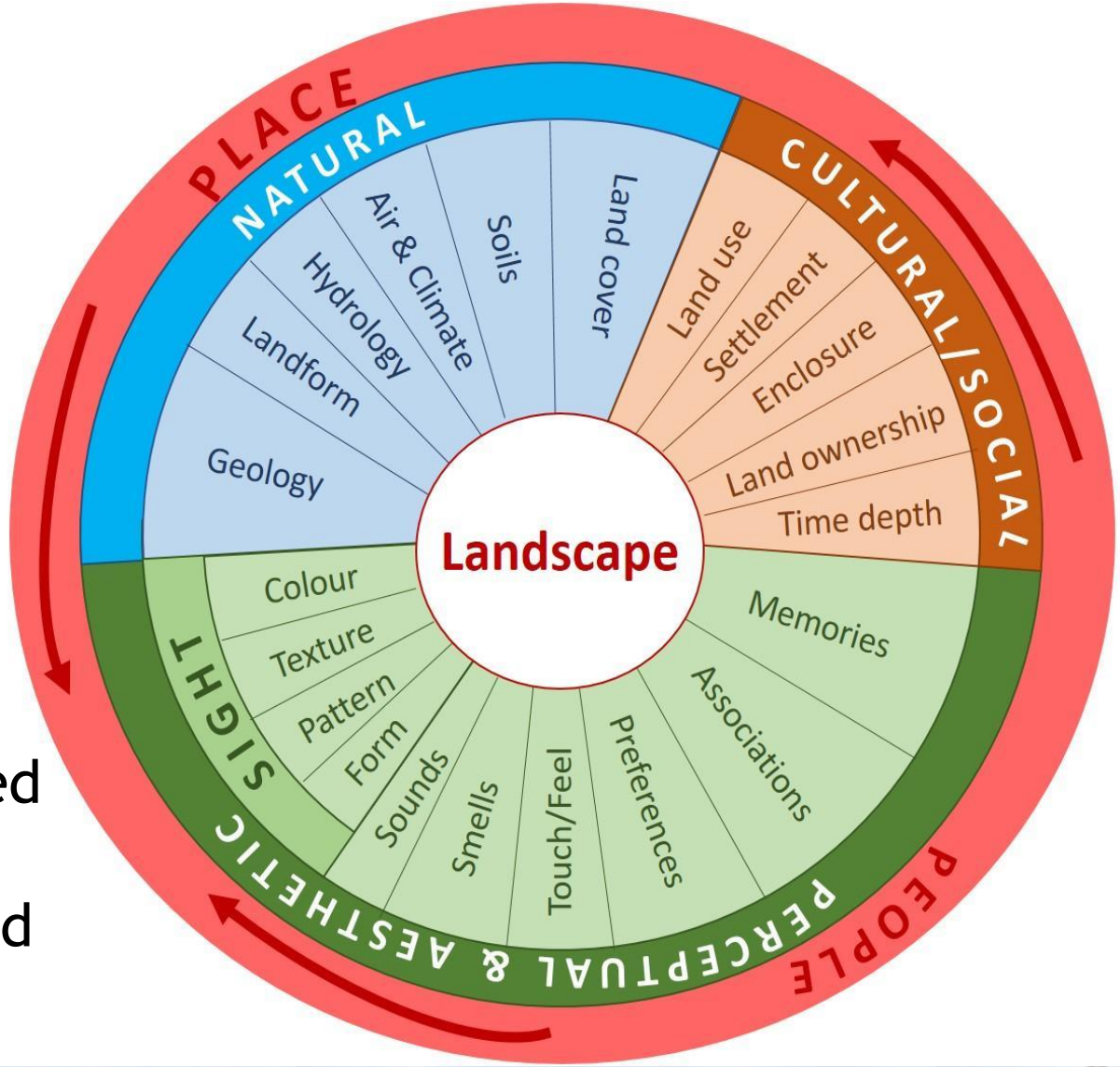
two major types of attributes, or components, related to landscapes:

- the *bio-physical attributes* linked to natural (e.g. geology, soils, landform, hydrology, climatic conditions) *and socio-cultural* (e.g. land use, settlement pattern, economic activities) inheritance where a landscape is considered in space
- the *perceptual/aesthetic attributes* linked to how a landscape is perceived, with regard to scenic quality, visual beauty and human well-being.



Question. Check the scale for what you think best matches how you experience the images.-7 to -1 is not magnificent. 0 neutral. +1 to +7 is magnificent.

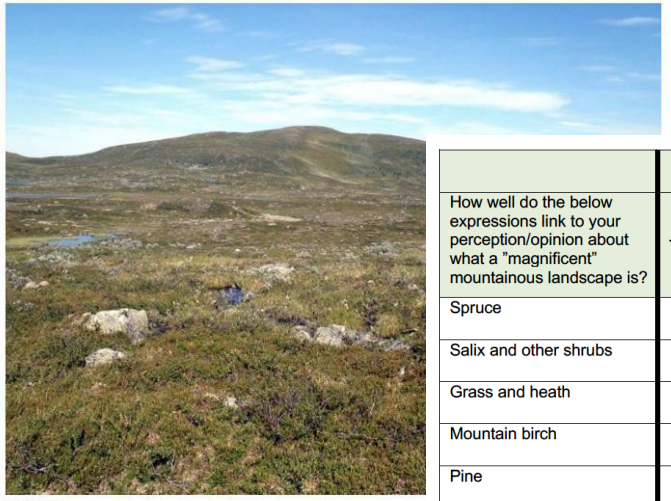
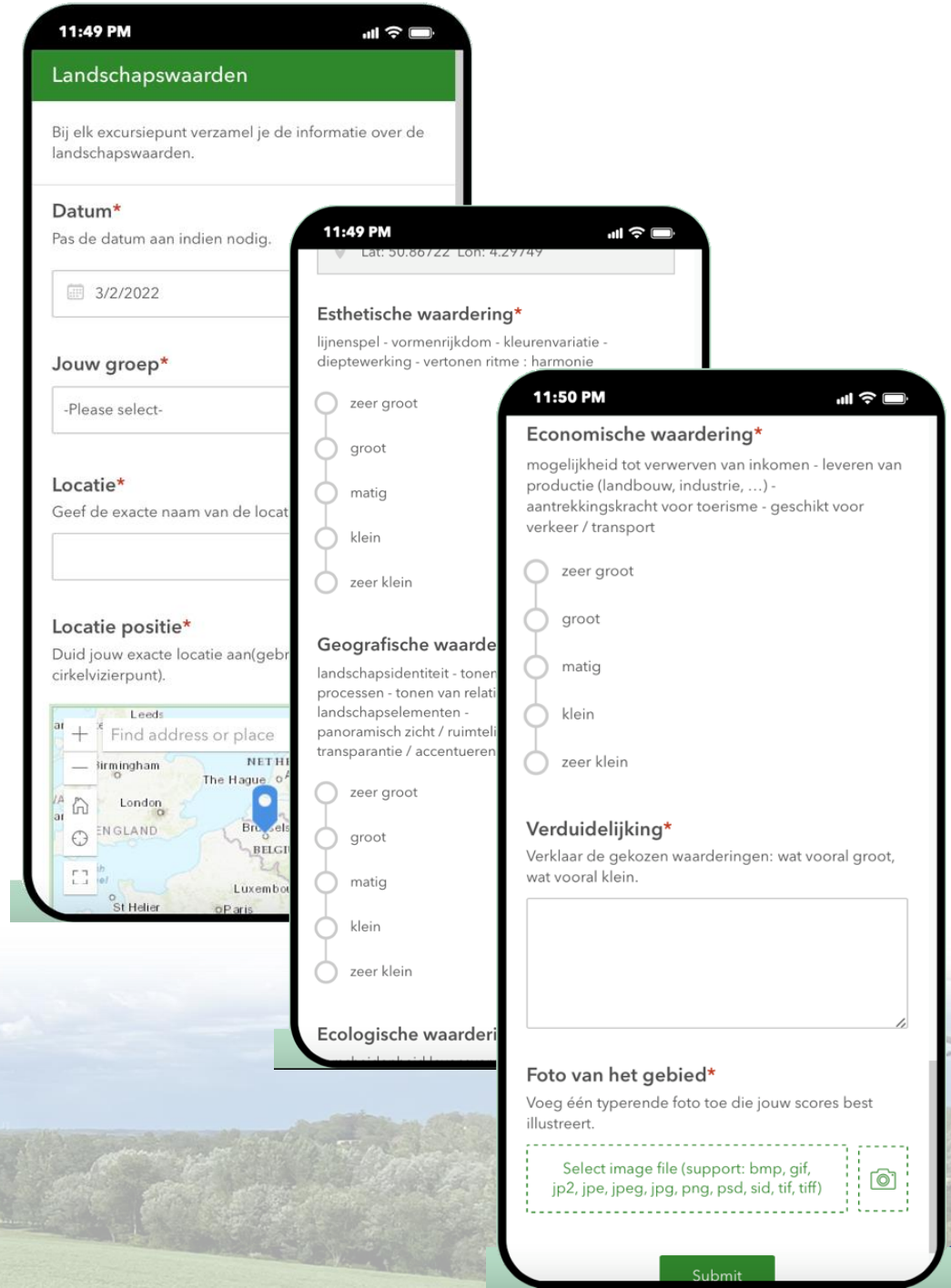


PHOTO 1.
In what extension do you think that this photo above capture area?

Not magnificent								
-7	-6	-5	-4	-3	-2	-1	0	+1	+2

How well do the below expressions link to your perception/opinion about what a "magnificent" mountainous landscape is?	Not magnificent								Magnificent						
	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7
Spruce															
Salix and other shrubs															
Grass and heath															
Mountain birch															
Pine															
Mire															
Mountains with a lot of rocks, lichens and mosses															
Mountain with trees and shrubs															
Valleys with surrounding mountains															
Glaciers with snow patches															
Scree and other unavailable areas															
Many animal species															
Many plant species															
Rare animals															
Rare plants															
Privacy															
Silence															
Openness, Open spaces															



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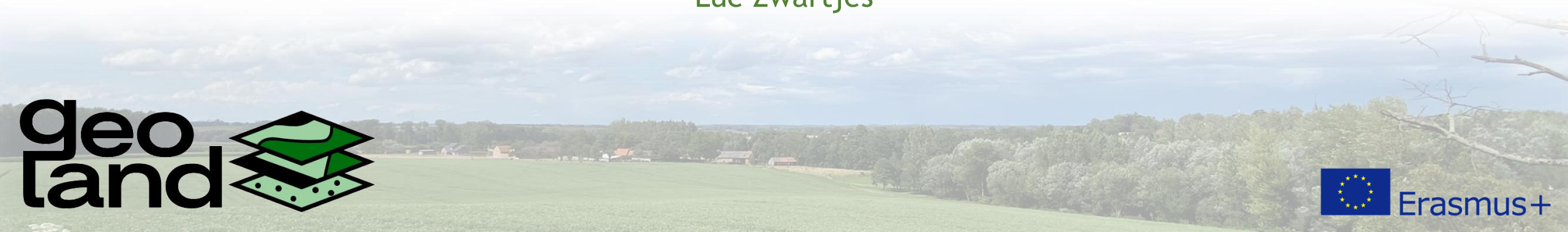
Landscape character assessment

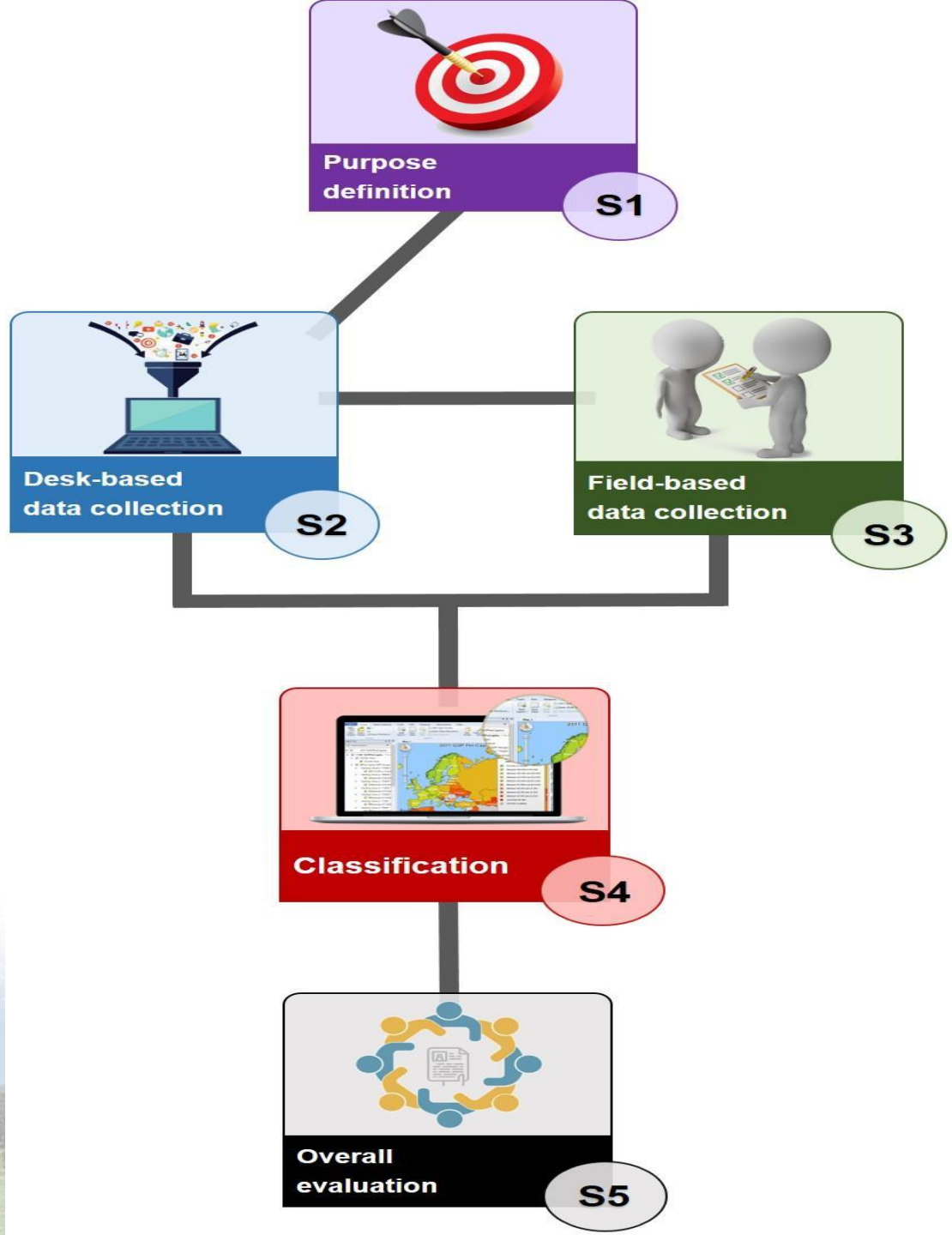
Case Gentbrugse meersen and Damvallei

Prof.Dr. Veerle Van Eetvelde
Luc Zwartjes



5 stages in GIS-based holistic LCA methodological framework employing public participation,

- Purpose definition
- Desk-based data collection
- Field-based data collection
- Classification
- Overall evaluation




650 ha nature area in Ghent
• 240 ha Gentbrugse meersen
• 410 ha Damvallei
Gentbrugse Meersen and Damvallei
Geography
DESTELDONK
OOSTAKKER
Lochristi
WONDELGEM
MEULESTEDE
Scheepbeek
MARIAKERKE
RABOT
SINT-AMANDSBERG
DRONGEN
Gent
Schelde
OVERMERE
GENTBRUGGE
KALKEN
LEDEBERG
Destelbergen
Laarne
Leie
OOST-VLAANDEREN
SINT-DENIJS-WESTREM
Fonteinbeek
Serskampsebeek
Sint-Martens-Latem
Melle
Wetteren
Schelde
Merelbeke
De Pinte
Google Earth


Damvallei
Gentbrugs
e Meersen
Schelde
GENTBRUGGE
Destelbergen
MOSCOU
Google Earth
Carrefour hypermarket
Coolblue Gent
Hogeweg
OUDE DOKKEN
WESTVELD
Konak Steakrestaurant
Destelbergen
Haenhoutstraat
Damstraat
HEILIG-KERST
SINT-AMANDSBERG
Renard
Damvallei
Gent
Schelde
GENTBRUGGE
Keizerpark
LEDEBERG
Gentbrugse
Meersen
STROP
Colruyt Ledeberg
Laarnebaan
Destelbergen
N424
N458
N70a
R4
N70
N445
R40
N422
N9
N447
E17

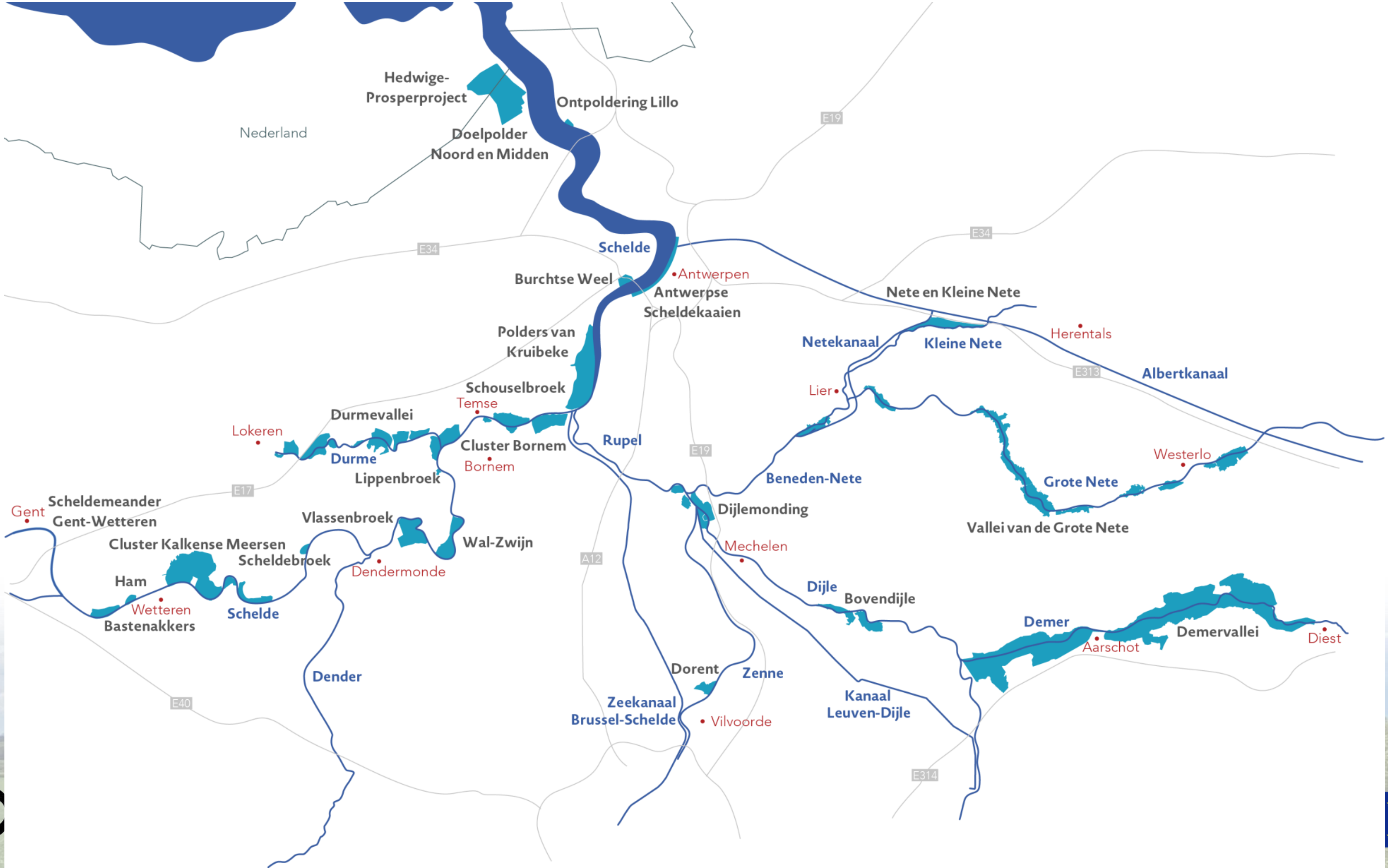

DESTELBERGEN
GOUDEN HAND
PAUWKEN
Schelde
MEERSKANT
STAPSTEEN
ZAND
Google Earth

Natura 2000 - Zeeschelde

- Tidal zone of the river Scheldt – “the artery of Flanders”
- Total of 8957 ha
- 16 protected habitats, 13 protected species

- Also multifunctional landscape in a highly dynamic and economic region
- Included in SIGMA: to protect the area against flooding and promote specific nature qualities

Sigmaplan – until 2030



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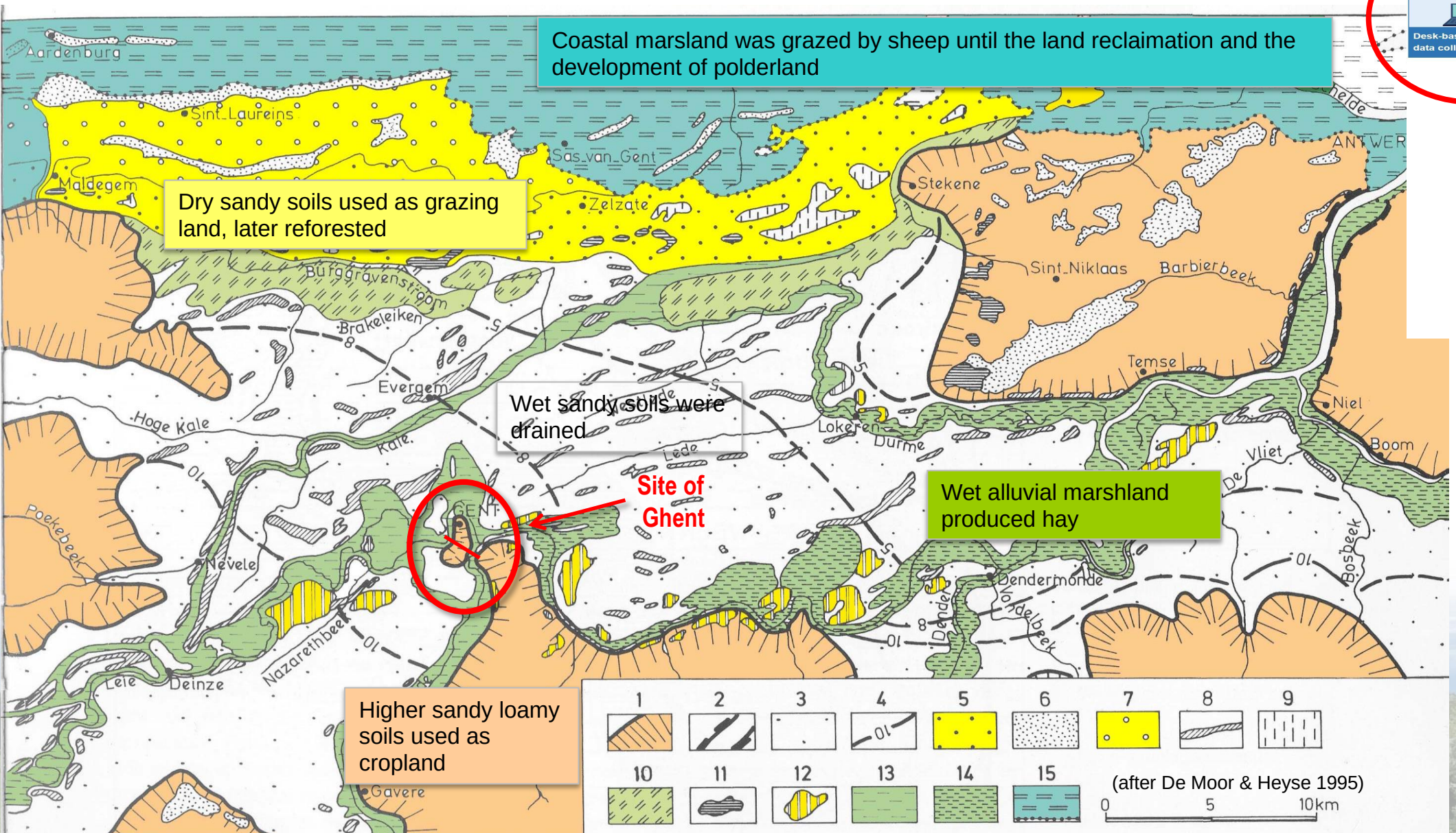
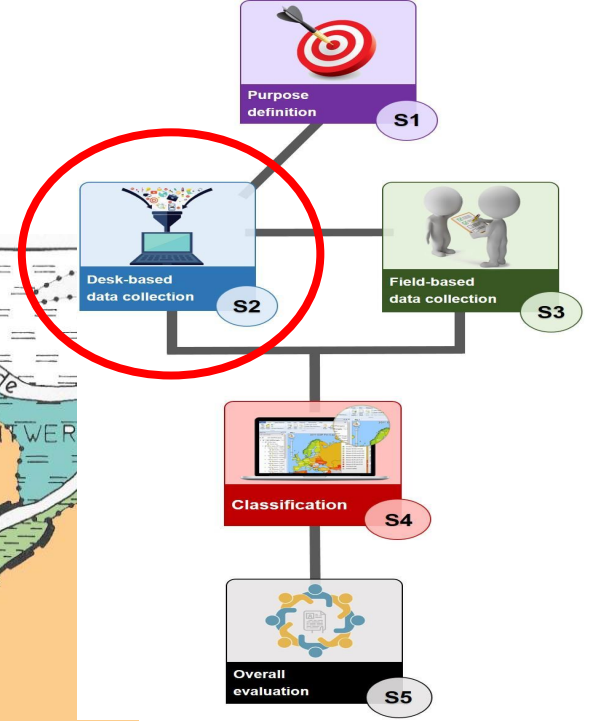
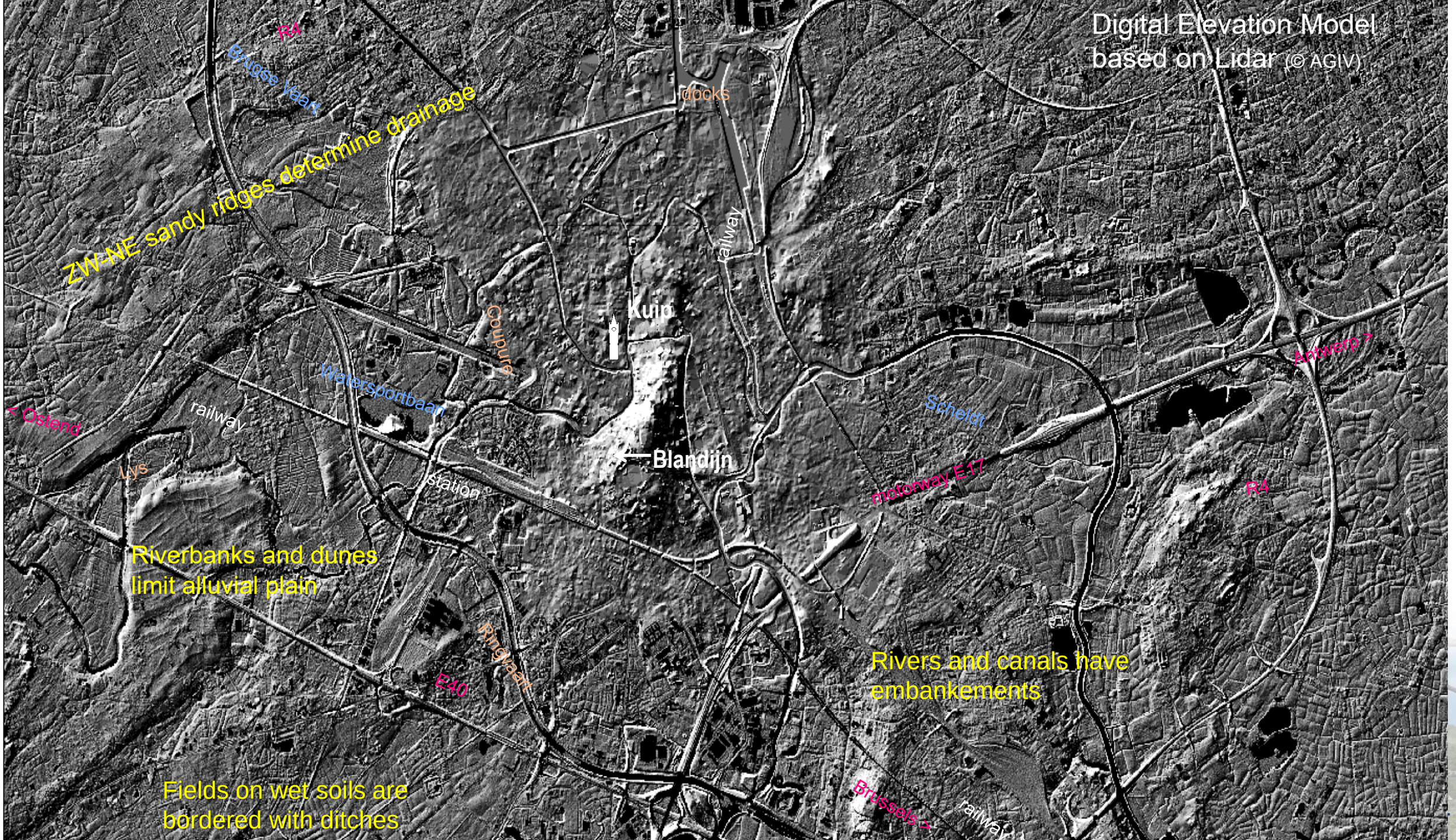
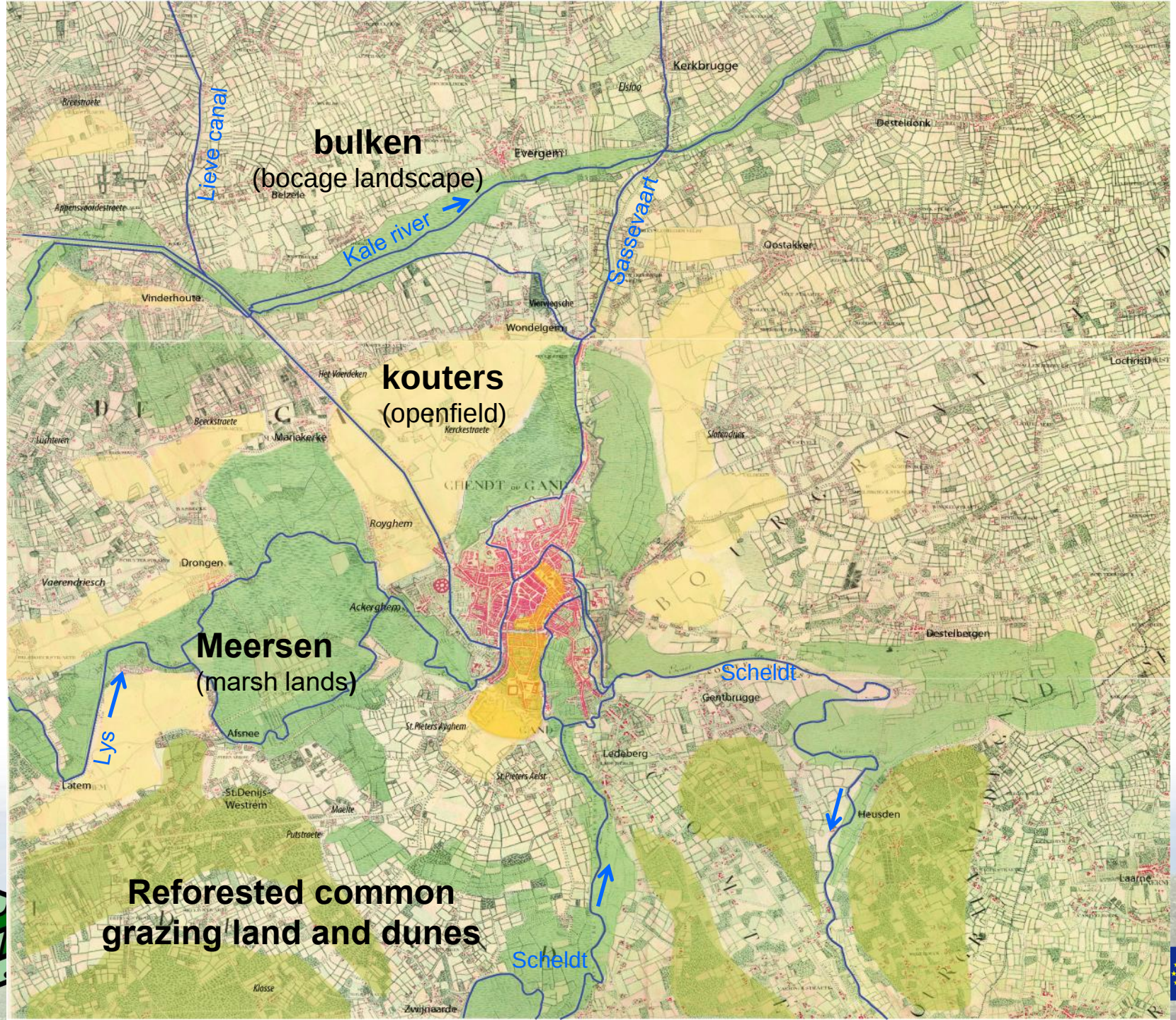
Geology, geomorphology, soils





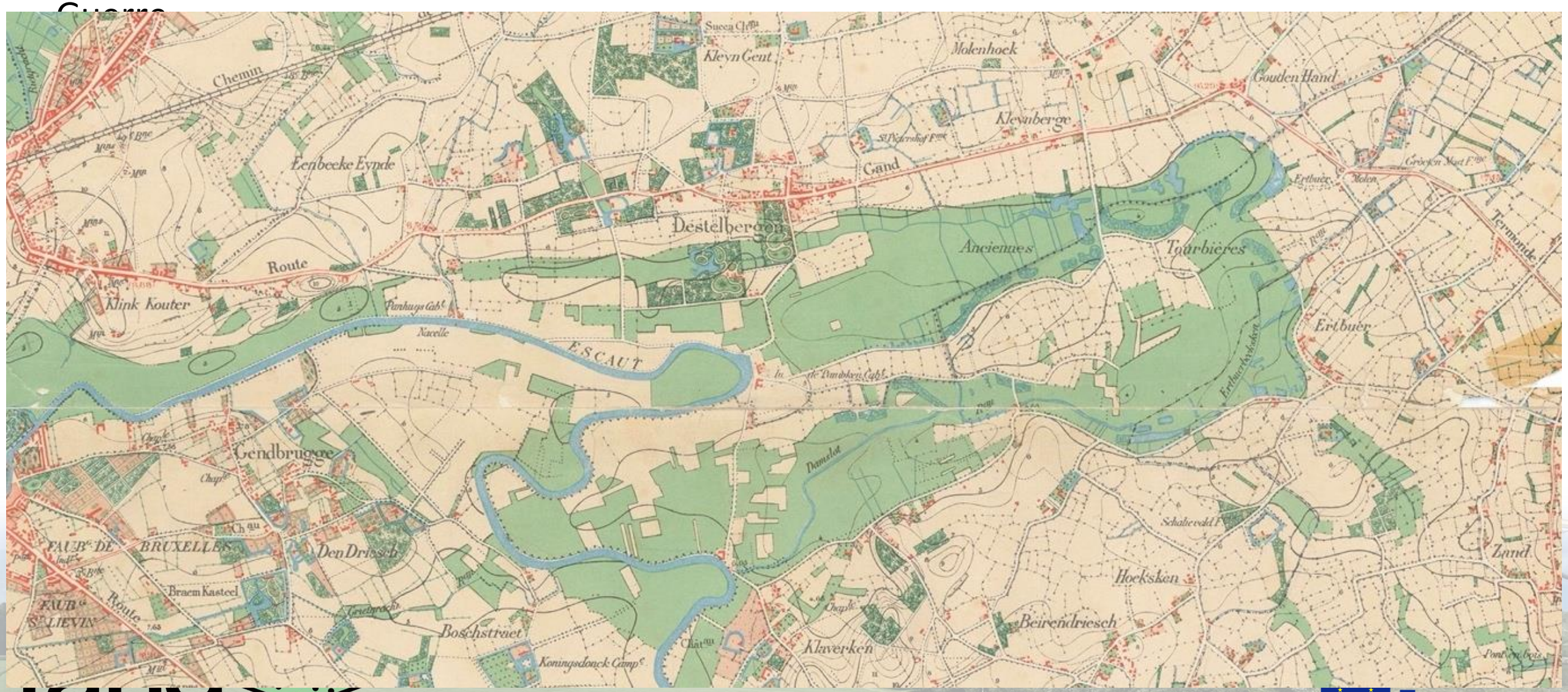

Digital Elevation Model
based on Lidar (© AGIV)
R4
Brugse Vaart
docks
ZW-NE sandy ridges determine drainage
railway
Kuip
Coupure
Watersportbaan
Antwerp >
< Ostend
railway
Scheldt
Blandijn
Lys
station
motorway E17
R4
Riverbanks and dunes
limit alluvial plain
Ringvaart
E40
Rivers and canals have
embankements
Brussels >
railway
Fields on wet soils are
bordered with ditches

- Situation 1770
- Map de Ferraris



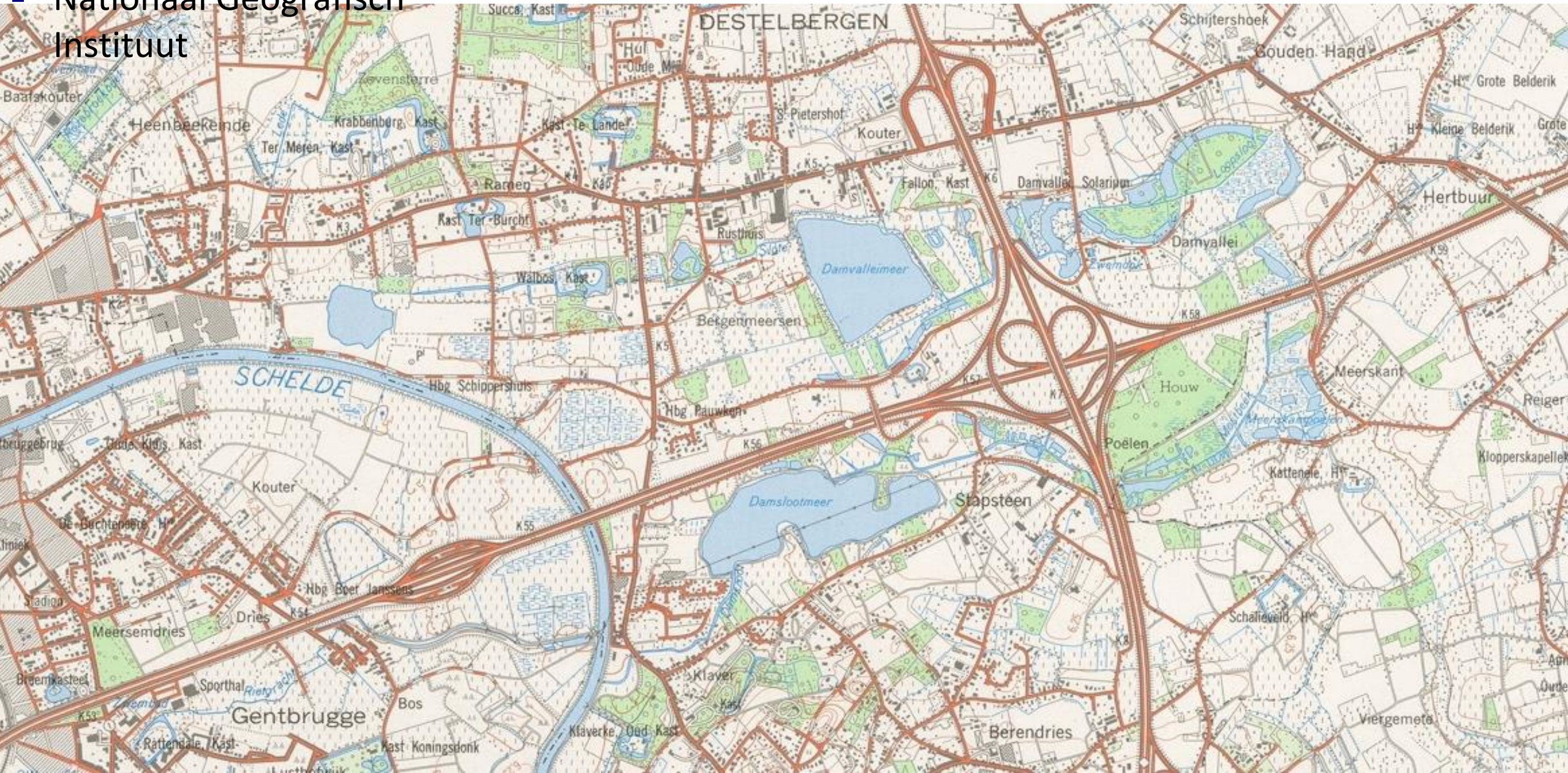
- Situation 1770
- Map de Ferraris

- Situation 1863
- Dépôt de la Guerre

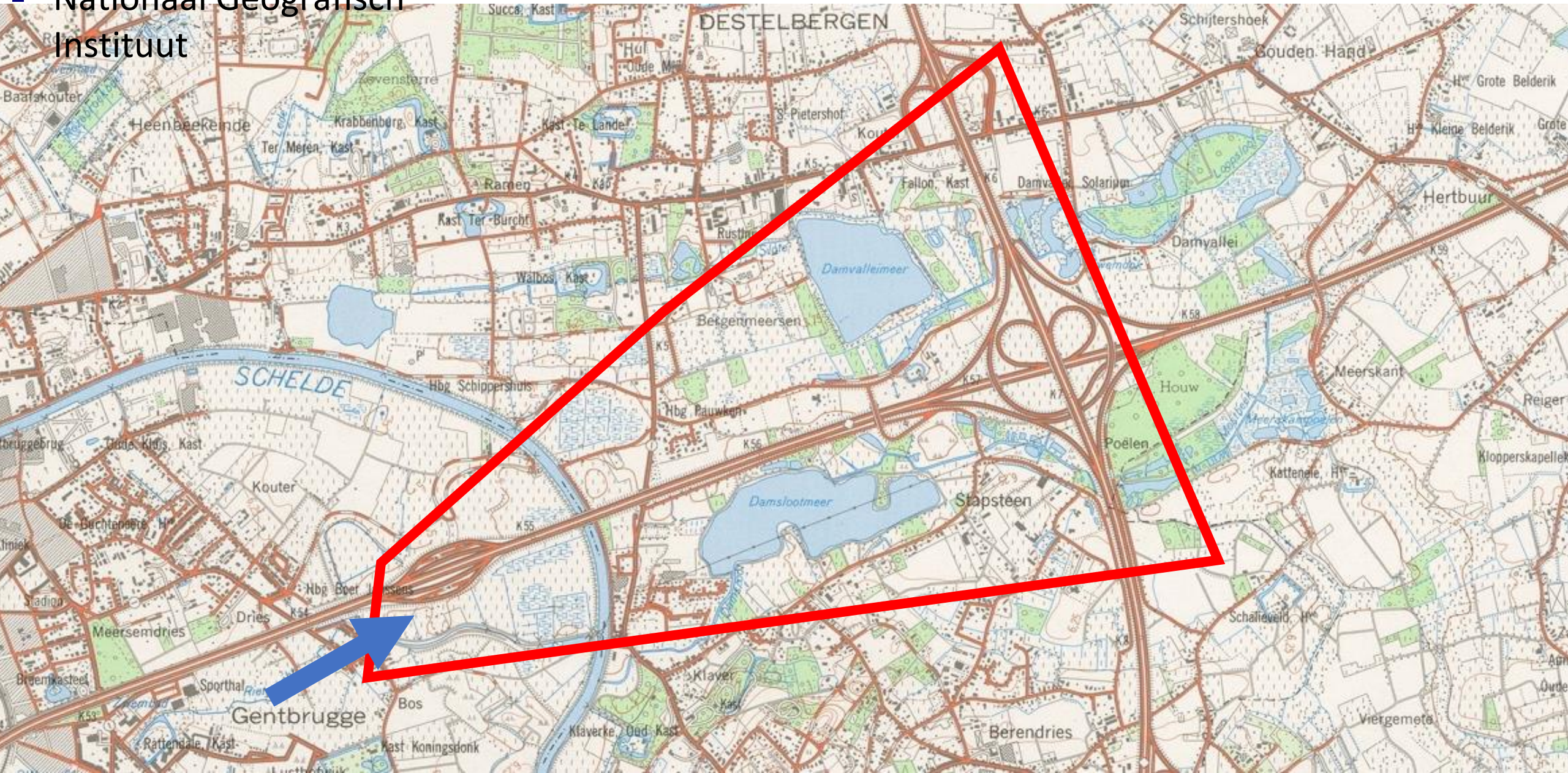


- Situation 1950
- l' Institut Géographique Militaire

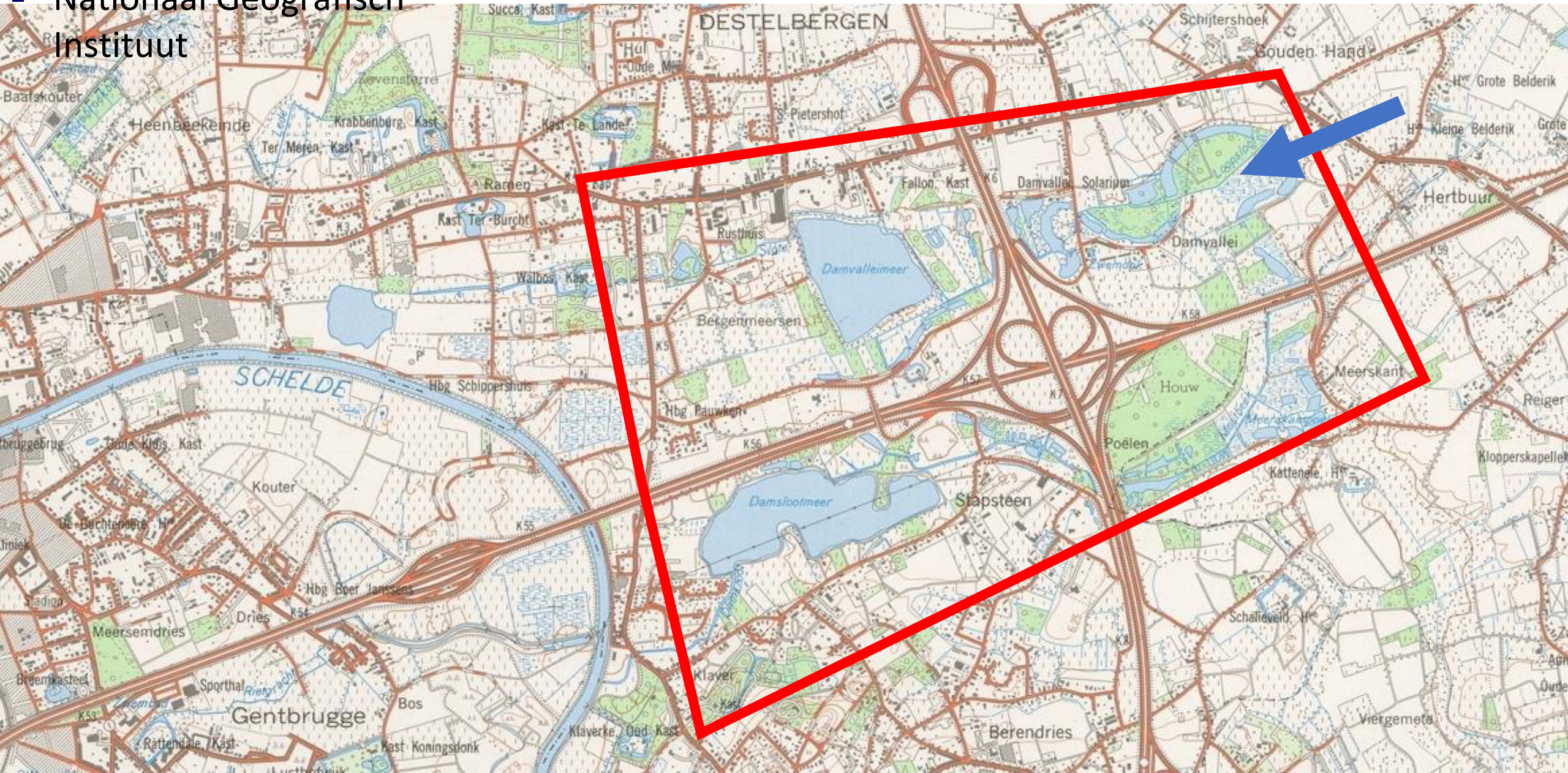
- Situation 1982
- Nationaal Geografisch Instituut



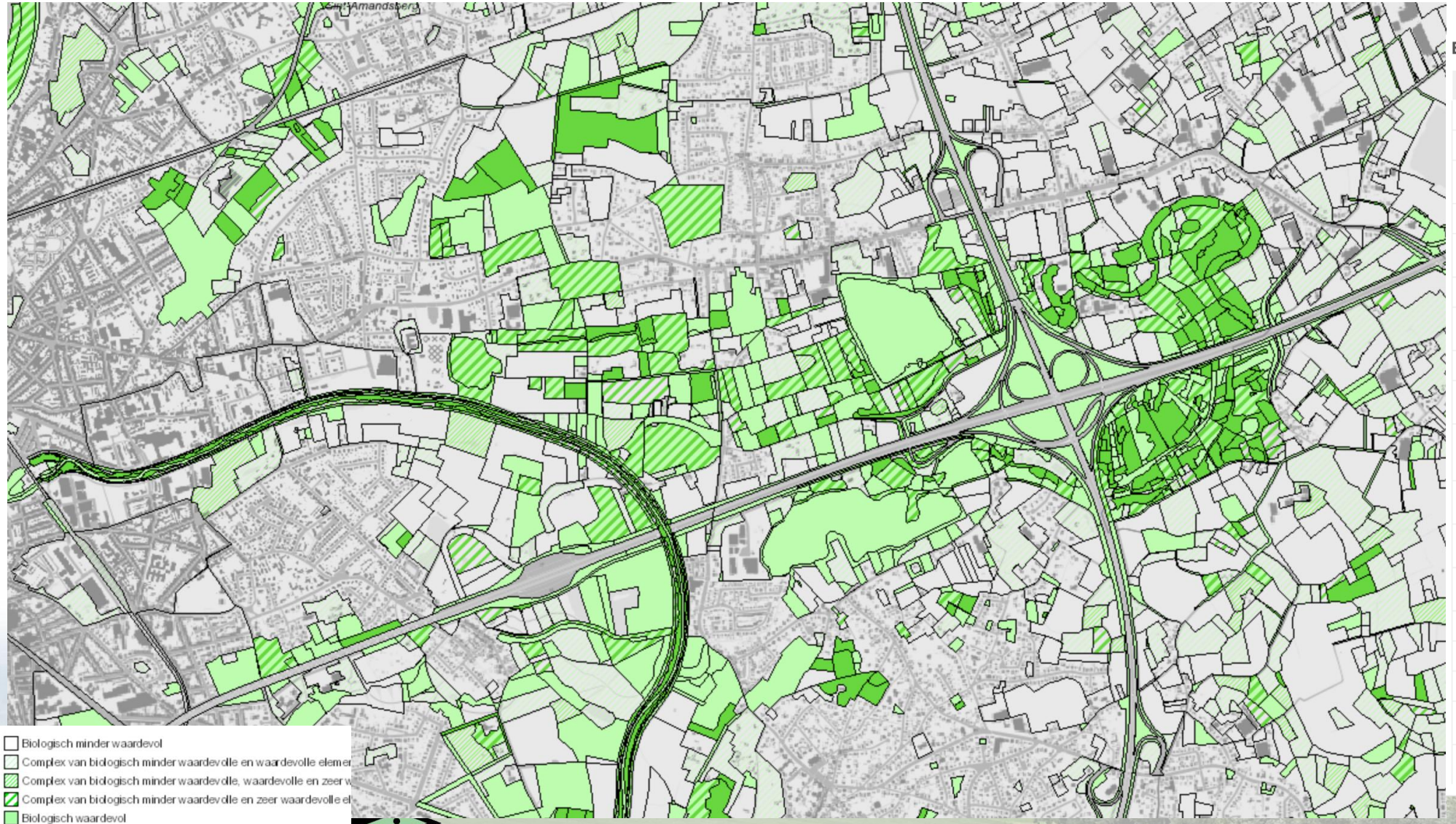
- Situation 1982
- Nationaal Geografisch Instituut



- Situation 1982
- Nationaal Geografisch Instituut



Biological evaluation map



BWK 2 - Zones

Kenmerk	Waarde
Identificator	548018_v2018
Biologische waardering	biologisch zeer waardevol
Code biologische waardering	z
Karteringseenheid 1	dotterbloemgrasland
Code karteringseenheid 1	hc
Karteringseenheid 2	grote zeggenvegetatie
Code karteringseenheid 2	mc
Karteringseenheid 3	zuur laagveen
Code karteringseenheid 3	ms
Karteringseenheid 4	bermen, perceelsranden, ... met rietland en andere vegetaties van het rietverbond
Code karteringseenheid 4	k(mr)
Karteringseenheid 5	bermen, perceelsranden, ... met moerasspirearuigte
Code karteringseenheid 5	k(hf)
Karteringseenheid 6	geen
Karteringseenheid 7	geen
Karteringseenheid 8	geen
Relatie tussen de karteringseenheden 1	
Relatie tussen de karteringseenheden 2	

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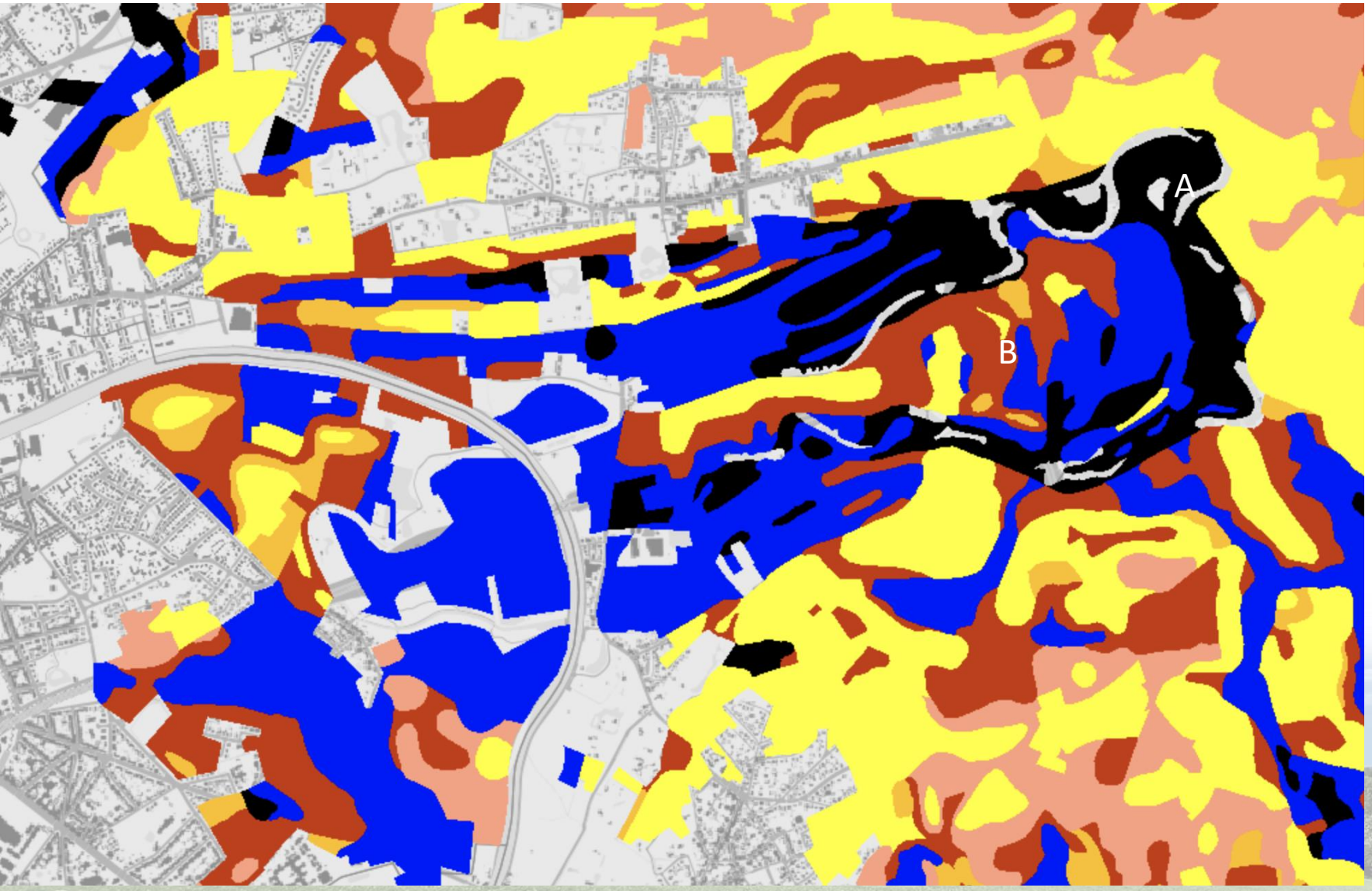
Grasslands

Natura 2000 - habitats

Potential natural vegetation



bij vrije getijdenwerking Wilgenvloedbos, zoniet Elzenbroekbos
bij vrije getijdenwerking Wilgenvloedbos, zoniet Elzen-Vogelkersbos
Elzenbroekbos
Elzenbroekbos met kans op Bronbos
Elzen-Vogelkersbos
Elzen-Vogelkersbos met kans op Bronbos
(A)

Beukenbos, Eiken-Haagbeukenbos of rijke Eiken-Beukenbos
typische Eiken-Beukenbos, droge variant
typische Eiken-Beukenbos, natte variant
arme Eiken-Beukenbos en Eikenbos, droge variant
arme Eiken-Beukenbos en Eikenbos, natte variant
(B)


(A) Wet alder forest


(B) Oak beech forest

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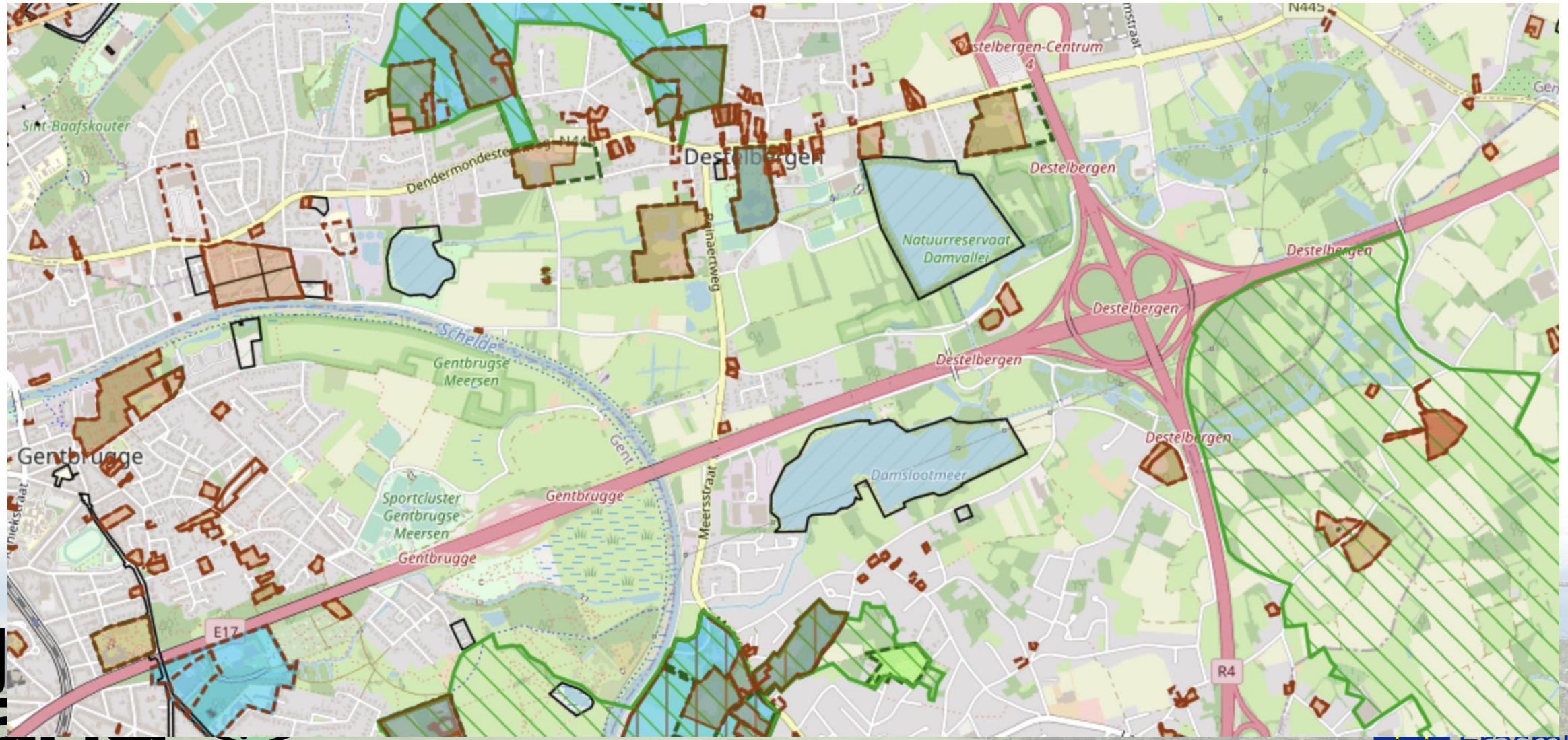
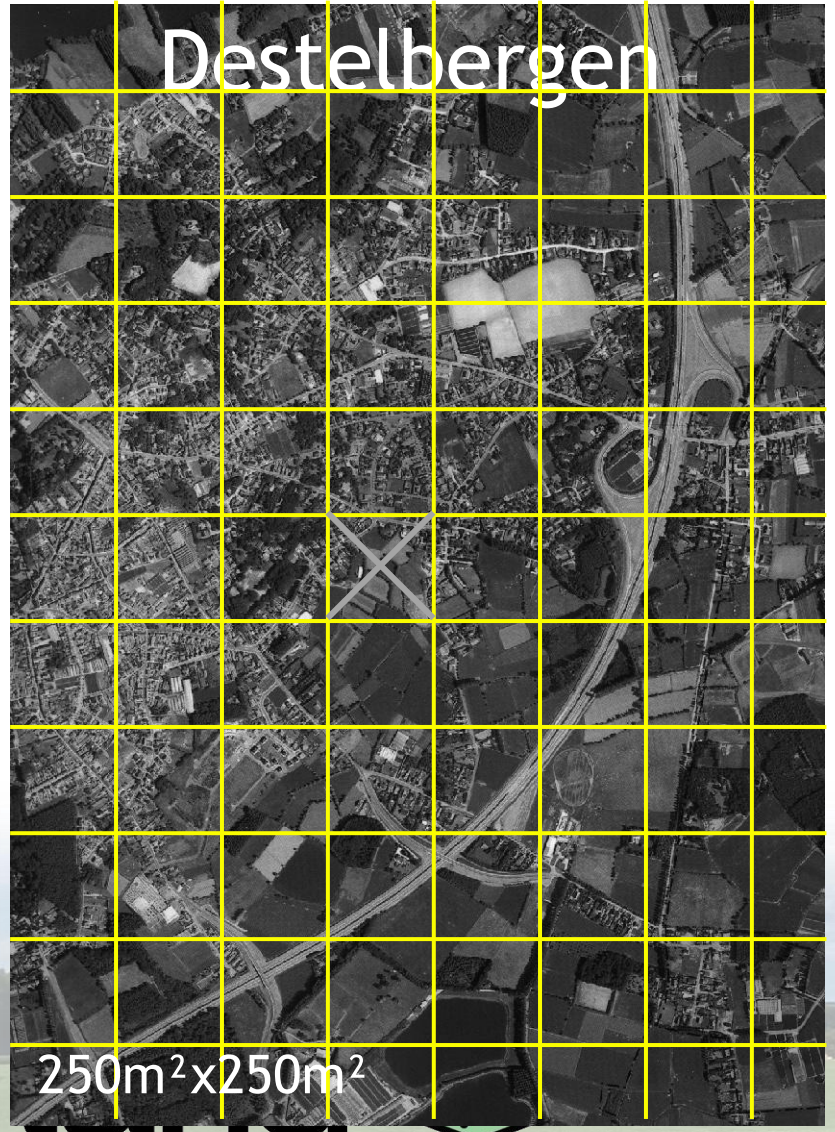
Cultural heritage



Raster analysis: cell as spatial integrator to calculate entropy



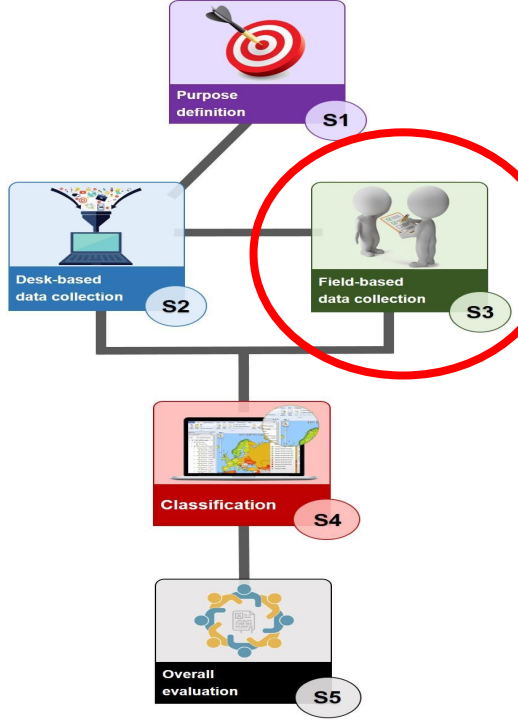


Fig. 8.20 Aerial photographs of two sample areas: an urban landscape (Destelbergen near the city of Ghent) and a transition between two types of rural landscapes (Verrebroek between the enclosed Land van Waas and the open polder land of the Scheldt river). Land use is sampled in both cases using a 250 m by 250 m grid (see also Fig. 8.21)

2 transects per raster

- 3 types
  - Area
  - line
  - points
- 3 time periods

Table 1
Categories of landscape elements used in the traverse sampling on aerial orthophotographs (Scale 1:10 000)

Zonal land use	Small point elements	Linear stuctures
Cropland	Tree row	Track (bicycle)
Grassland	Hedgerow (low)	Narrow road
Deciduous trees	Hedgerow (high)	Wide road
	other	
Conifers	Isolated construction	Motorway
Mixed wood	Farm	Railway
Poplars	Industrial land	Power line
Orchard	Disturbed land	River
Tree nursery	Ponds	Brook
Wasteland		Canal
Continuously		Escarpment
built up		
Garden city		
allotment		
Waste dump		
Lakes		

Antrop 1998

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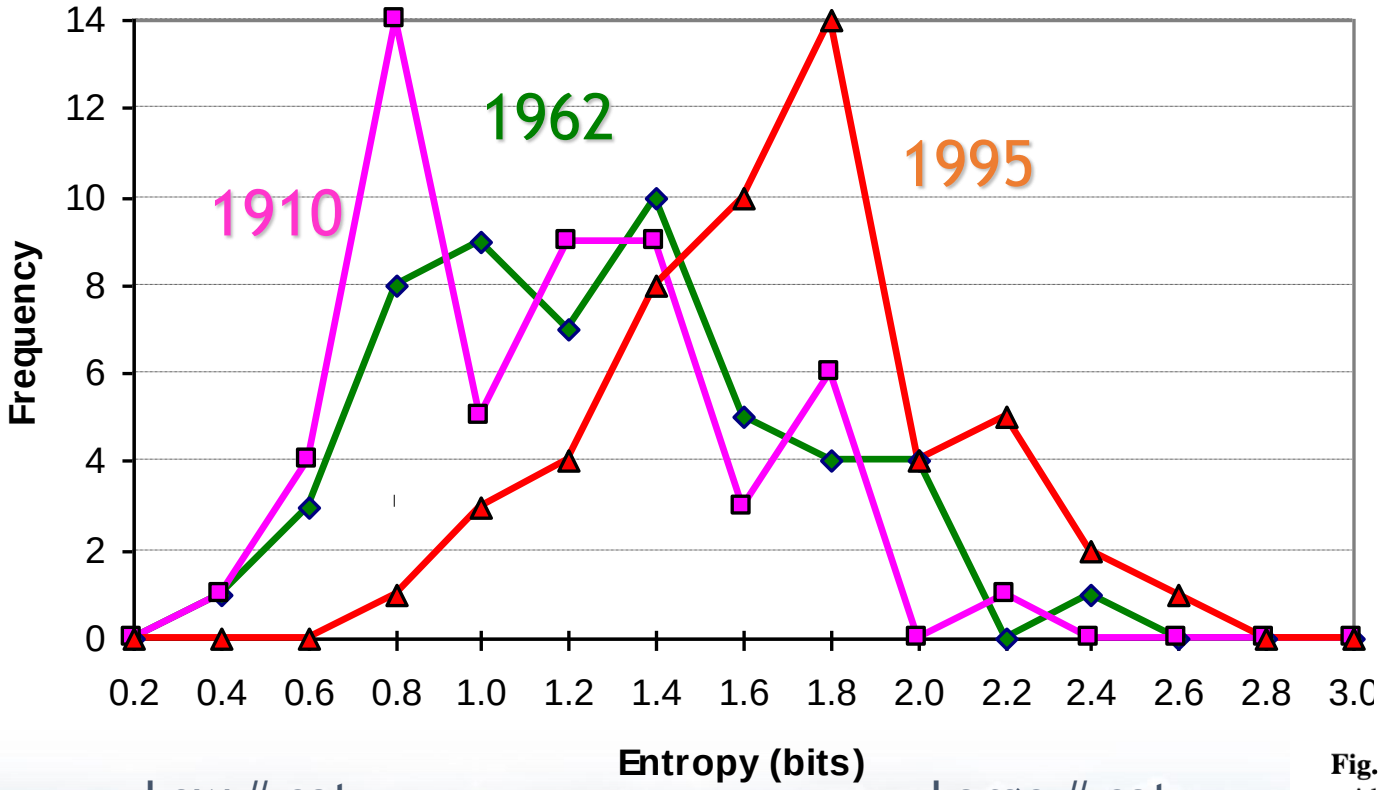
Destelbergen: changes

Homogeneous → heterogeneous → suburban



Low # cat
Dominant cat

Large # cat
Fragmentated

104 transects

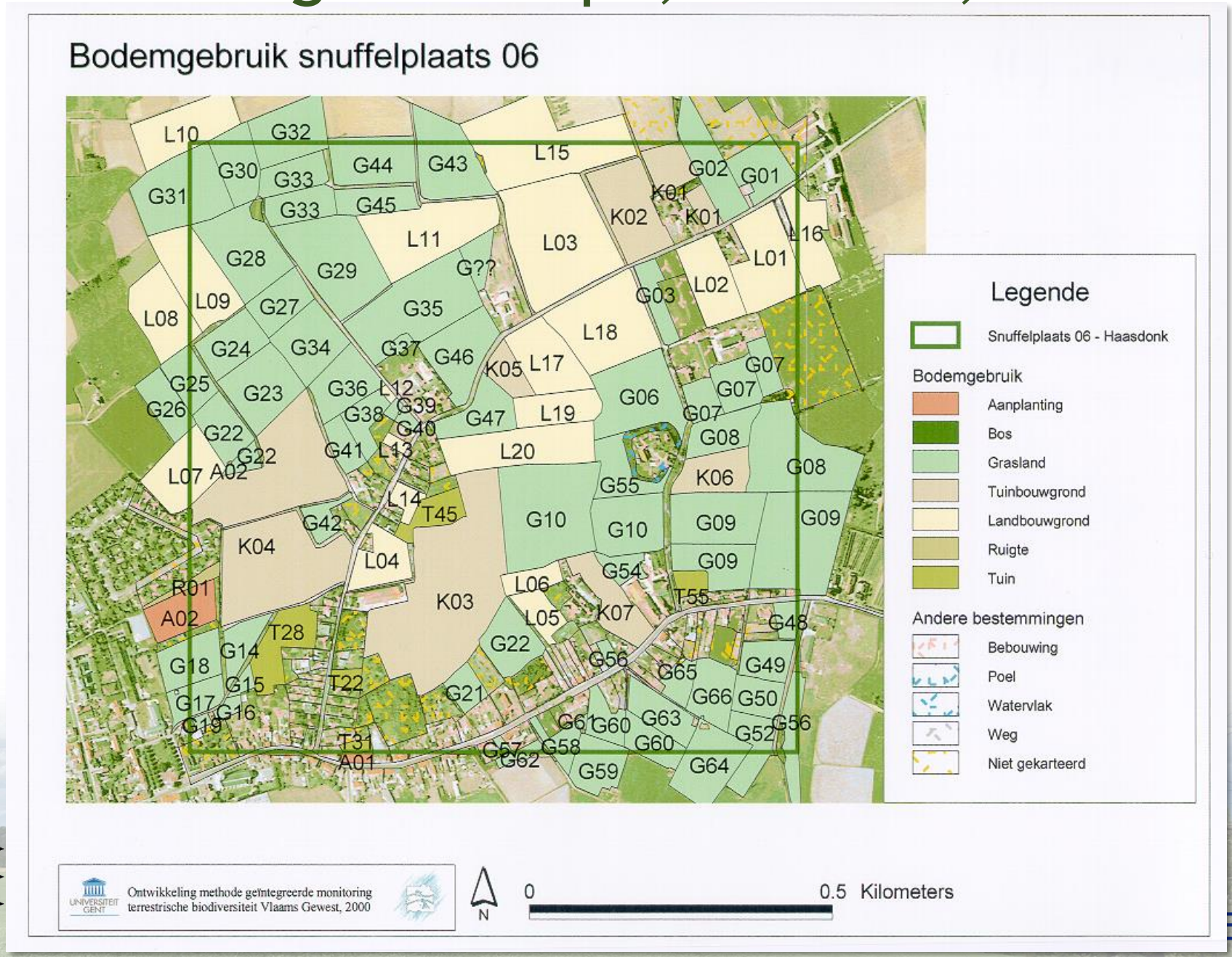
Fig. 8.21 Frequency distribution of the information entropy of the land use, calculated for each grid of the sample areas Destelbergen and Verrebroek on topographical maps from three time periods. Low values of information entropy indicate homogeneous landscapes with a low diversity in land use types or with a dominating category. A high information entropy indicates a large diversity in land use and/or a large spatial heterogeneity or fragmentation. The distributions for case Destelbergen show the transition from a rural to an urban landscape: in 1910 the distribution of the information entropy is rather normal. In 1962, the suburbanization started and the diversity in land use categories dropped. Finally, in 1995, the whole area turned into a heterogeneous urban landscape. During the same period, the landscape in case Verrebroek remained unchanged and characterised by a homogenous cropland with a low diversity in land use categories. Sampling according to Fig. 8.20 (After Antrop 1998)

geo land

Antrop 1998


DESTELBERGEN
GOUDEN HAND
PAUWKEN
MEERSKANT
Schelde
STAPSTEEN
ZAND
Google Earth

Mapping and monitoring landscape, habitats, biodiversity



OBSERVATION SHEET – GEOLAND

Date:		ID observation (letter transect + number sample):
Hour:		Place (village):
Observers:		
GPS	X – coordinate:	
	Y- coordinate:	
	Z-coordinate:	
Distance to previous sample point (m)		
Weather conditions:		
Photograph numbers:		

1. Topography: (1) flat (2) slope (N S E W) (3) undulating
   In case of slope: concave – convex
2. Slope: (1) 0-2° (2) 2-8° (3) 8-22° (4) > 22°
   Exact percentage or degrees (to be calculated based on XYZ coordinates)
3. Soil
   Moisture conditions: |---------- dry ---------- wet ----------|
   (circle along the gradient)
   Colour soil (Munsell scale code):

Top-soil conditions: (circle one or more options)	(1) bare bedrock (> 75%)	(2) bedrock, partially bare (50/50%)	(3) loose soils dominating (>75%): gravel, clay, sand, loam, marl (circle one or more options)	(4) man-made, anthropogenic

   Other bedrock, soil or topography observations of the site (erosion, weathering, deposition):
4. Vegetation

Ground layer coverage:	(1) bare %	If yes, specify
	(2) grass %	
	(3) herbs %	
	(4) cultivated %	

   Number of tree & scrub layers: 0 1 2 more
   Layer heights: (1) < 0,3m (2) 0,3-0,6m (3) 0,6-2m (4) 2-5m (5) > 5m
   Coverage: (1) open <25% (2) semi-open 25-50% (3) semi-closed 50-75% (4) closed >75%
   Spatial distribution: (1) continuous (2) uneven (3) patchy
5. Management

What are the current land use activities in this area?	
Are there any evidences of past land uses in the site today?	
Are there any animals? Which and how much?	

6. Conclusion

General Habitat category	Global/env. qualifier	Site qualifier	Man. qualifier	Life form

geo land

Erasmus+

10:29 PM

Geoland observation sheet

General info

Date & time*

8/4/2022

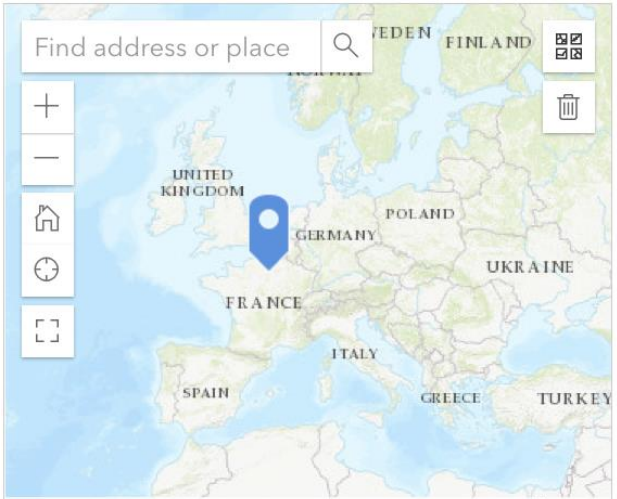
10:20 PM

ID observation*

Letter transect + number sample

ID x

Location*



Lat: 48.764124 Lon: 2.806181

10:31 PM

Weather conditions

Make only one choice

	dry	humid	wet
very cold (<0 °C)	○	○	○
cold (0-15 °C)	○	◉	○
hot (15-25 °C)	○	○	○
very hot (>25 °C)	○	○	○

Add pictures

Make sure the pictures (min. 1, max. 5) are most representative for the location.

1 Select image file (number of files allowed: 1 - 5)

Back Next

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10:29 PM

Geoland observation sheet

Vegetation

Ground layer coverage

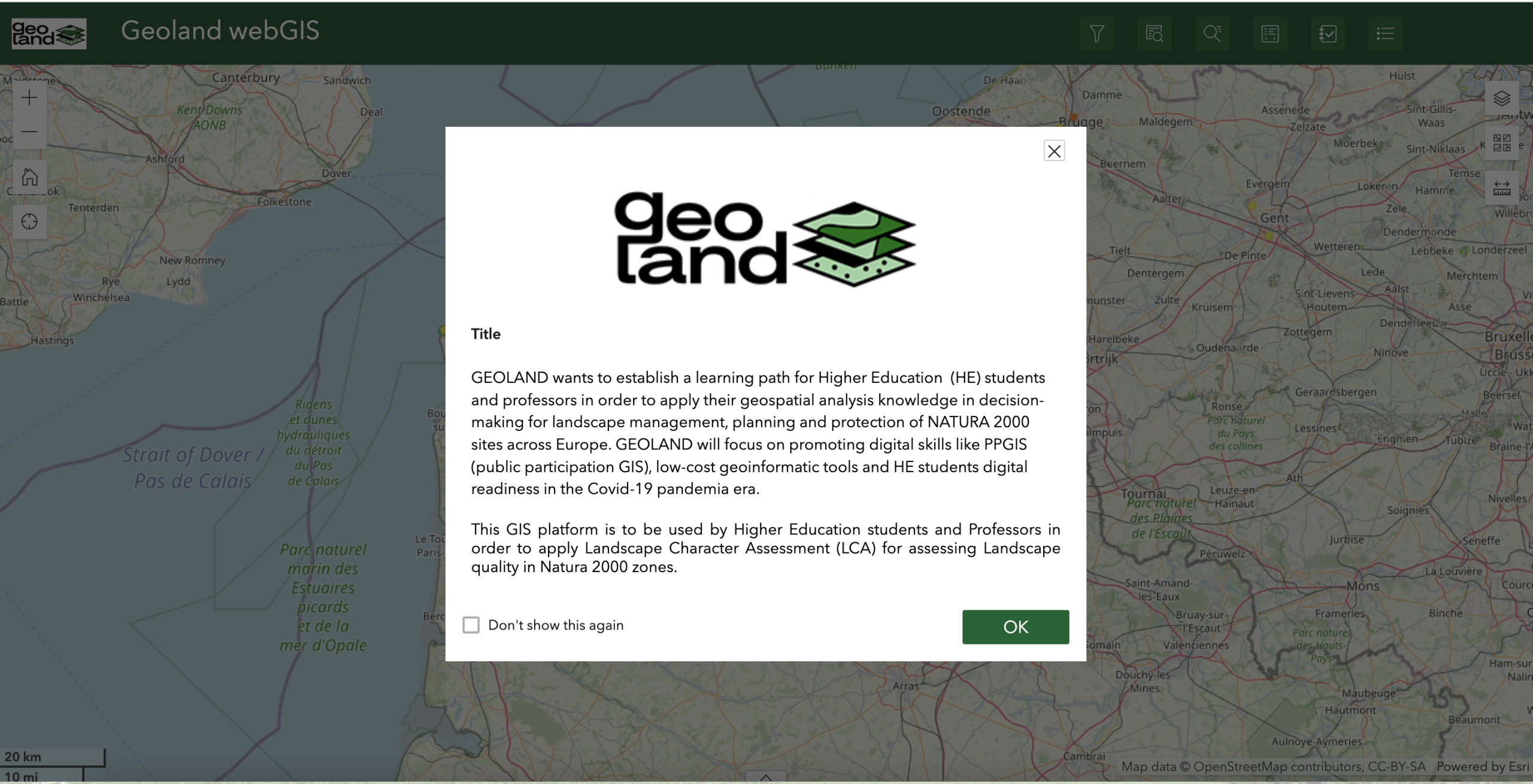
Indicate for each category the percentage (if so)

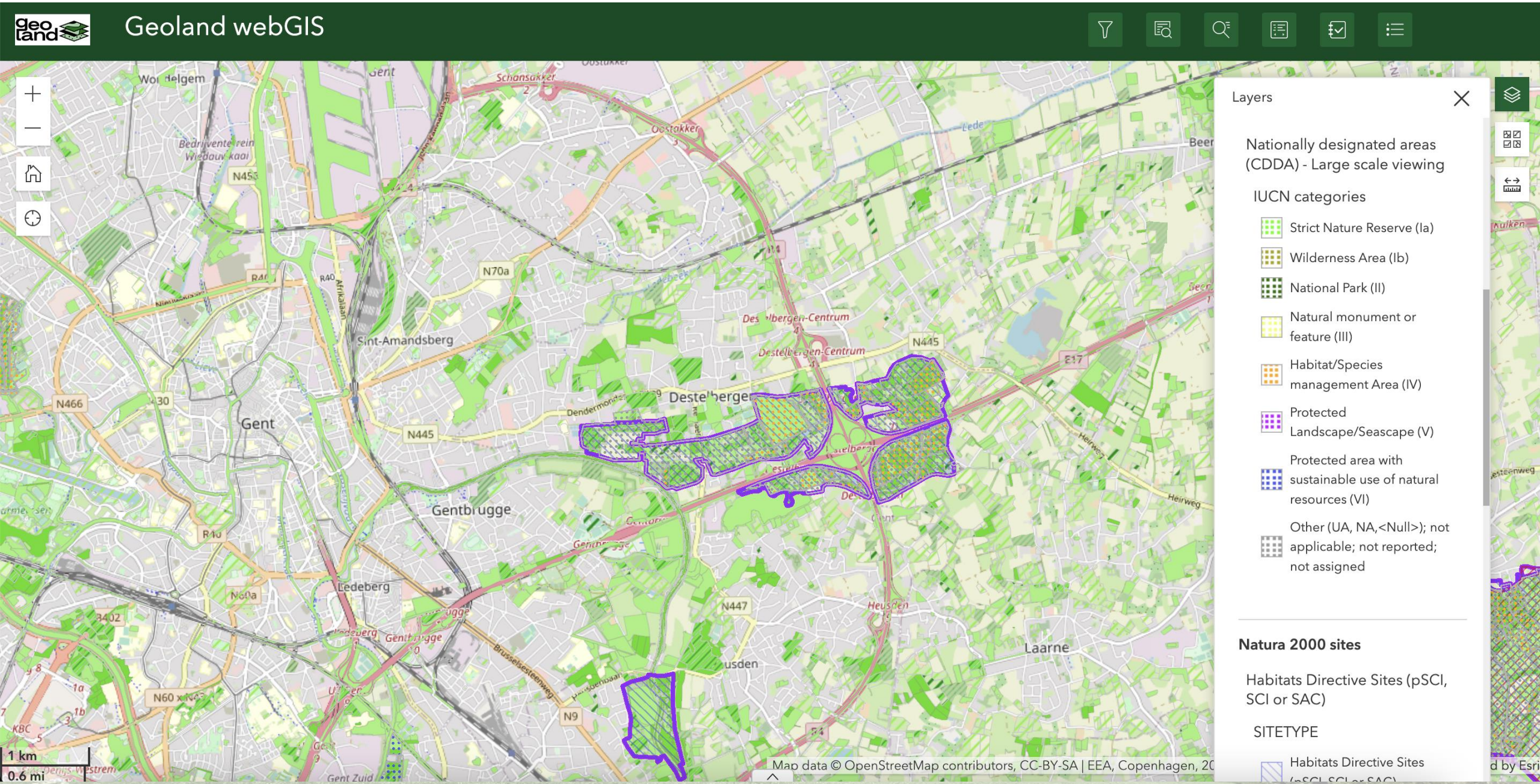
	none	0-25 %	25-50 %	50-75 %	75-100 %
bare	○	◉	○	○	○
grass	○	○	○	◉	○
herbs	○	◉	○	○	○
cultivated	◉	○	○	○	○

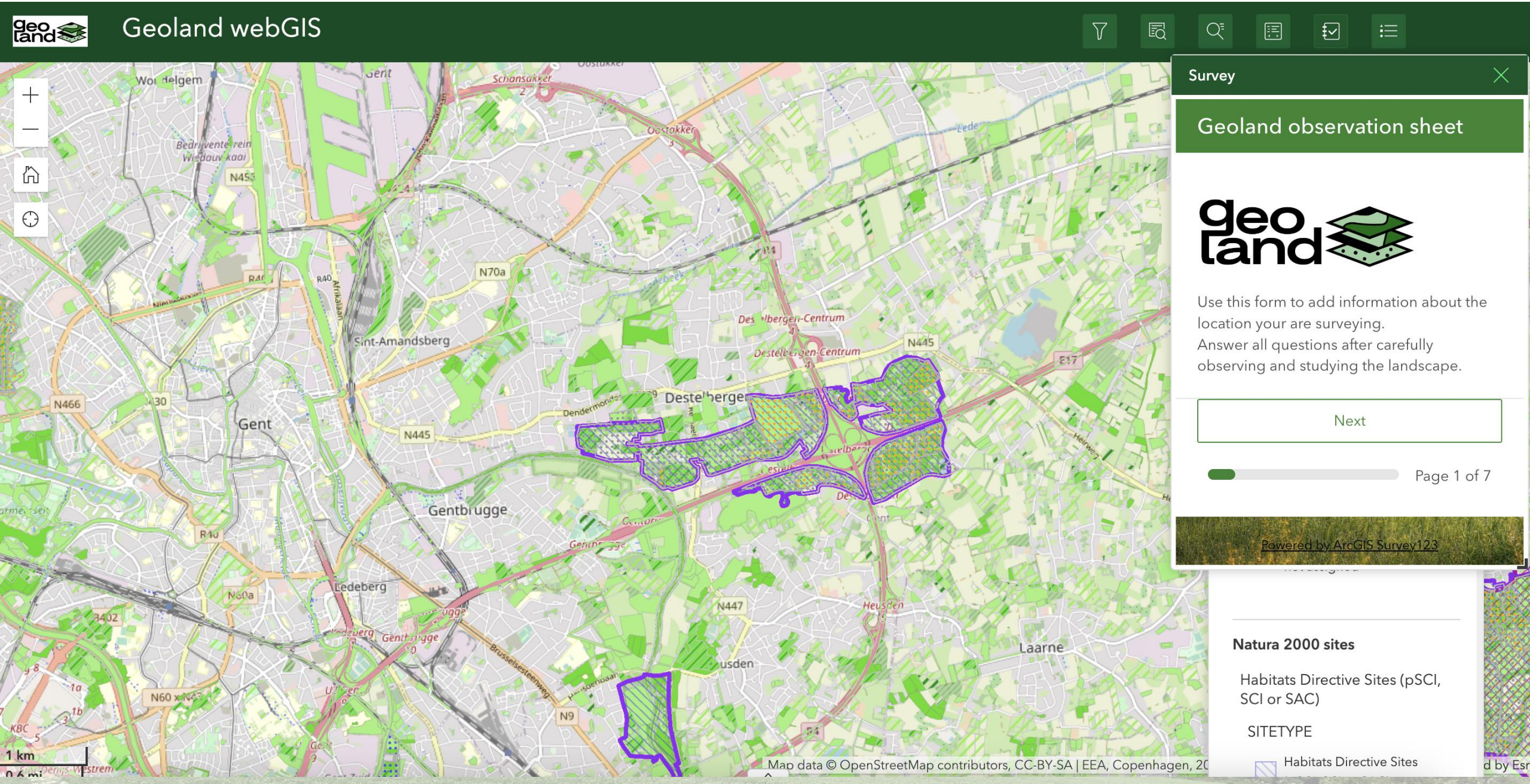
Number of tree & scrub layers*

- ○ 0
- ◉ 1
- ○ 2
- ○ more

Results in webmap application




Geoland webGIS
Layers
Nationally designated areas (CDDA) - Large scale viewing
IUCN categories
Strict Nature Reserve (Ia)
Wilderness Area (Ib)
National Park (II)
Natural monument or feature (III)
Habitat/Species management Area (IV)
Protected Landscape/Seascape (V)
Protected area with sustainable use of natural resources (VI)
Other (UA, NA,<Null>); not applicable; not reported; not assigned
Natura 2000 sites
Habitats Directive Sites (pSCI, SCI or SAC)
SITETYPE
Habitats Directive Sites
Gent
Sint-Amandsberg
Gentbrugge
Ledeberg
Laarne
N445
N70a
N466
N447
N9
1 km
0.6 mi
Map data © OpenStreetMap contributors, CC-BY-SA | EEA, Copenhagen, 20


Geoland webGIS
Survey
Geoland observation sheet
Use this form to add information about the location your are surveying.
Answer all questions after carefully observing and studying the landscape.
Next
Page 1 of 7
Powered by ArcGIS Survey123
Natura 2000 sites
Habitats Directive Sites (pSCI, SCI or SAC)
SITETYPE
Habitats Directive Sites
Gent
Destelbergen
Gentbrugge
Sint-Amandsberg
Ledeberg
Laarne
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N445
N70a
N447
N9
N466
1 km
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