Sustainable Energy Landscapes

GEOSPATIAL WORLD FORUM

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Outline

- Introduction
- Large Scale Energy Landscapes
- Territorial Energy Tool
- Data collection
- Conclusions

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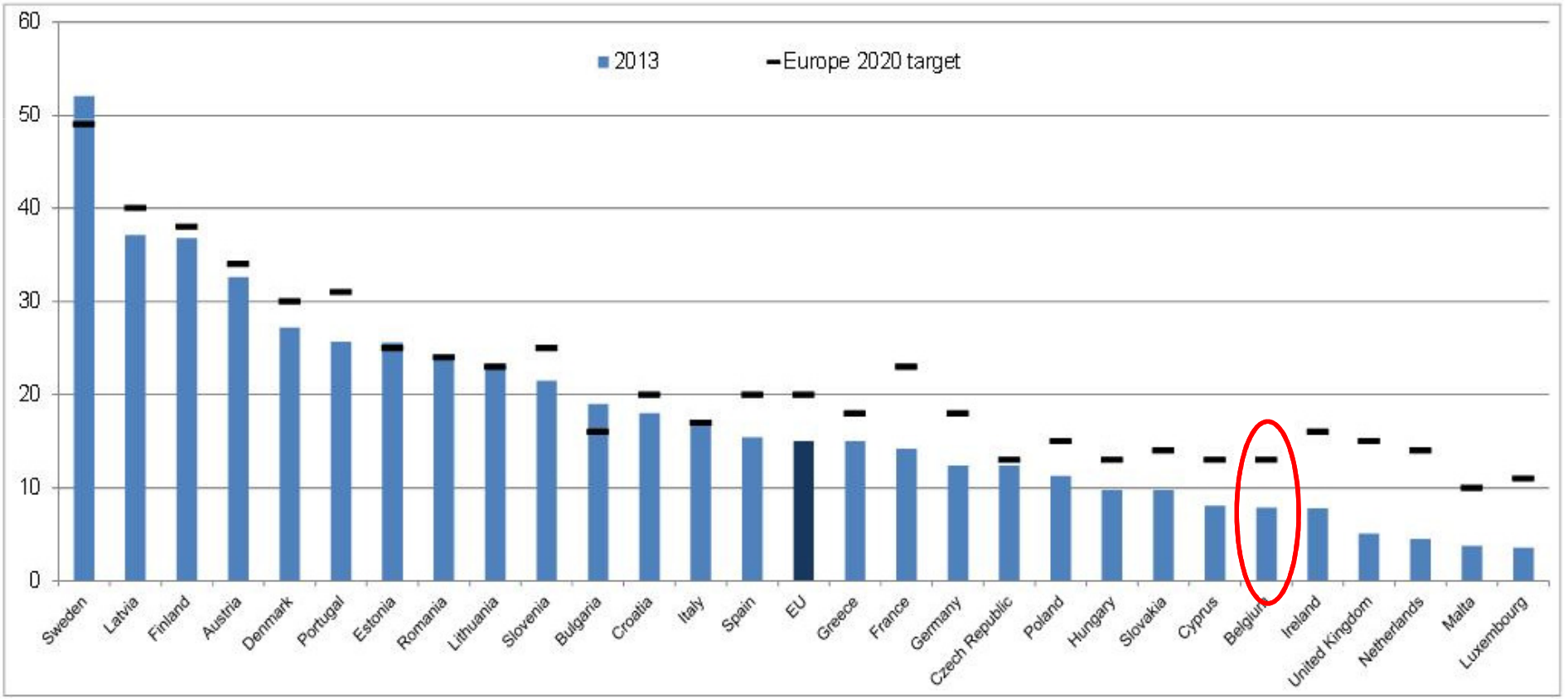
Introduction

Europe 2020 target

Share of energy from renewable sources in the EU Member States, 2013
(in % of gross final energy consumption)



Introduction

Spatial Policy Plan

Room for Energy Transition

- Minimise energy demand
  - Location policy
  - Densifying the space
- Maximise energy efficiency
  - Synergie between functions
- Use renewable resources
  - Integrated energy production
  - Large-scale renewable energy generation

Introduction

Spatial Policy Plan

Room for Energy Transition

- Minimise energy demand
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- Use renewable resources
  - Integrated energy production
- **Large-scale renewable energy generation**

Large Scale Energy Landscapes

Definition Large Scale Energy Landscape:

“An Energy Landscape is an area where the most important function is to supply a considerable amount of the energy needs of the society. It accomplishes this function by the large scale generation of renewable energy. This generation structures the area into a new and attractive landscape.”

Large Scale Energy Landscapes

Garding Spatial Quality

Utility Value

- Efficient functioning without compromising each other
- Select places with highest potential
- Mix with other functions

Perception Value

- Local identity
- Readability of a landscape

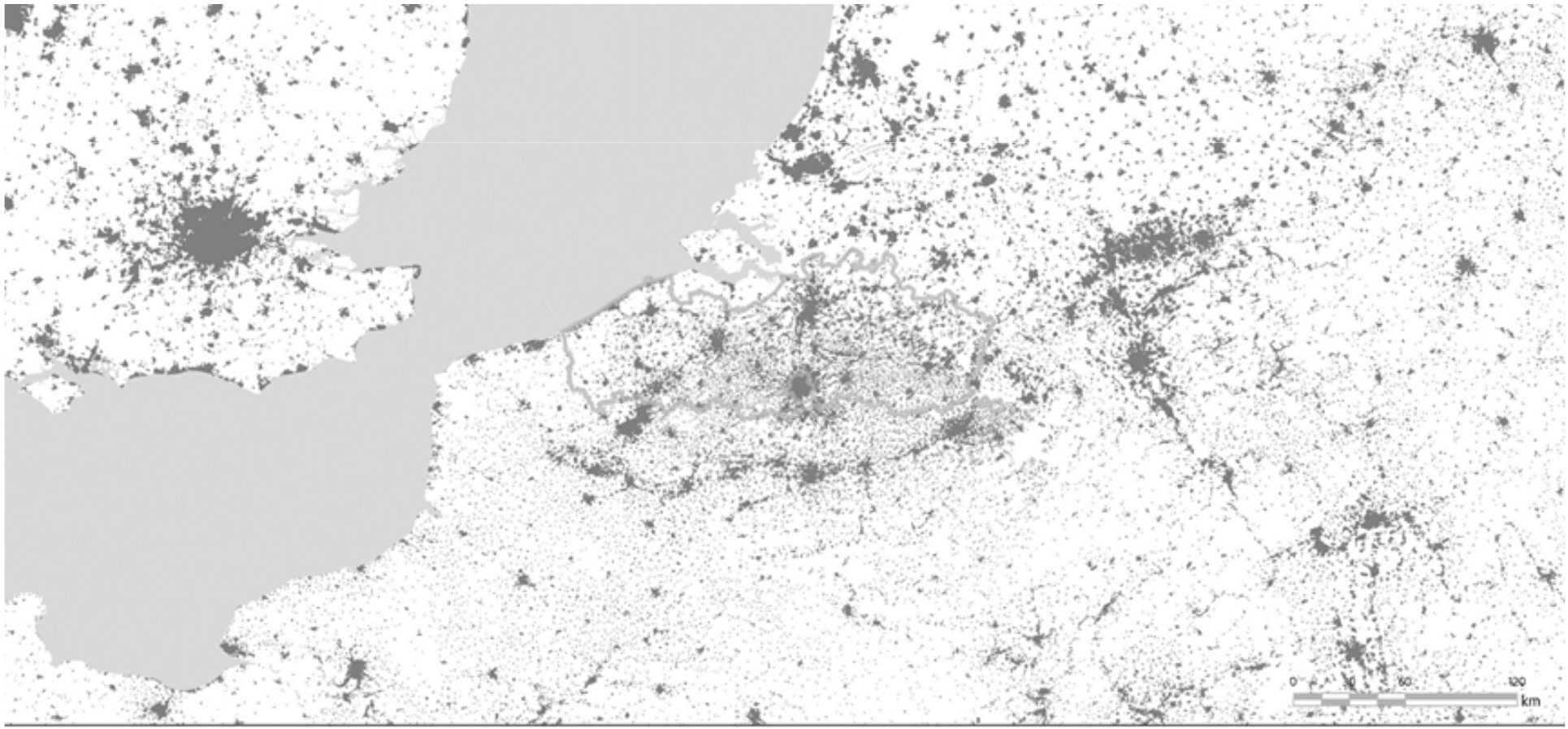
Future Value

- Deal with spatial consequences of changing circumstances

Large Scale Energy Landscapes

Restrained by:

- Population
- Built Up Area



Large Scale Energy Landscapes

Current practice windturbines

- Harbors
- Industry
- Line elements
  - Highways
  - Power lines

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Large Scale Energy Landscapes

Territorial Energy Tool

- Development of Energy Potential Map of Flanders
  - Territorial Energy Tool
  - Made by VITO (Flemish Institute for Technological Research)
- Interactive Cartografic Tool
- Identification of areas with highest energy potential

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Territorial Energy Tool

Tool in General

- Model based on ASCII raster images
- Resolution of 0,25 hectares
- Current Energy production
  - Classic Energy production
  - Renewable Energy production
- Potential Energy production
  - Focused on wind energy
- Terrain potential

- Identification of areas with highest potential energy production

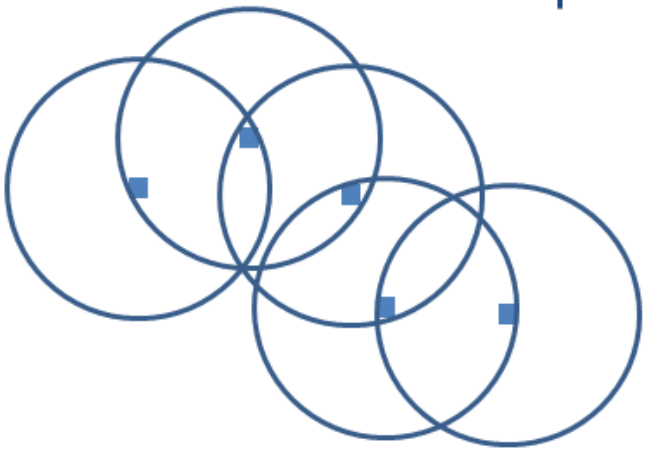
Territorial Energy Tool

Current Energy Production

Potential Energy Production

Terrain Potential

MW / cell X Terrain potential



Clustering > 70MW

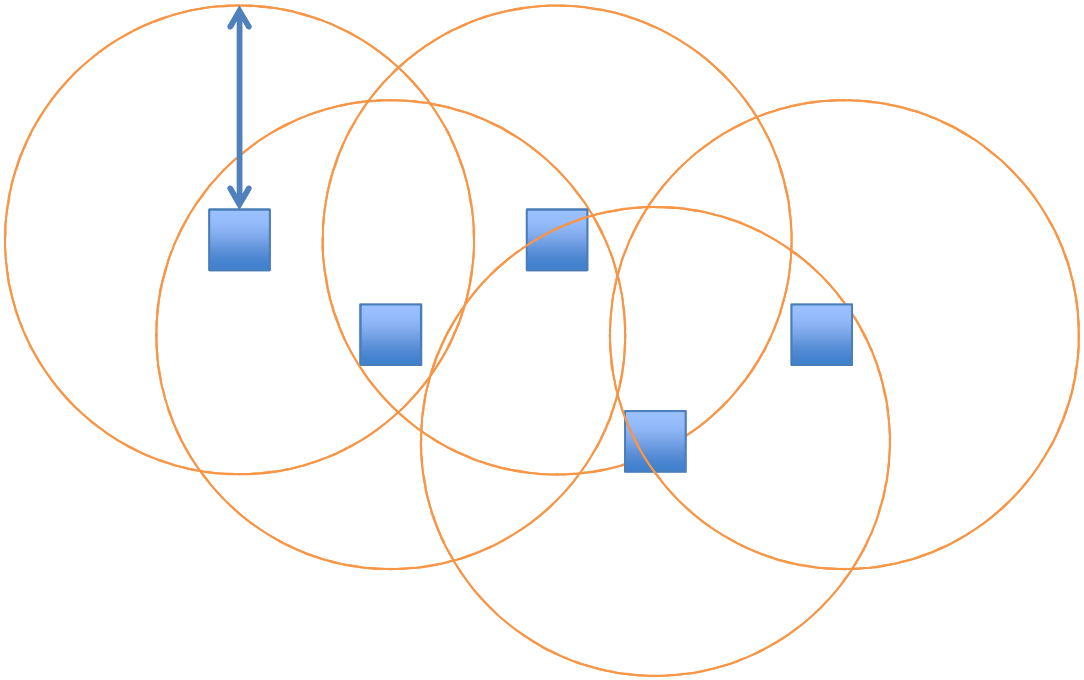
Territorial Energy Tool

Tool in General

Input Variables:

- Surface: Maximum area an Energy landscape can have
  - 600 hectares
  - 1000 hectares
- Radius: Maximum distance between two rastercels
  - 550 meter
- Minimum MW: Minimum power produced by an energy landscape
- MW per windturbine

550 m



70 MW?

Data collection

Current Energy Production

Classic Energy Production

- Fossil Fuel
- Nuclear Energy

List available through internet

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Data collection

Current Energy Production

Renewable Energy Production

- Wind Energy → Building permits
- Solar Energy – small → Based on municipality
- Solar Energy - big
- Biomass
- Biogass
- CHP
- Geothermal Energy

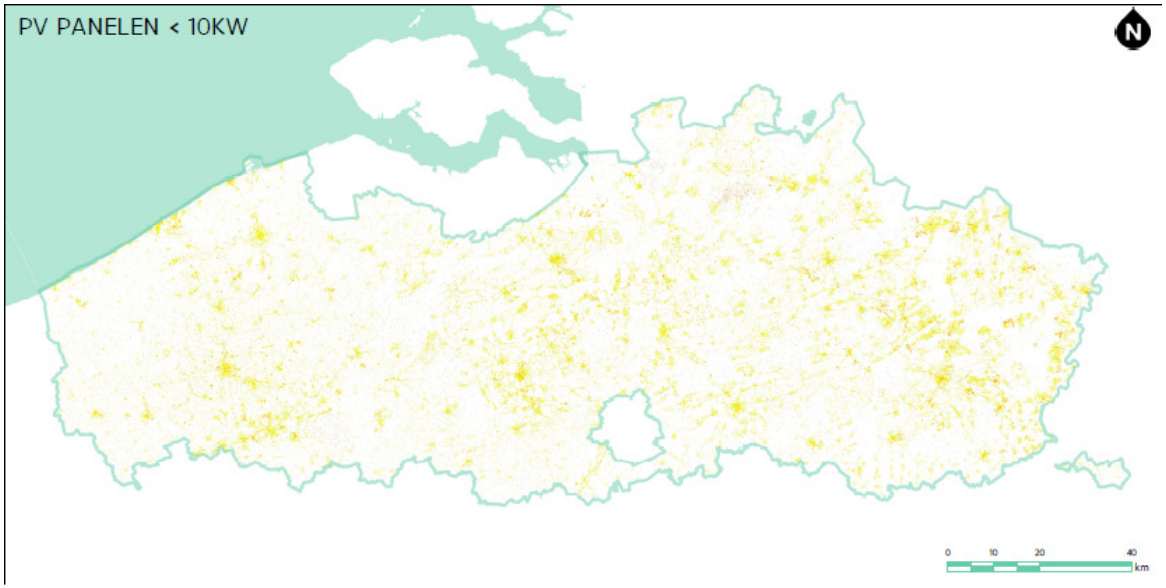
→ Green certificates

Data collection

Potential Energy Production: Solar Energy

Calculation process:

- Total roof surface in Flanders
  - A GIS file is available with all buildings
- Allocation of 52,5 Watt / m²
  - Average production of 130 Watt / m²
  - 40% of roof surface is suitable



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Data collection

Potential Energy Production: Focus on Wind Energy

- Spatial impact of windturbines
- Territorial footprint
  - Nucleair powerplan of 3000 MW on 80 hectares
  - Windturbines of 3000 MW on 22.500 hectares

Data collection

Calculation wind energy potential

Automatic siting of locations of windturbines

- Positive factors
- Negative factors

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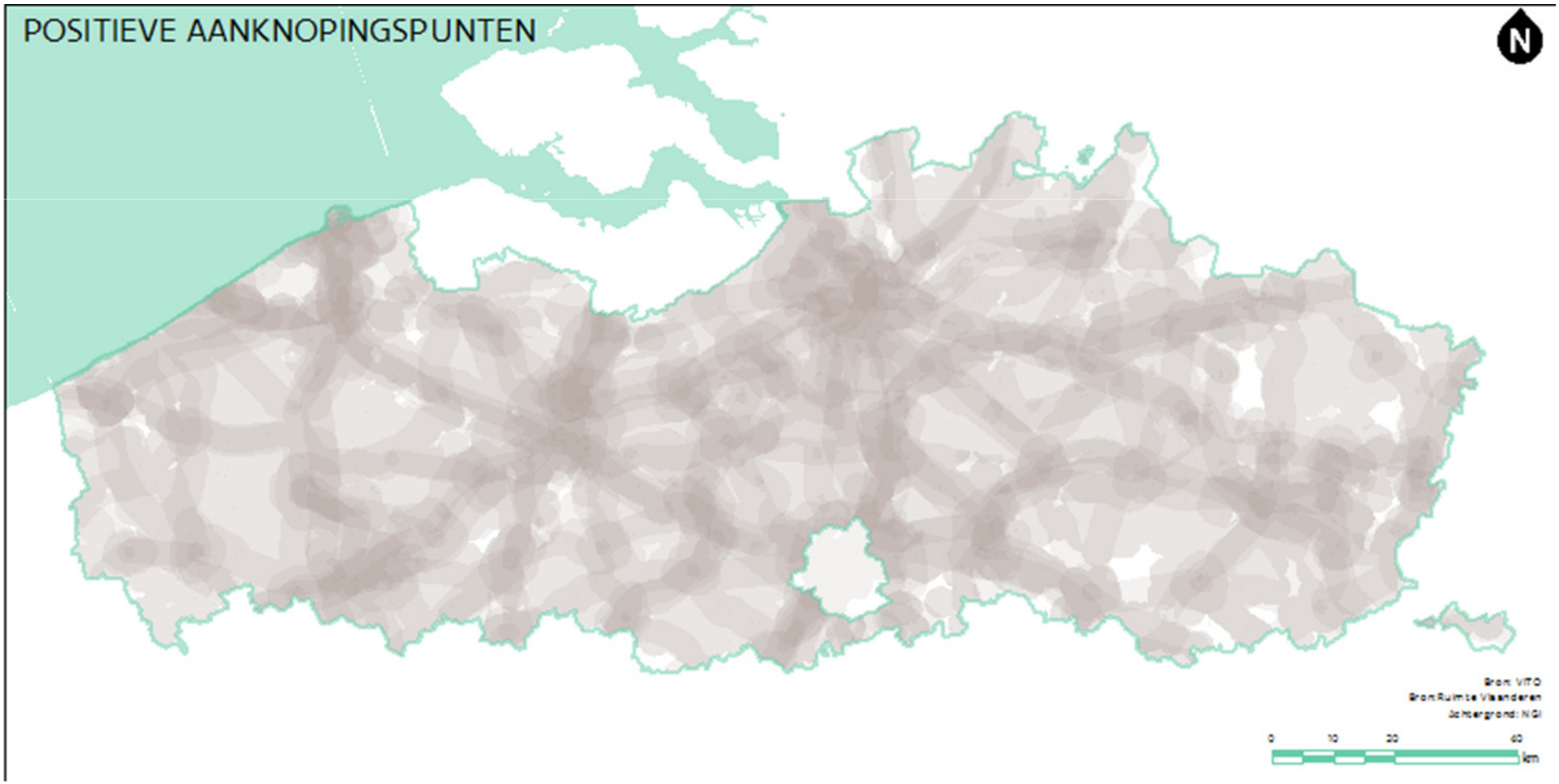
Data collection

Calculation wind energy potential

Type	Dataset
Positive Factors	
Industrial Areas	Current Industrial Areas, buffer 250 m
	Planned Industrial Areas, buffer 250 m
Ports	Port area
Line infrastructure	Railway, buffer 250 m
	Highway, buffer 250 m
	Primairy road, buffer 250 m
	Waterway, buffer 250 m
Urban area	Sealed Soil> 50%
	Planned Urban Areas
Community facilities	Community facilities
Current Windturbines	Build wind turbines (large scale >145 m), buffer 750 m

Data collection

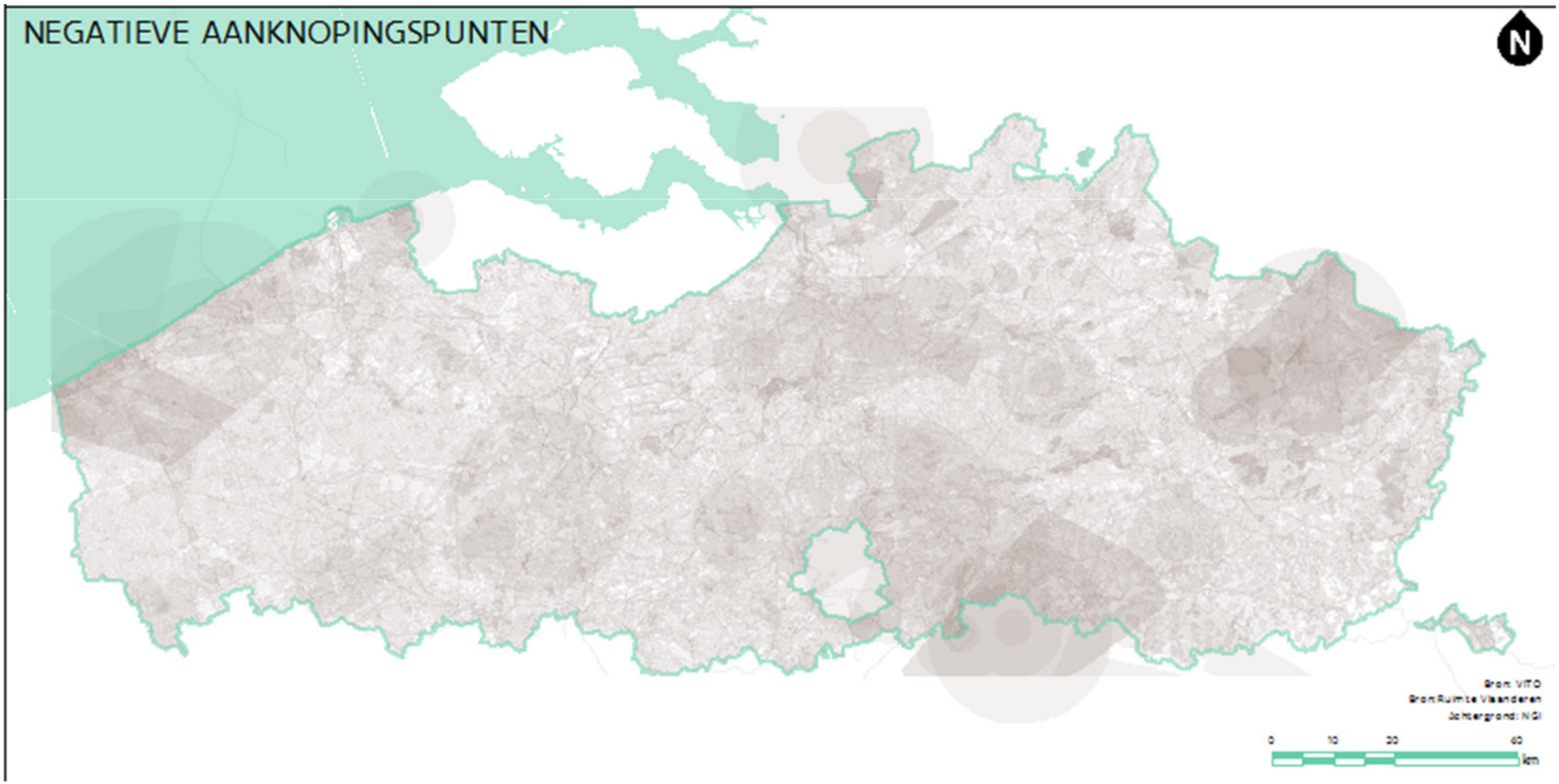
Calculation wind energy potential



Type	Dataset
Negative Factors	
Area with nature value	Habitats Directive Area
	Bird Directive Area
	Nature Reserve Area
	Forest Reserve Area
	Flemish Ecological Infrastructure
Area with heritage value	Anchor Place
	Protected Archeological Sites
	Protected Landscapes
	Protected Monuments
	Protected cities and villages
	Unesco
Spatial Vulnerable Areas	Spatially vulnerable areas
Residential Areas	Planned residential Areas, buffer 300m
Safety Restrictions	Industrial Buildings, buffer 50 m
	Residential Buildings, buffer 300 m
	Railways, buffer 50 m
	Highways, buffer 50 m
	Primairy roads, buffer 50 m
	Waterways, buffer 50 m
	Powerlinesn, buffer 150m
	Pipelines, buffer 150m
	Industrial installations, buffer 200m
Aviation restrictions	Defense Radar Zone
	Defense Military Reserve Aerodrome
	Defense Aerodrome Control Zone
	Defense High Danger Zone
	Belgocontrol Radar Zone
	Belgocontrol Orange Zone
Current / planned wind turbines	Built Wind Turbines, buffer 500m
	Planned Windturbines, buffer 500 m
Open Space	Open Space > 1000 hectares

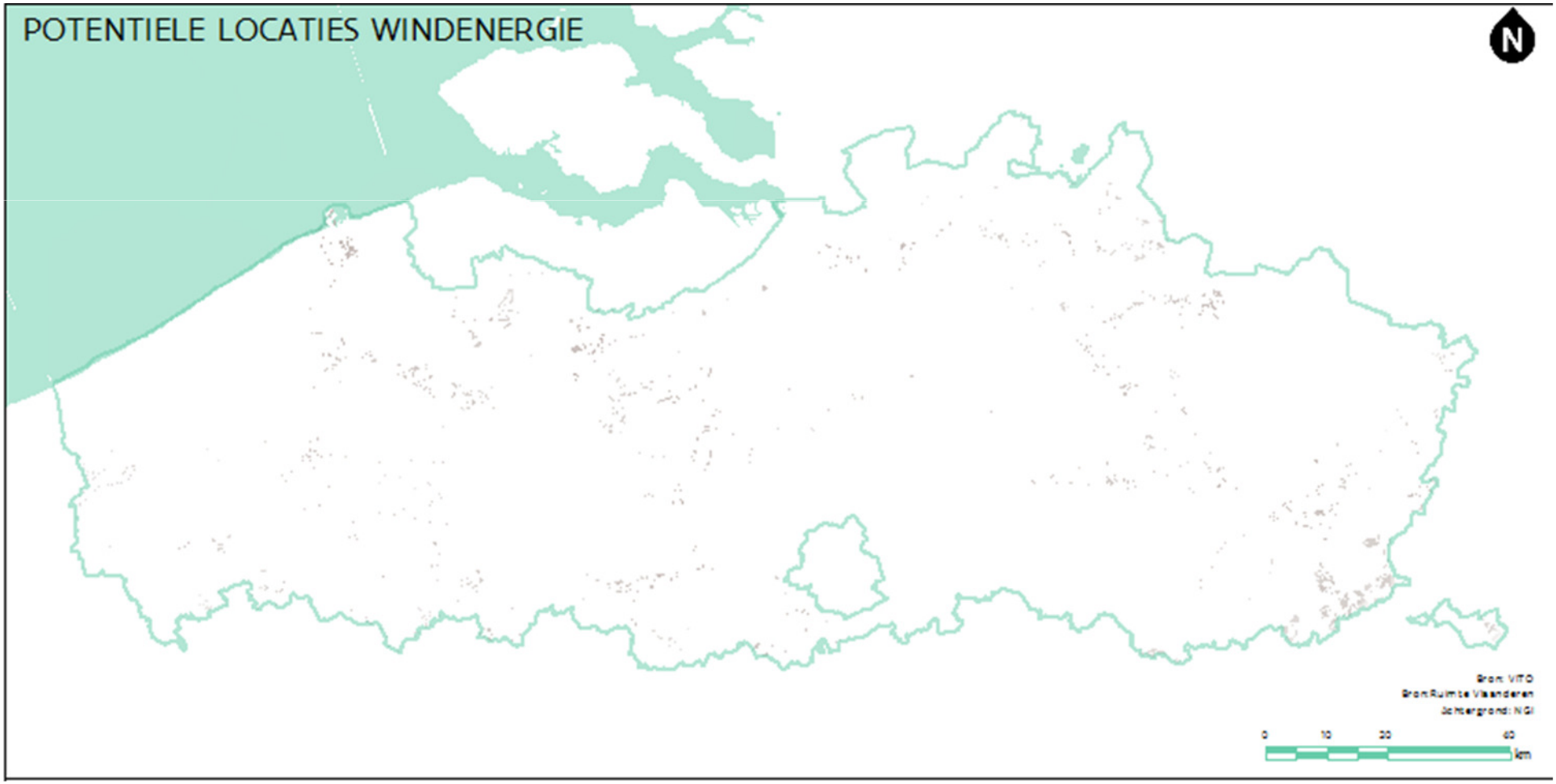
Data collection

Calculation wind energy potential



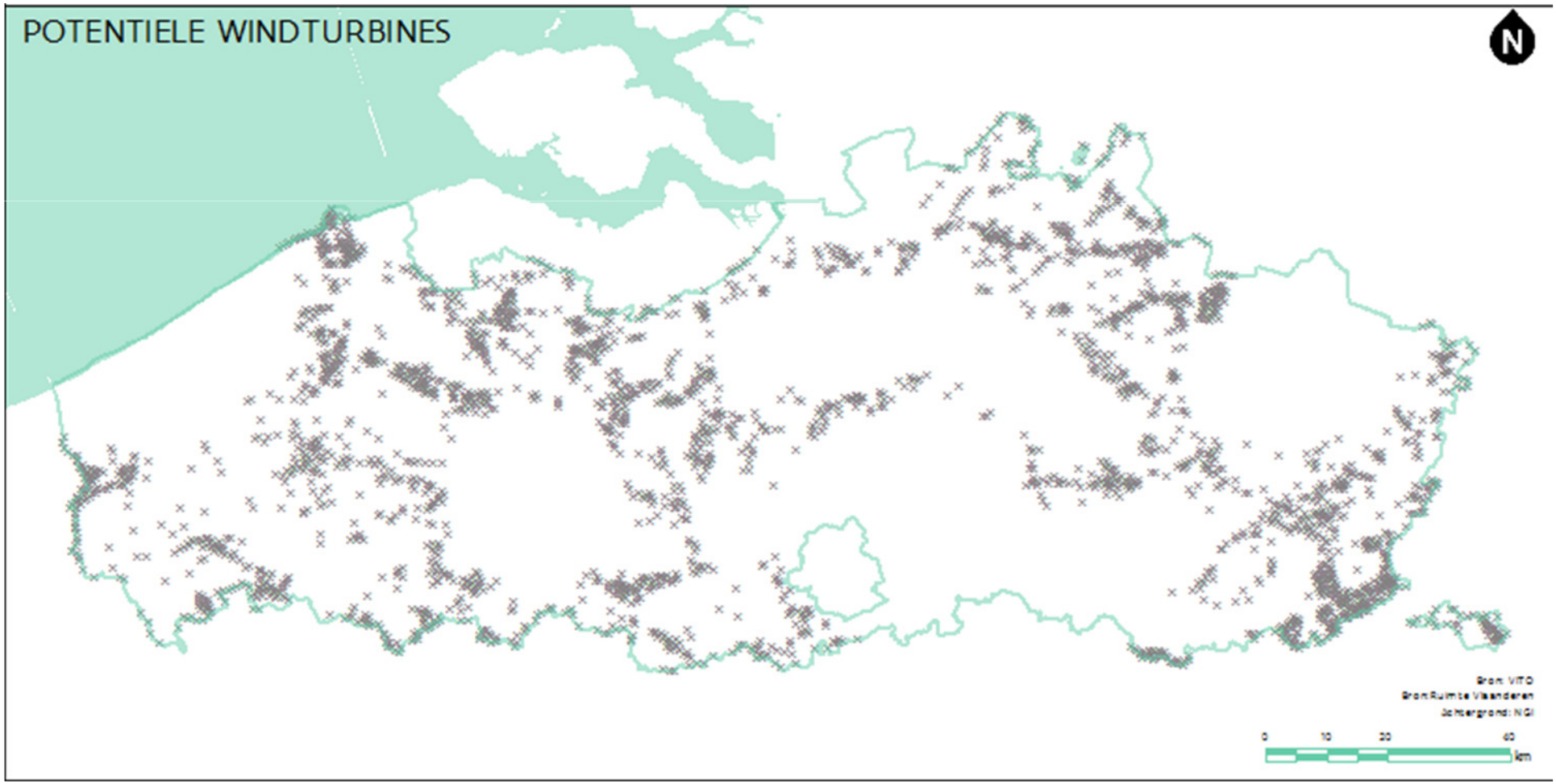
Data collection

Calculation wind energy potential



Data collection

Calculation wind energy potential



Conclusions

Advantages of the tool

- Integrating different sources
- Interactive map
  - Adding new data on energy sources
  - Adding new positive or negative factors
- Working with scenario's
  - What if: wind turbines were allowed in natural areas?
  - What if: wind turbines were allowed nearer to houses
  - What if: wind turbines were allowed in open space?

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Conclusions

Disadvantages of the tool

- Data availability
  - Confidential data
  - Privacy rules
- Data format
  - Data conversion
- Scale

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Thank you for your attention

Questions?

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