

# Land take data in a European context – Comparing apples and oranges?

Fit for 2050? Strategies for achieving the EU's 'no net land take' goal

ILS - Research Institute for Regional and Urban Development

4 February 2022, Virtual Symposium

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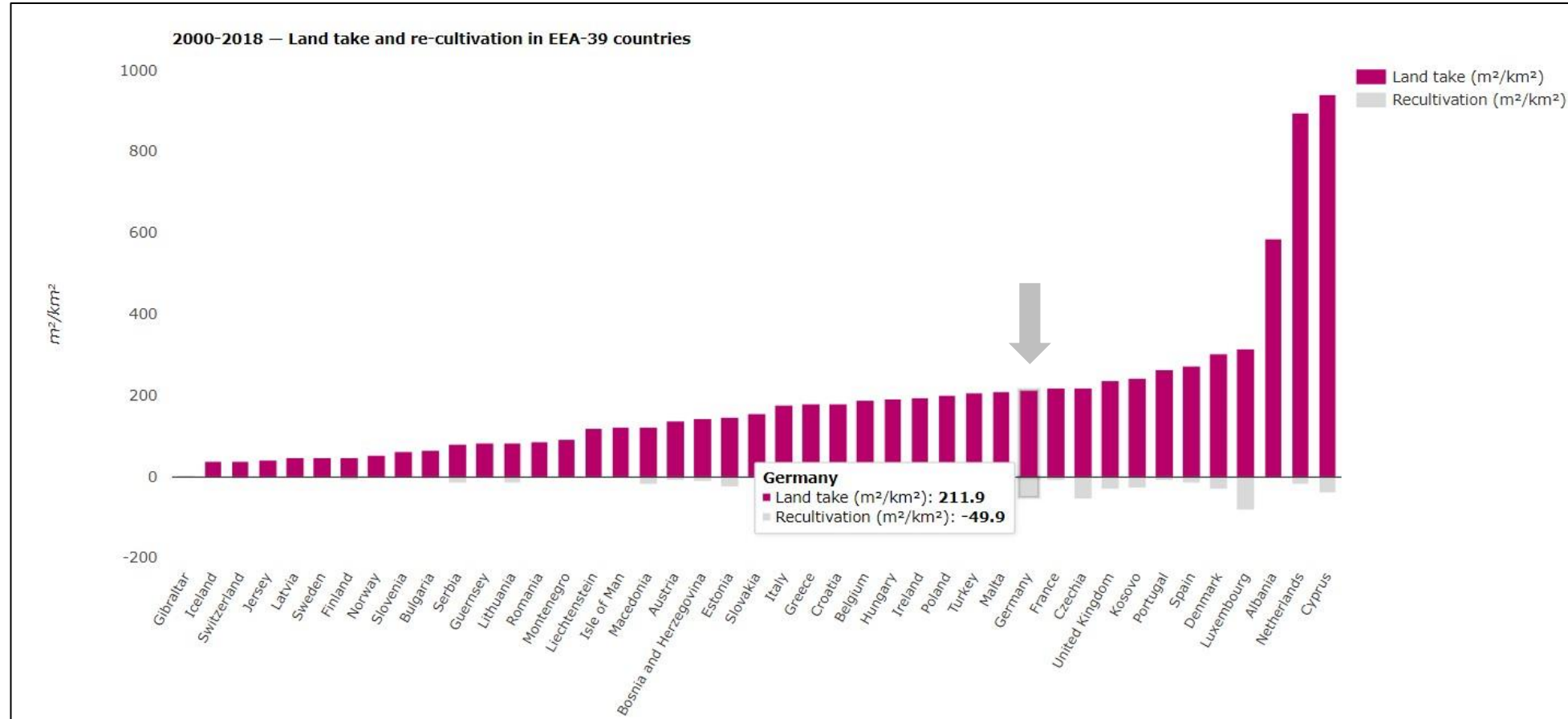
- **Introduction and project context**
- Approaches to monitor land take rates
- Monitoring results vs. policy interpretation
- Conclusion and outlook

# Introduction and project context

## Consistency and reliability of land use data (UBA - Federal Environment Agency)

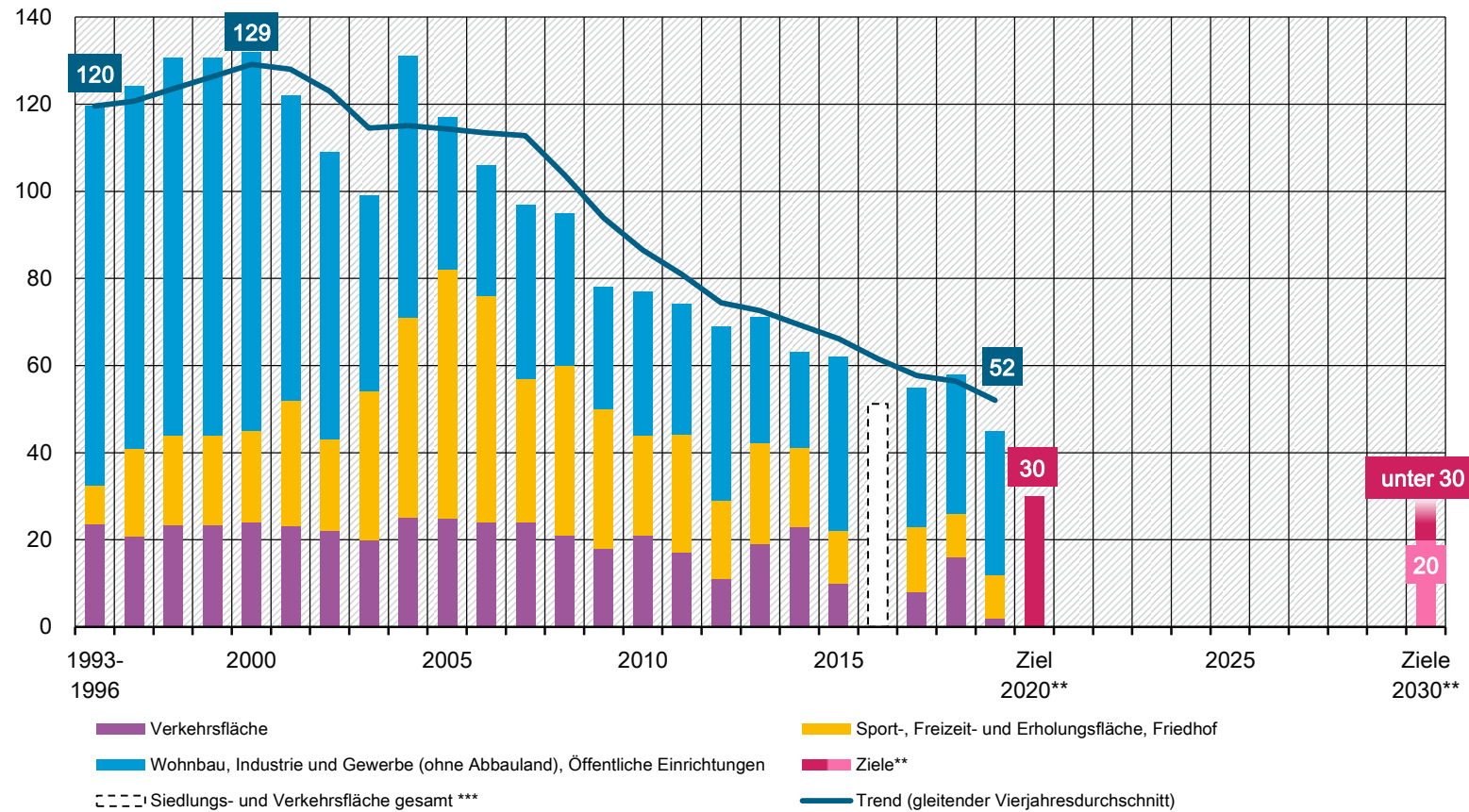
- Quantitative spatial development indicator(s) to monitor sustainable development targets (Sustainable Development Goals ↔ German Sustainability Strategy)
- Mismatches caused by different approaches, data and methods in monitoring
  - Germany: catalogue of 'factual' urban and transport land uses from regional statistics (sourced from local cadastral systems)
  - European Union: Change of land cover classes derived from satellite-based earth observation
  - Comparative study for selected countries: Swiss areas statistics, STABEL Belgium regional statistics/cadastral-based land use, (Land Use Ordinance Survey England)

# Introduction and project context



Land take monitoring of built-up areas and re-cultivation between 2000 and 2018 (Source: EEA, 2020) <https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment>

# Introduction






Monitoring of new urban and transport areas in Germany (Source: German Environment Agency 2021; Data: Federal Statistical Office)

<https://www.umweltbundesamt.de/themen/boden-landwirtschaft/flaechensparen-boeden-landschaften-erhalten#flachenverbrauch-in-deutschland-und-strategien-zum-flaechensparen>

# Monitoring of land take in Germany

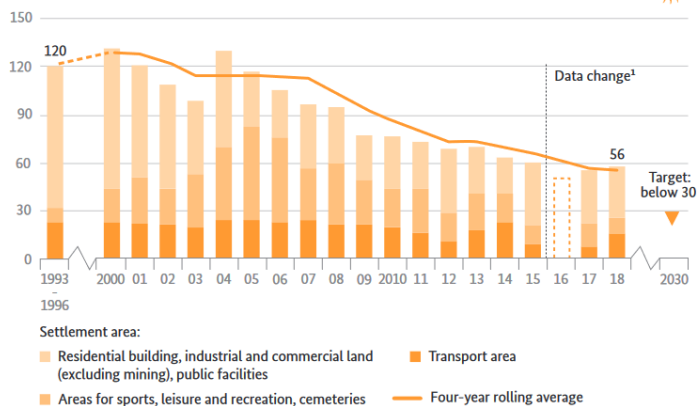
## SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable

<b>11.1.a</b>	<b>Land use</b> <i>Using land sustainably</i>	Expansion of settlement and transport area in ha per day	Reduction to under 30 ha on average per day by 2030	
<b>11.1.b</b>		Loss of open space area	Reduce the loss of per capita open space area	
<b>11.1.c</b>		Density of settlements	No reduction in density of settlements	

<https://www.bundesregierung.de/resource/blob/998220/1941044/81190075aa2808adaeb73fa08b6e9bea/2021-07-09-kurzpapier-n-englisch-data.pdf?download=1>

### Expansion of settlement and transport area

In hectares per day



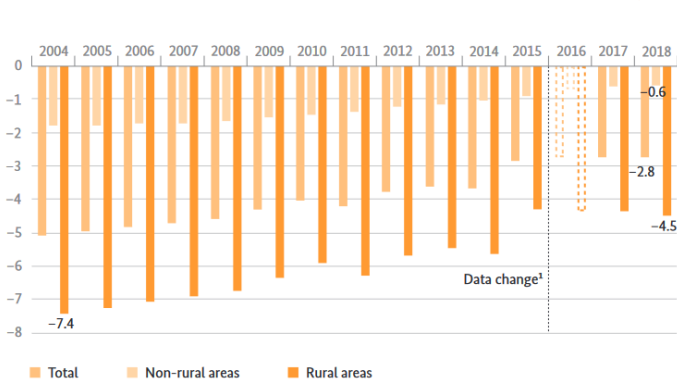
<sup>1</sup> The data for assessing settlement and transport land is taken from the official survey of land. Since 2016, the survey has been based on ALKIS, the official land register information system. As a result, the possibilities of comparison with previous years are limited and it is more difficult to calculate the extent of changes. The settlement and transport land covered after the switch largely encompasses the same categories of land use as before.

Source: Federal Statistical Office

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Statistisches Bundesamt

### Changes in open space area per capita

Four-year rolling average in square metres per year



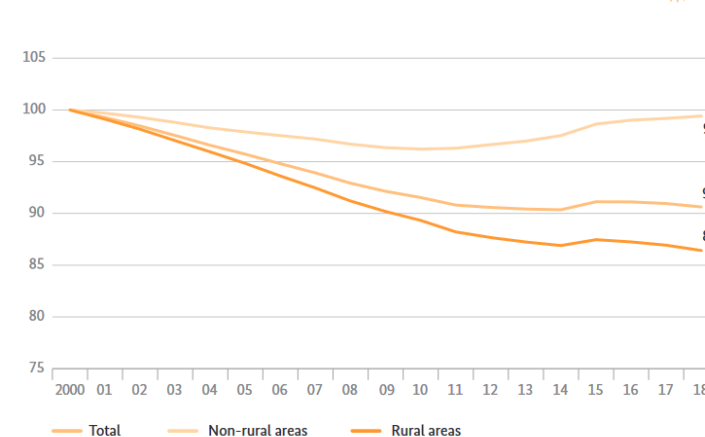
<sup>1</sup> A change in the data underpinning this indicator took effect on 31 December 2016, with a new land-use classification system being used from then on. This meant that no change could be recorded between 2015 and 2016. Comparisons over time are not possible without caveats.

Source: Federal Statistical Office, Federal Institute for Research on Building, Urban Affairs and Spatial Development, Johann Heinrich von Thünen Institute

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Statistisches Bundesamt

### Inhabitants per square kilometre of settlement or transport area

2000 = 100



Source: Federal Statistical Office, Federal Institute for Research on Building, Urban Affairs and Spatial Development, Johann Heinrich von Thünen Institute

**STATIS**  
Statistisches Bundesamt

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# Approaches to monitor land take rates

## Urban and transport land use vs. built-up land cover

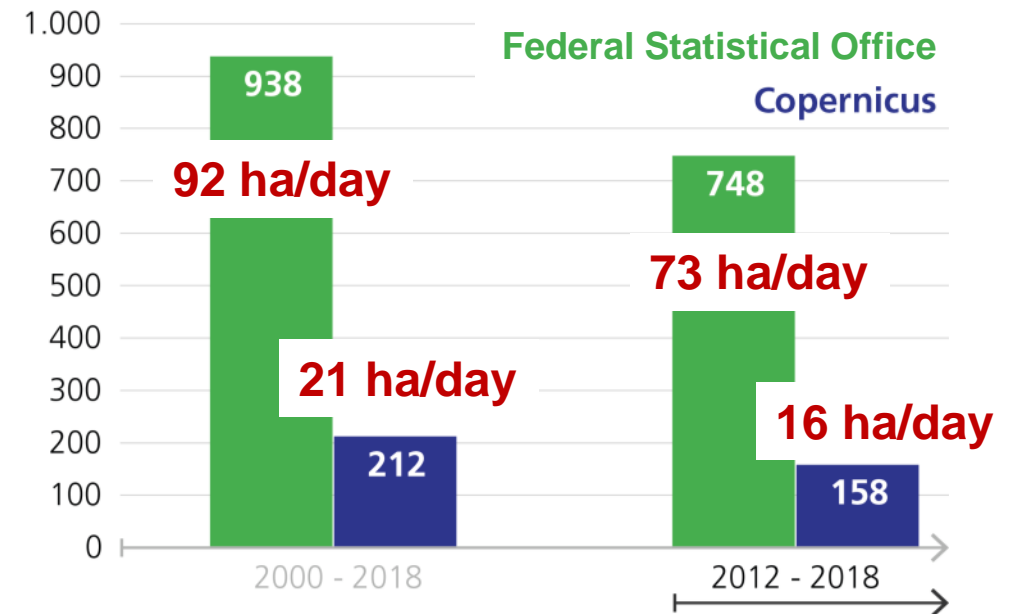
### Federal Statistical Office

- Residential
- Industrial and commercial
- Mixed use
- Special purposes
- Sports, recreation and leisure
- Cemetery
- Dump sites
- Mining areas
- Quarry, (open) pit
- Transport areas (aggregate)

### EEA Copernicus (Corine)

- Continuous urban fabric
- Discontinuous urban fabric
- Industrial or commercial units
- Road and rail networks and associated land
- Port areas
- Airports
- Mineral extraction sites
- Dump sites
- Construction sites
- Green urban areas
- Sport and leisure facilities

## New urban land in Germany 2012-2018 in m<sup>2</sup> per km<sup>2</sup> of the total land area



Source: Statistisches Bundesamt, European Environment Agency (EEA)  
<https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment>

Grafik: J. Rönsch, ILS



# Mapping urban growth

## Residential areas in Munster

- Limited coverage by Copernicus CLC
  - Minimal mapping units / resolution
  - Misclassifications
  - Mismatches in observation period
- Sum of new residential areas
  - Copernicus CLC 2012-2018: **7.12 ha**
  - Reference data („ATKIS“): 2012-2018: **341.47 ha**

■ Copernicus 2012-1018  
■ ATKIS 2012-2018



Data: Bezirksregierung Köln, EEA

# Mapping urban growth

Glasmacherviertel Dusseldorf (20,07 ha)



Copernicus Change Detection 2012-2018



ALKIS 2017 (Regierungsbezirk Köln)

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# Interpretations of land take in Germany

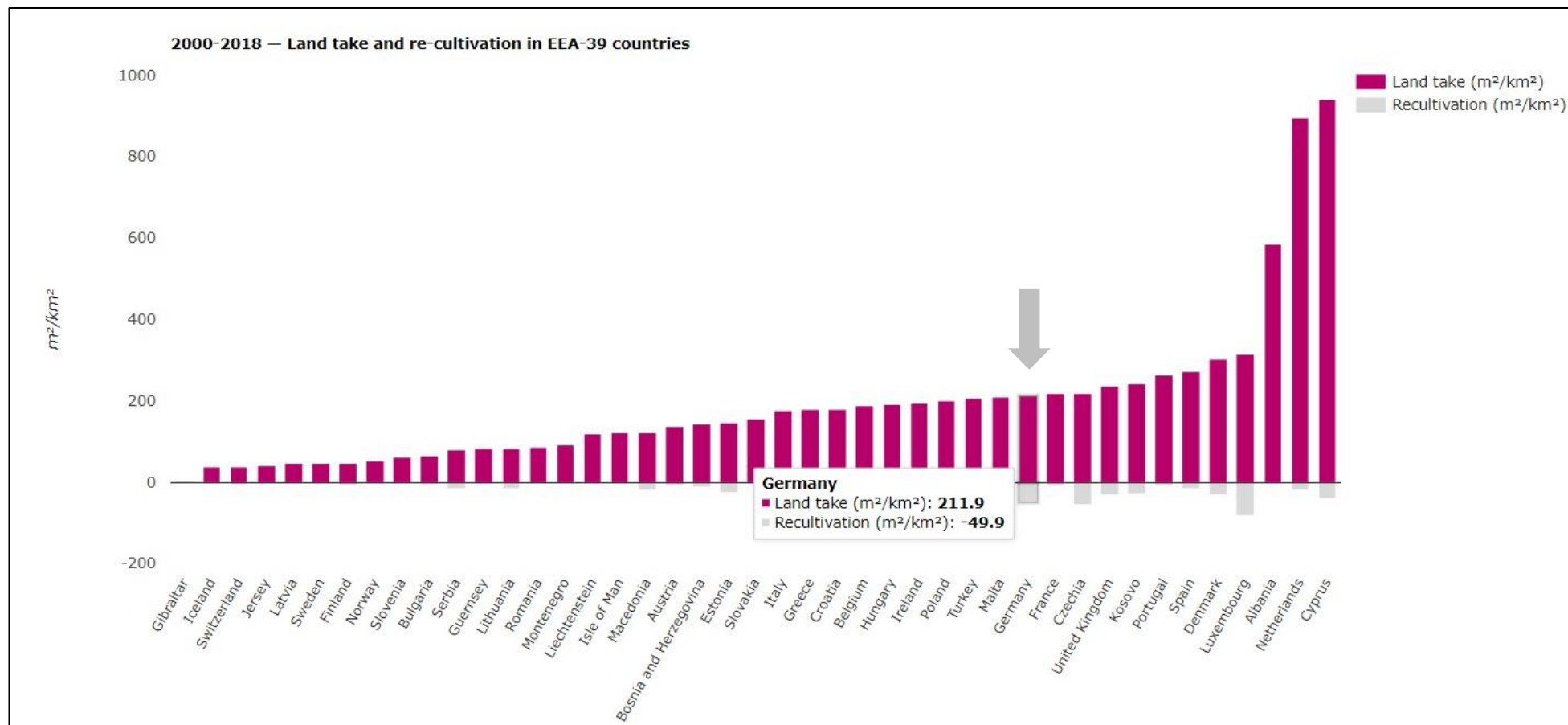
ESPON SUPER

EU State of the Environment

Decoville et al. (Luxemburg)

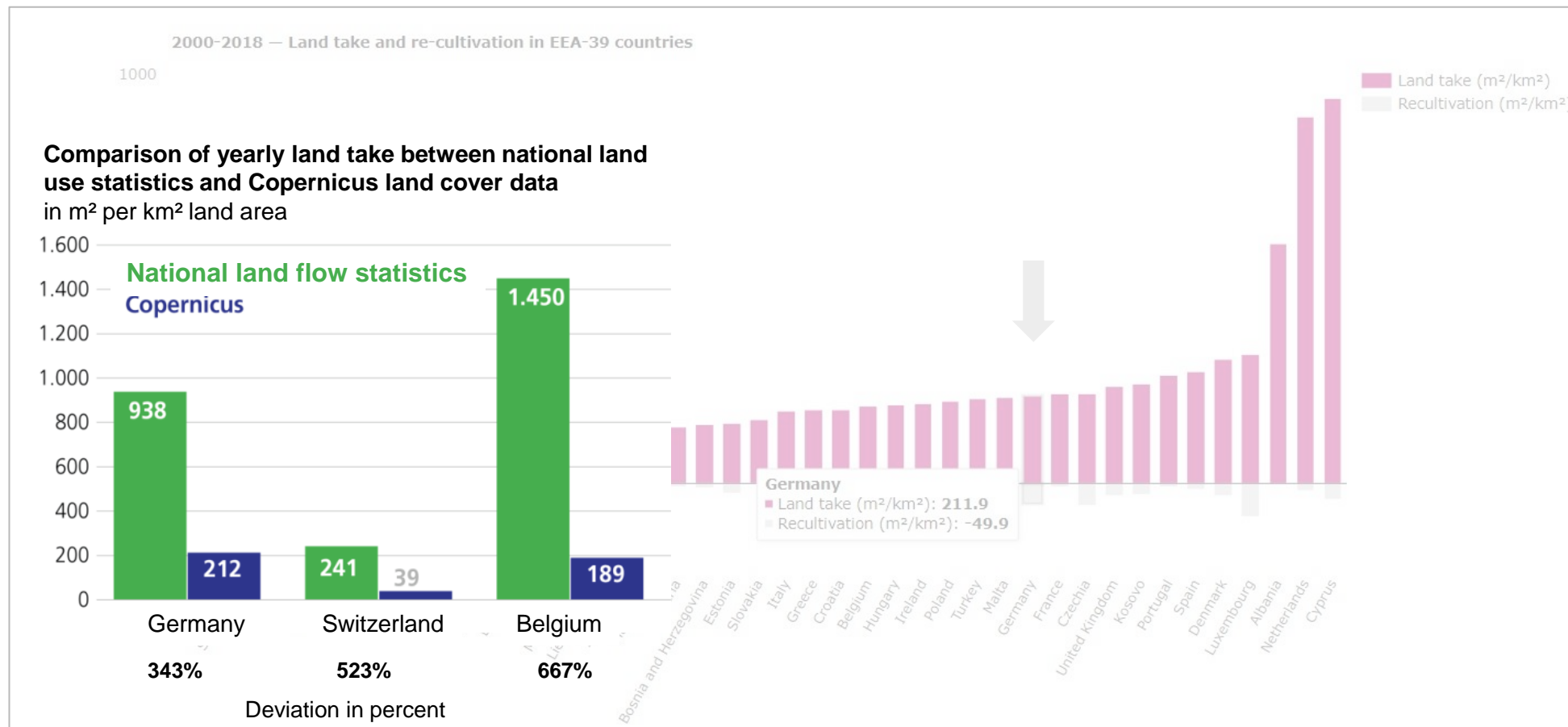
- Amongst EU member states, the change of land resources for urban use is highest in Germany, Belgium and the Netherlands
- Germany belongs to the countries where the growth of industrial areas per capita was highest between 2000 and 2018
- Sprawling commercial and business areas in Germany decreased by 45 % between 2012-2018 compared to 2000-2012
- (The conversion rate of agricultural areas (to non-tillage agriculture) decreased by 97 %)
- Land monitoring at the EU-level does not allow comparisons between smaller administrative units
- Existing data sources do not allow for a systematic monitoring of a 'zero land take objective'

## Ranking of land take by country



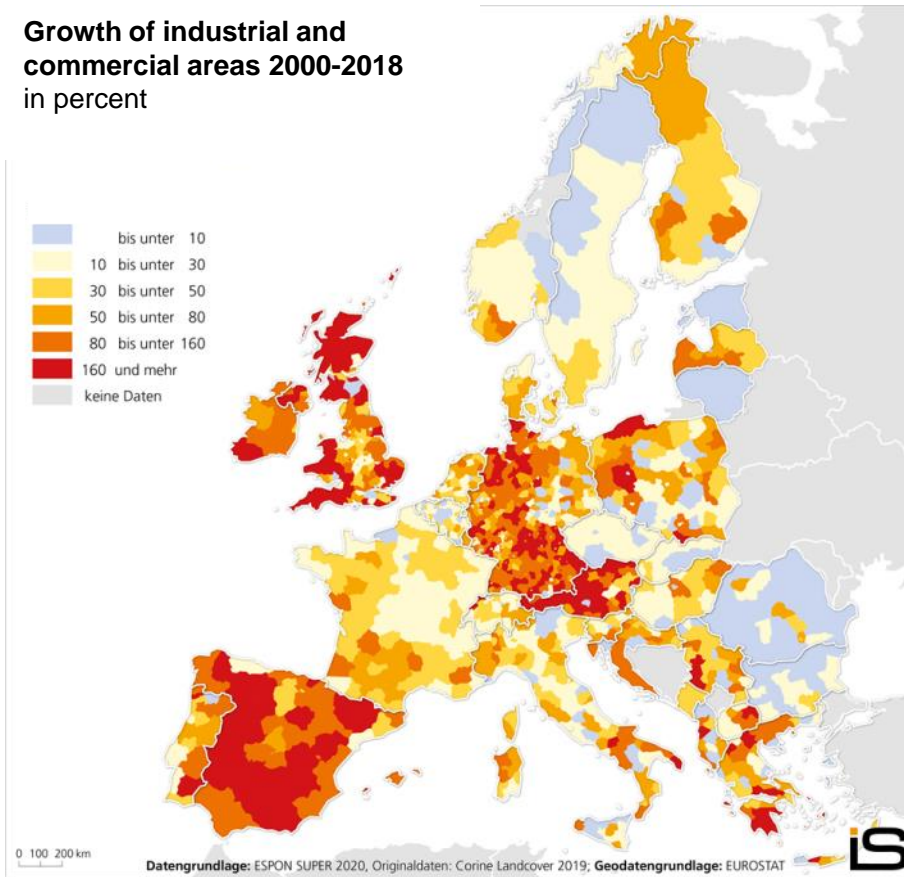
Land take monitoring of built-up areas and re-cultivation between 2000 and 2018 (Source: EEA, 2020) <https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment>

# Scrutinizing policy interpretations with national data on land take

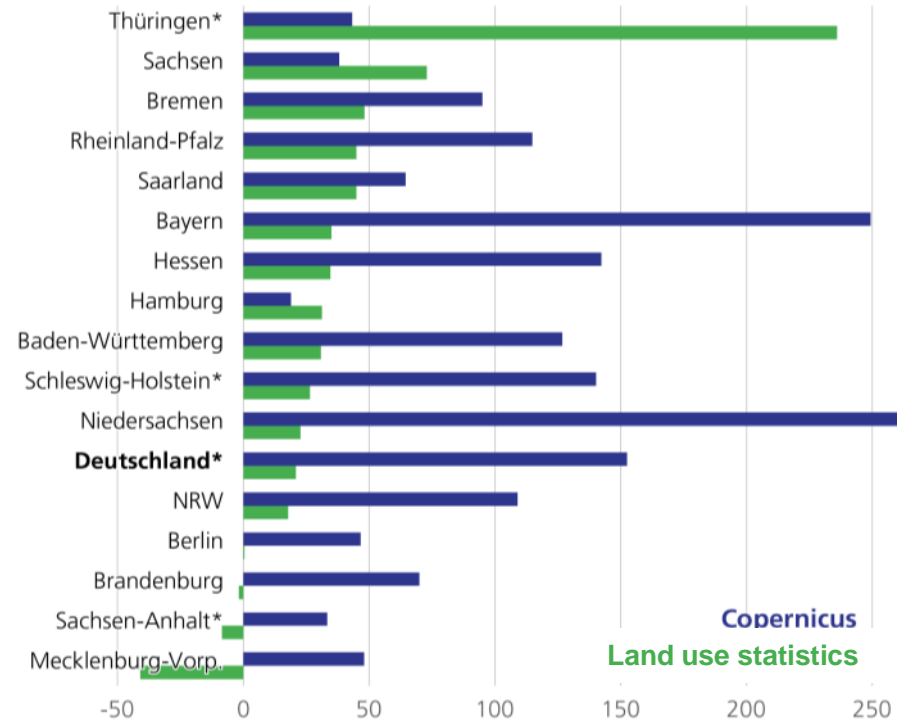


# Very high land take for industrial and commercial land

**Growth of industrial and commercial areas 2000-2018 in percent**



**Germany – land use statistics and Copernicus by state**  
Development of industrial and commercial areas 2000-2018 in percent

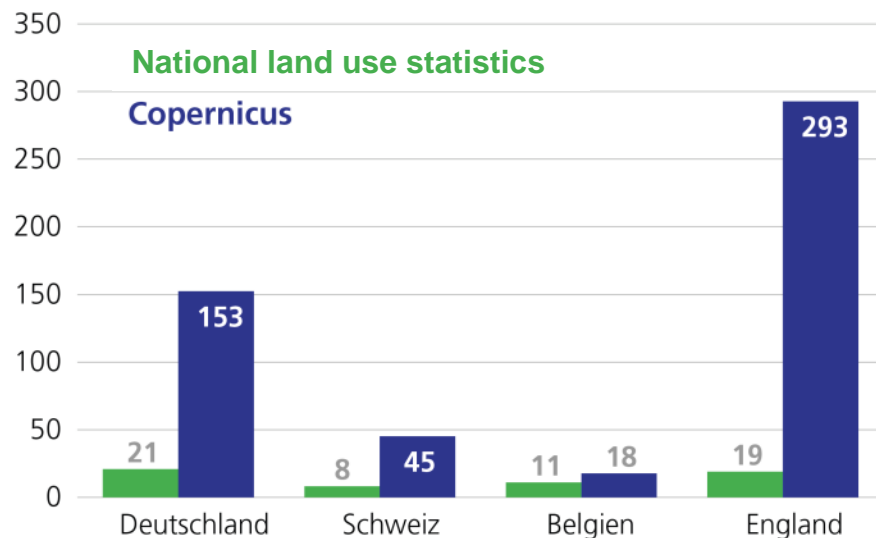


Data: Federal Statistical Office, ESPON SUPER 2020

# Very high land take for industrial and commercial land

## Industrial and commercial land take national statistics vs. EEA Copernicus

in percent

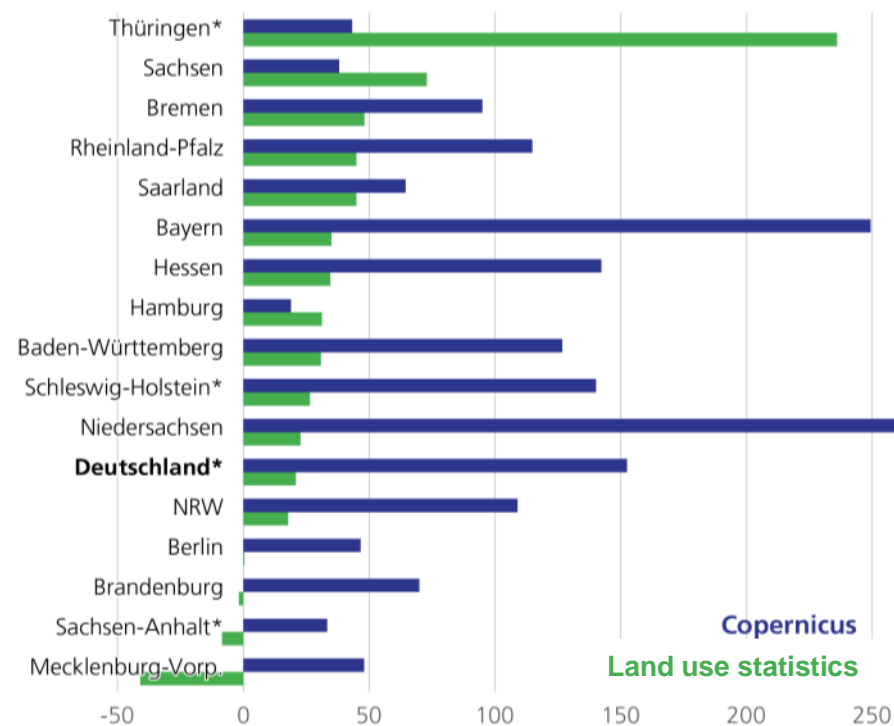


Quelle: ESPON SUPER 2020, Statbel (Direction générale Statistique - Statistics Belgium), Statistisches Bundesamt, Bundesamt für Statistik (BFS), Ministry of Housing, Communities and Local Government

## Germany – land use statistics and Copernicus by state

Development of industrial and commercial areas 2000-2018

in percent

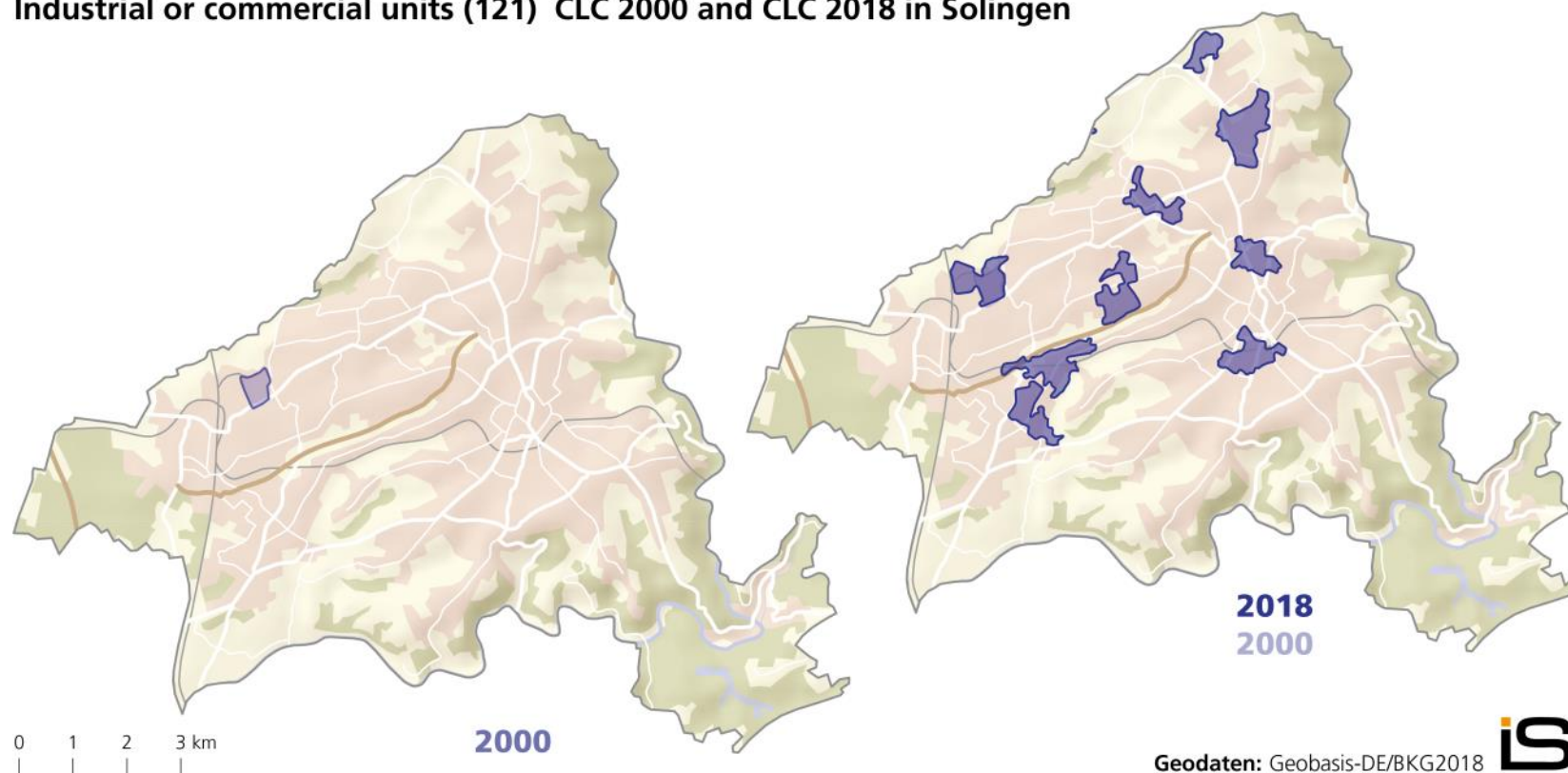


Data: Federal Statistical Office, ESPON SUPER 2020



# Very high land take for industrial and commercial land

Industrial or commercial units (121) CLC 2000 and CLC 2018 in Solingen



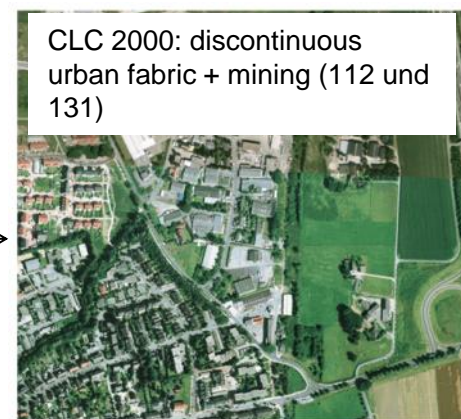
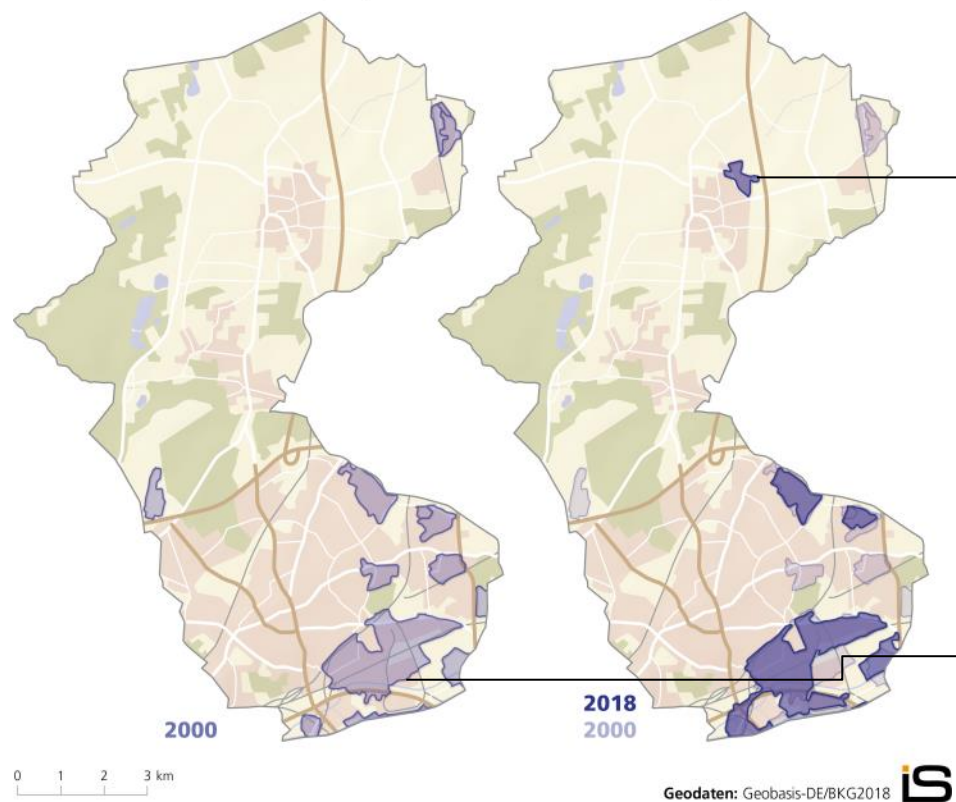
## Reality check based on aerial photographs

- Areas recognizable in 2000 as built-up
- Change from „discontinuous urban fabric“

	Stats [ha]	CLC [ha]
2000	412,0	25,4
2018	407,3	448,7

# Very high land take for industrial and commercial land

Industrial or commercial units (121) CLC 2000 and CLC 2018 in Bottrop



1998

CLC 2000: industrial and commercial (121)



1998



2019

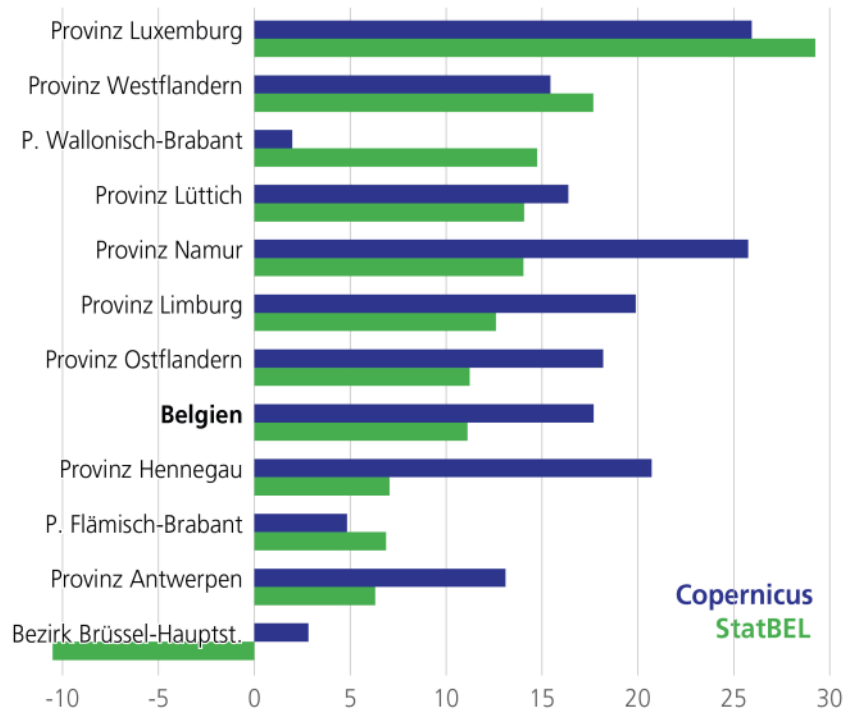
CLC 2018: discontinuous urban fabric (112)



2019

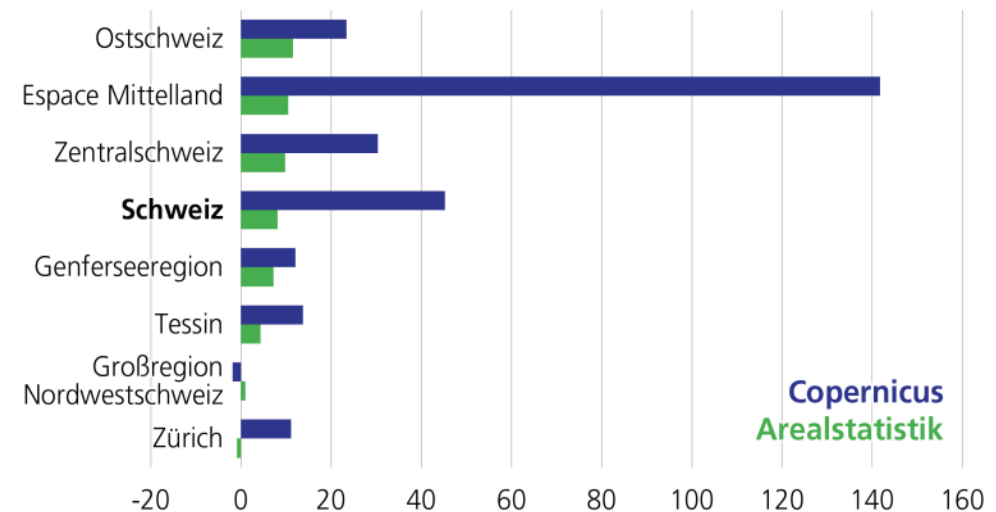
# Land take for industrial and commercial land in comparison

**Belgium - Land use statistics vs. EEA Copernicus:  
Development of industrial and commercial areas 2000-2018  
in percent**



Quelle: Statbel (Direction générale Statistique - Statistics Belgium), ESPON SUPER 2020

**Switzerland - Area statistics vs. EEA Copernicus:  
Development of industrial and commercial areas 2000-2018  
in percent**



Quelle: Bundesamt für Statistik (BFS), ESPON SUPER 2020

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# Conclusion and outlook

- Change of built-up areas (EU) deviates significantly from national statistics
  - Urban and transport land use  $\neq$  CORINE land cover (e.g. industrial and commercial areas)
  - Differences in time of data capture (Copernicus: 2012-2018, StaBa: 2012-2015, 2016-2020)
  - Spatial resolution (Copernicus change layer:  $> 5$  ha, national statistics mostly  $\sim 1000$  m<sup>2</sup>)
- Similar problems in Switzerland, Belgium and England
- Trend analysis with aggregated data still possible? To some degree...
- Mismatch between national and international interpretations for policy development
- Precise indicators and data crucial for monitoring and planning practice