Indicators, datasets and mapping developed at EU level by Copernicus Land Monitoring Service: opportunities, constraints, challenges

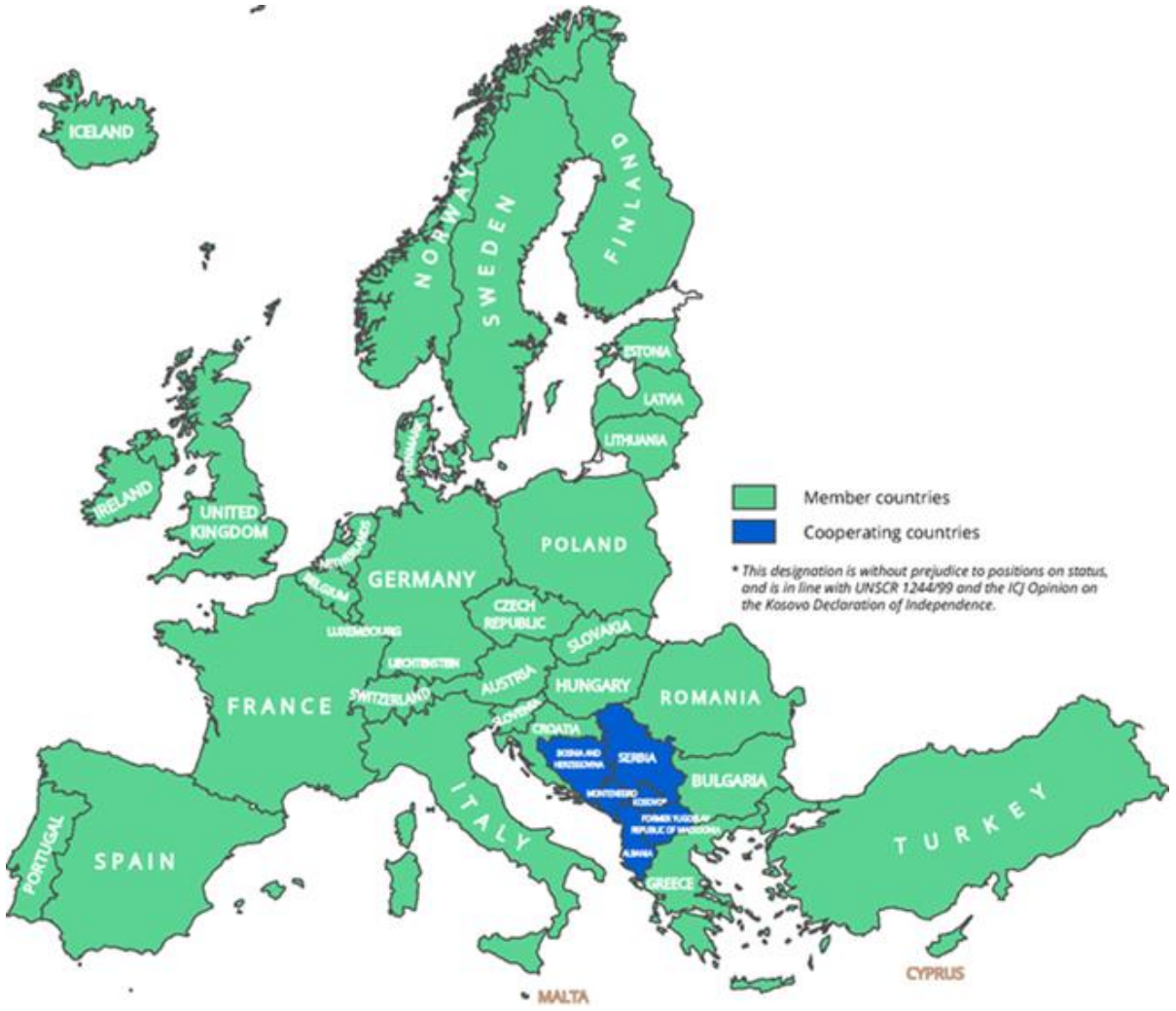
Jaume Fons-Esteve (EEA, UAB)

Eva Ivits (EEA)

European Environment Agency

To provide **relevant**, reliable, **targeted** and **timely** information to policy-makers and the public.

To help achieve **significant** and **measurable** improvements in Europe's environment and to support sustainable development.



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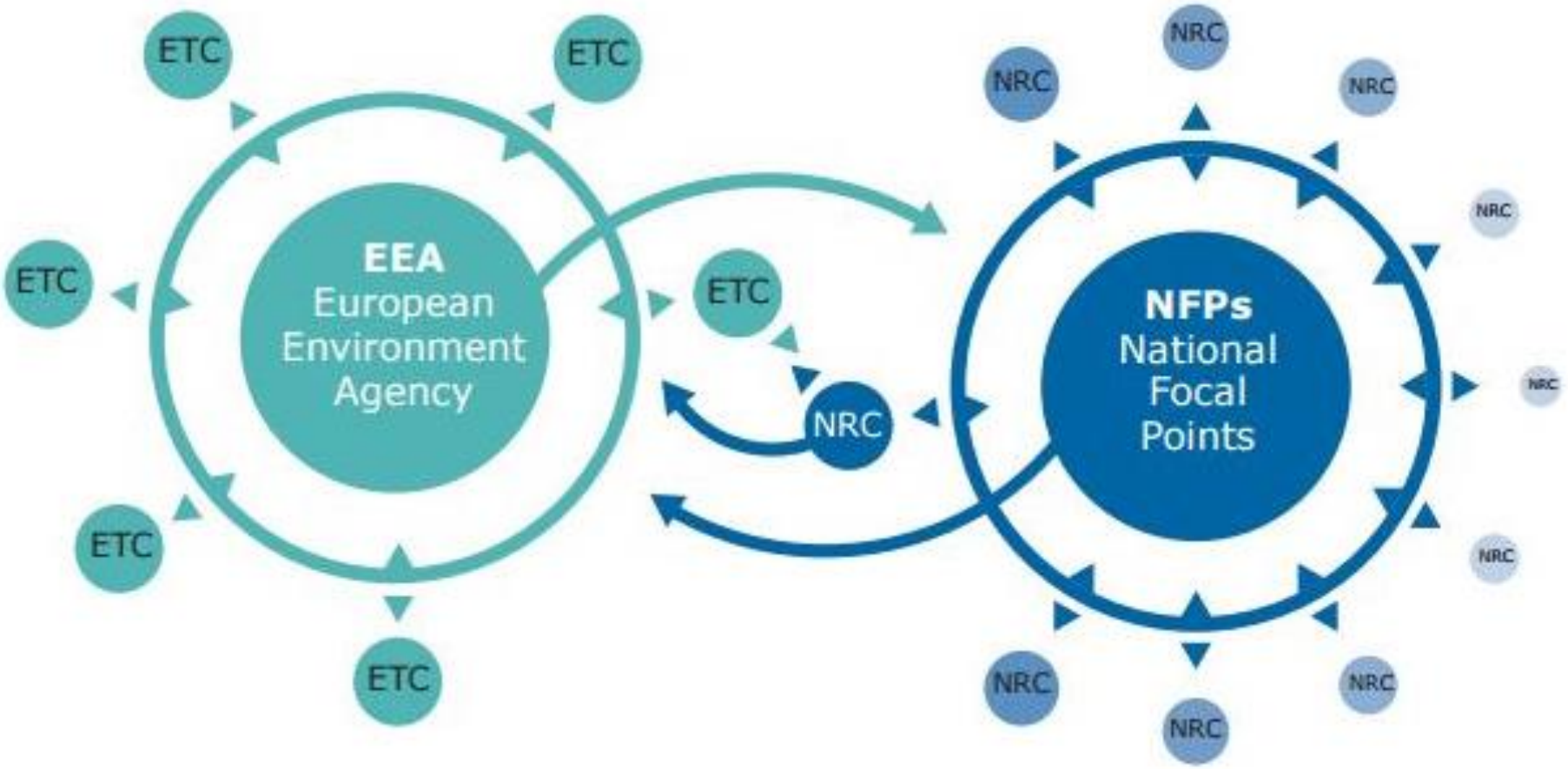
EEA environmental network



EEA: areas of work

Air pollution, transport and noise

Industrial Pollution

Climate change mitigation and energy

Climate change impacts, vulnerability and adaptation

Water management, resources and ecosystems

Marine and maritime, fisheries and coastal

Biodiversity, ecosystems, agriculture and forests

Urban, land use and soil

Waste and material resources

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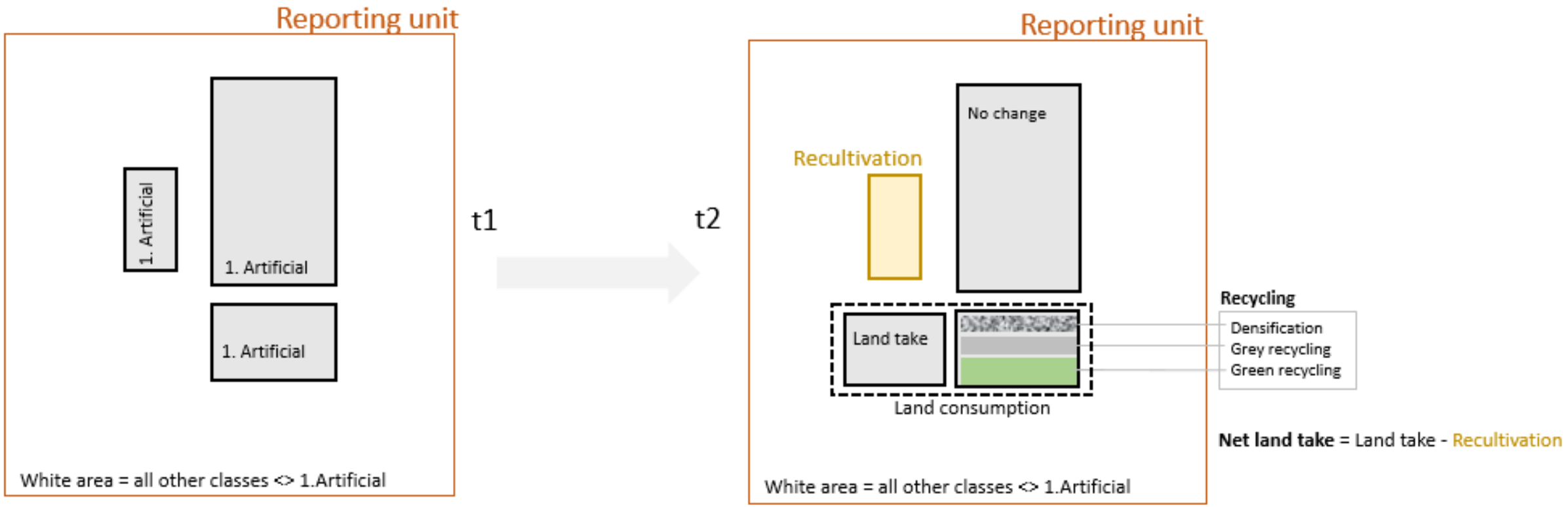
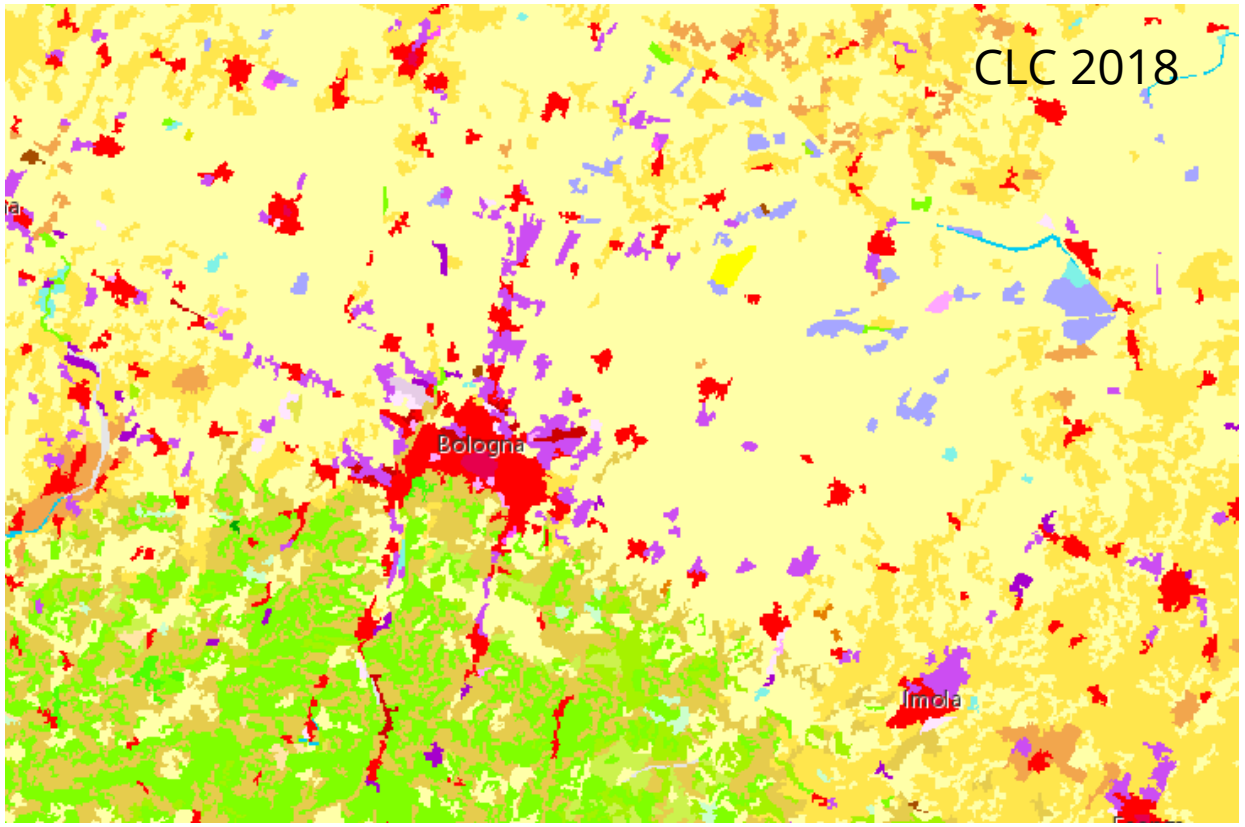
Land take, urban sprawl & land recycling



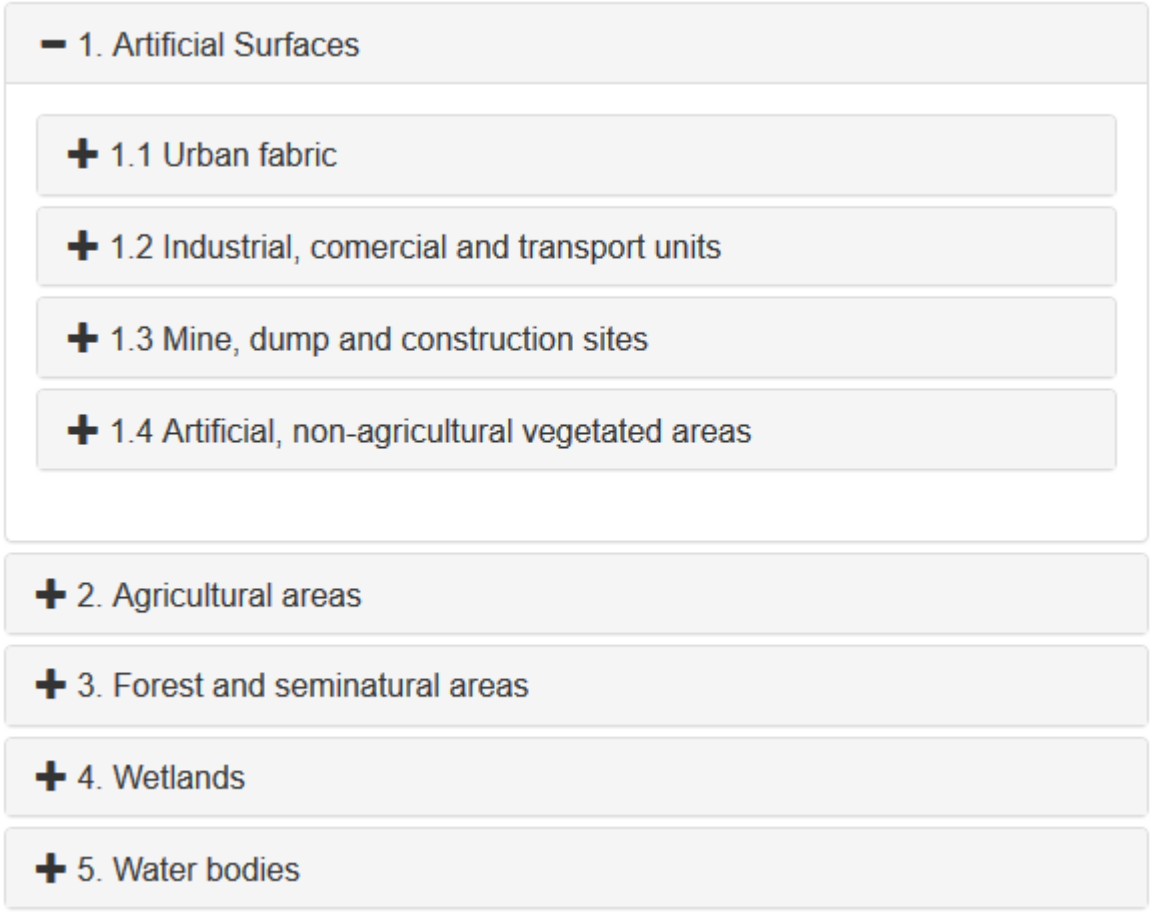
Land take: how to monitor?

CLMS Corine Land Cover

Minimum mapping unit/width	25 ha / 100 m
Change mapping	≥ 5 ha
Time series (nr of countries)	1990 (26) 2000 (30) 2006 (38) 2012 (39) 2018 (39)



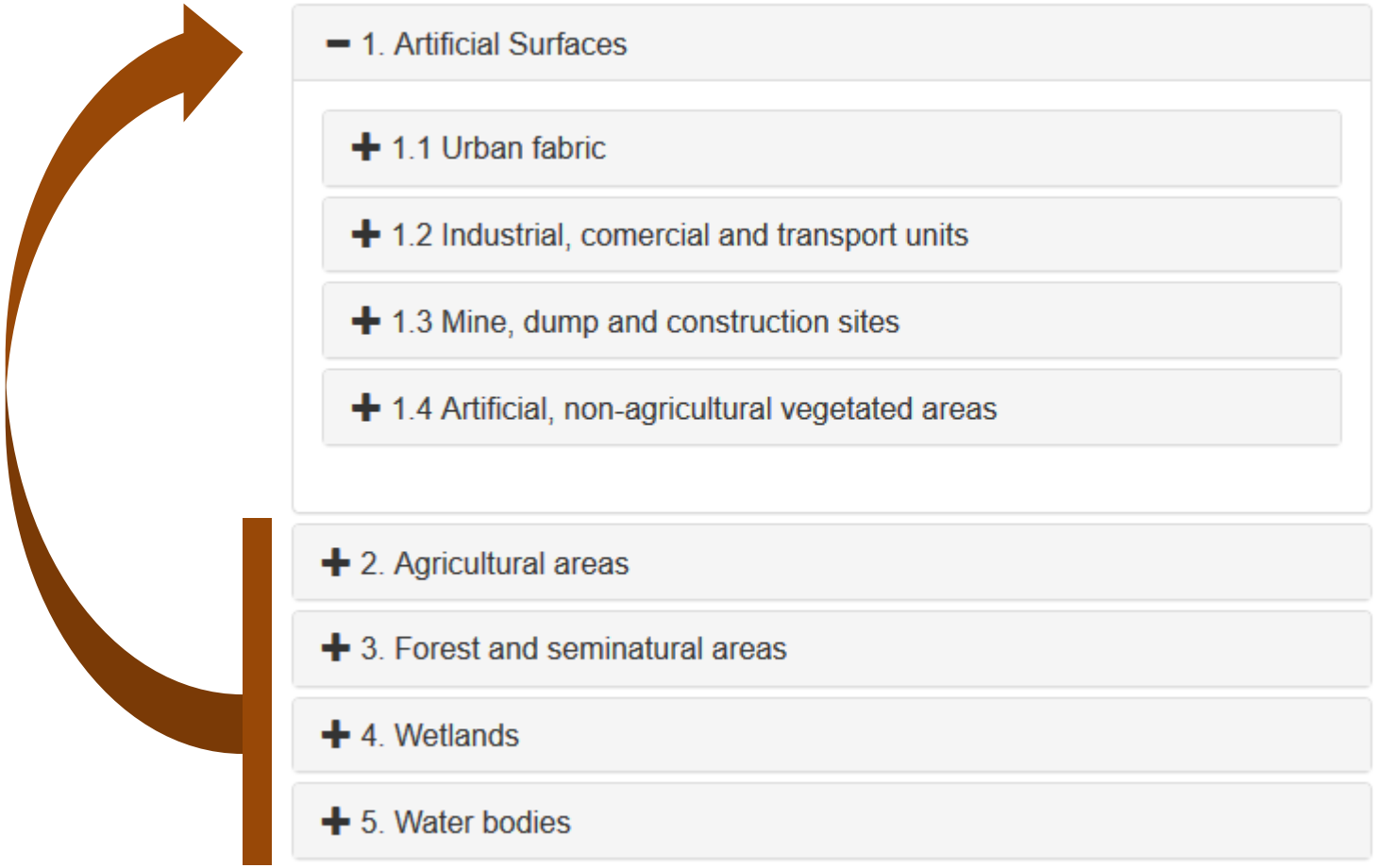
Land take: from CLC classification to indicator



Hierarchical clasification with 3 levels

44 classes level 3

Land take: from CLC classification to indicator



https://land.copernicus.eu/user-corner/technical-library/corine-land-cover-nomenclature-guidelines/html

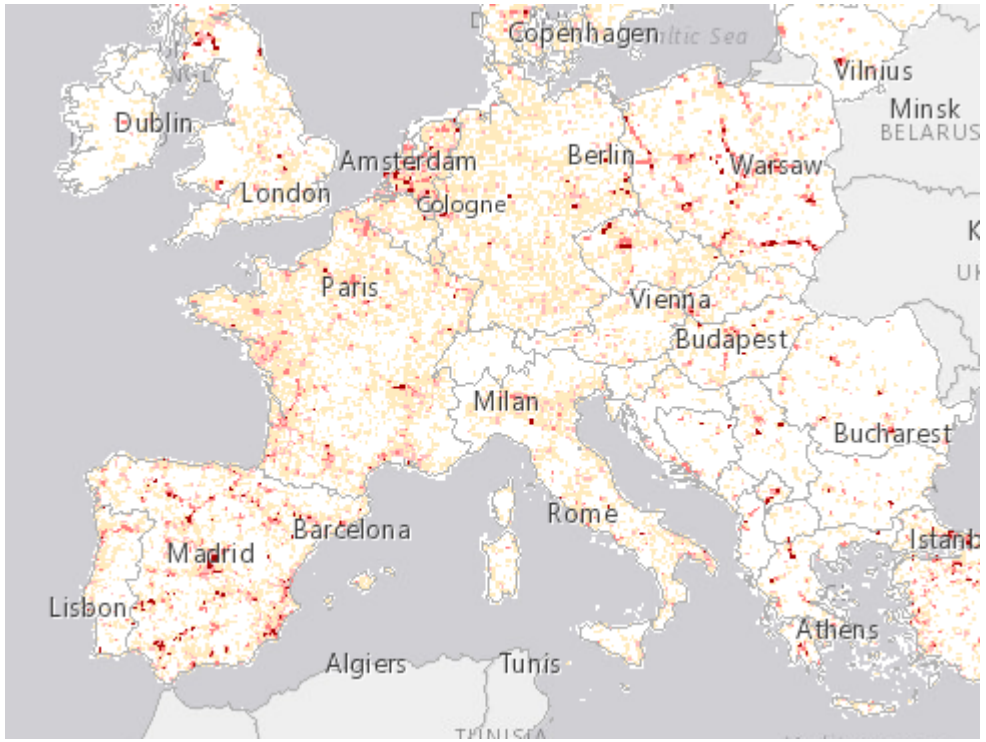
Land take: from CLC classification to indicator

		FROM			TO	
LCF2: Urban Residential Sprawl	LCF21: Urban dense residential sprawl	2xx	Agricultural areas	→	111	Continuous urban fabric
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
	LCF22: Urban diffuse residential sprawl	2xx	Agricultural areas	→	112	Discontinuous urban fabric
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
LCF3: Sprawl of economic sites and infrastructures	LCF31: Sprawl of industrial and commercial sites	2xx	Agricultural areas	→	121	Industrial or commercial units and public facilities
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
	LCF32: Sprawl of transport networks	2xx	Agricultural areas	→	122	Road and rail networks and associated land
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
	LCF33: Sprawl of harbours	2xx	Agricultural areas	→	123	Port areas
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
	LCF34: Sprawl of airports	2xx	Agricultural areas	→	124	Airports
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
	LCF35: Sprawl of mines and quarrying areas	2xx	Agricultural areas	→	131	Mineral extraction sites
		3xx	Forest areas (1)			
		4xx	Wetlands			
		5xx	Water bodies			
		2xx	Agricultural areas			

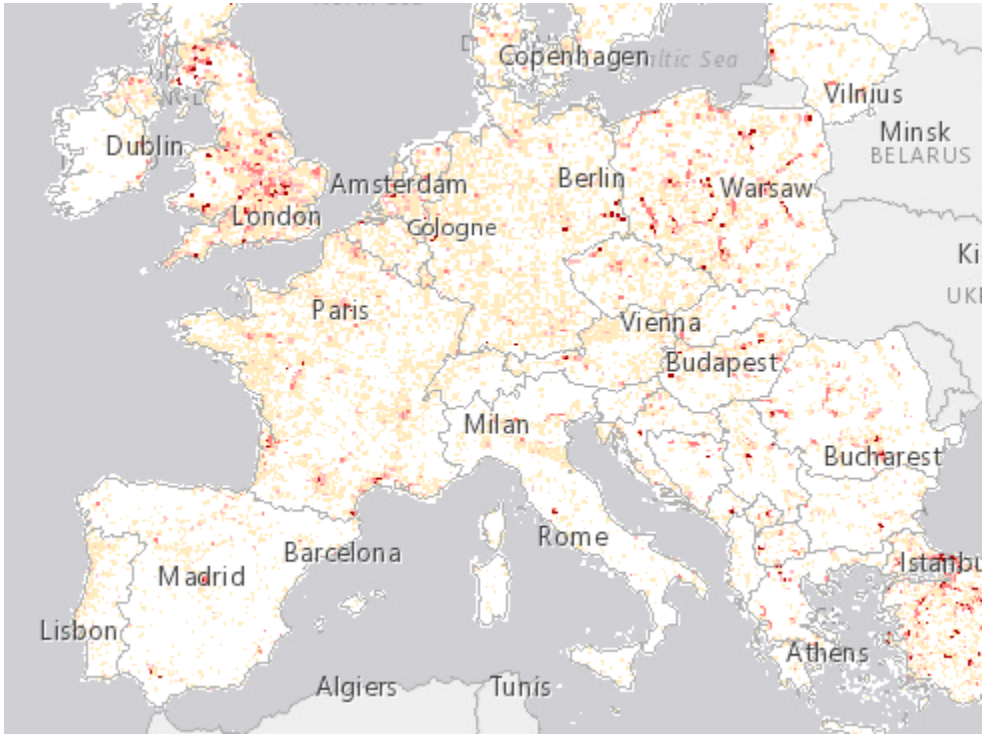
Detailed changes at level 3

Land take (km^2)

2006-2012



2012-2018



Land take in km^2 presented in 10 km grid

- 0
- 0.5
- 1
- 2
- > 2

https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment

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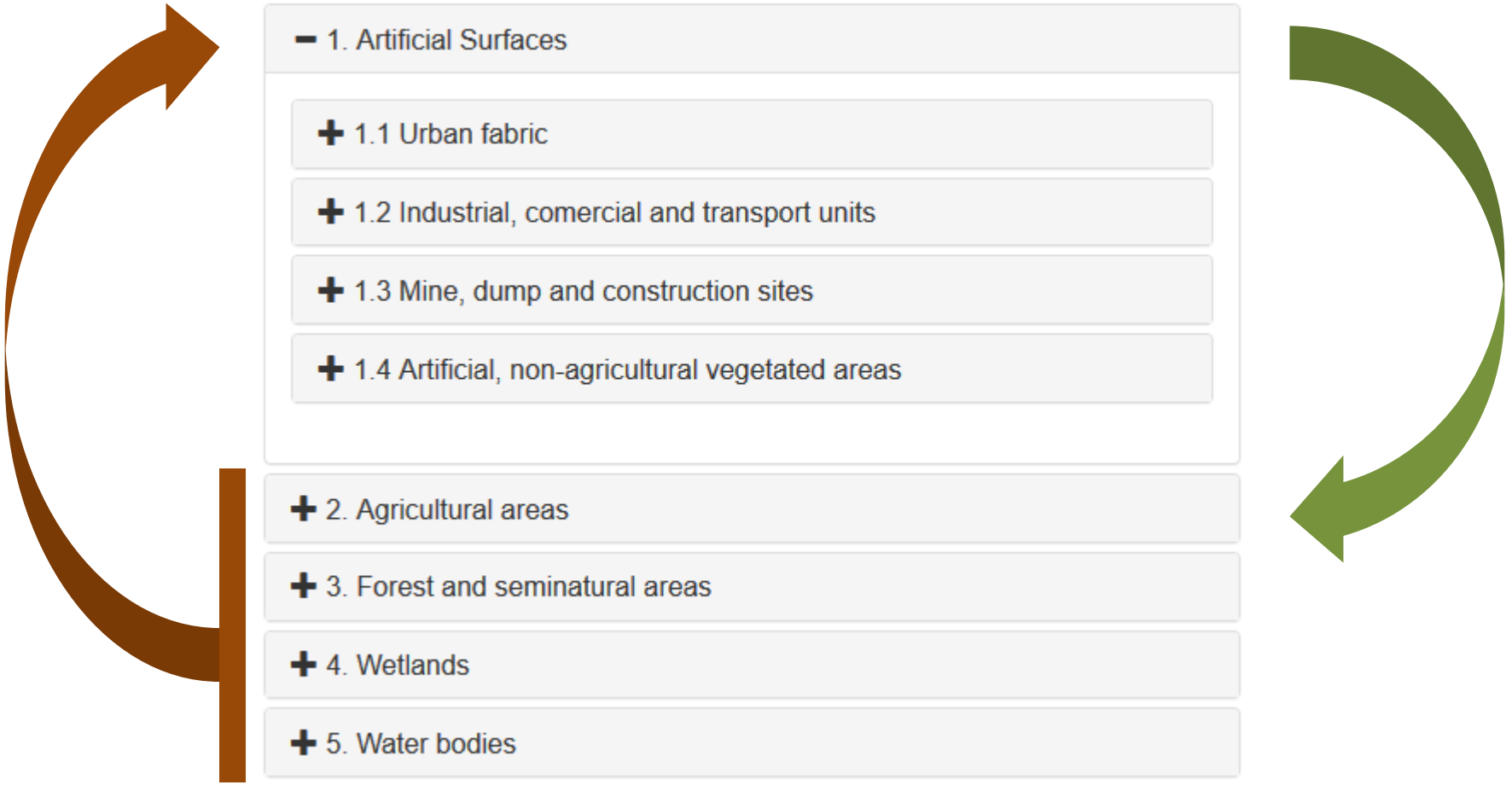
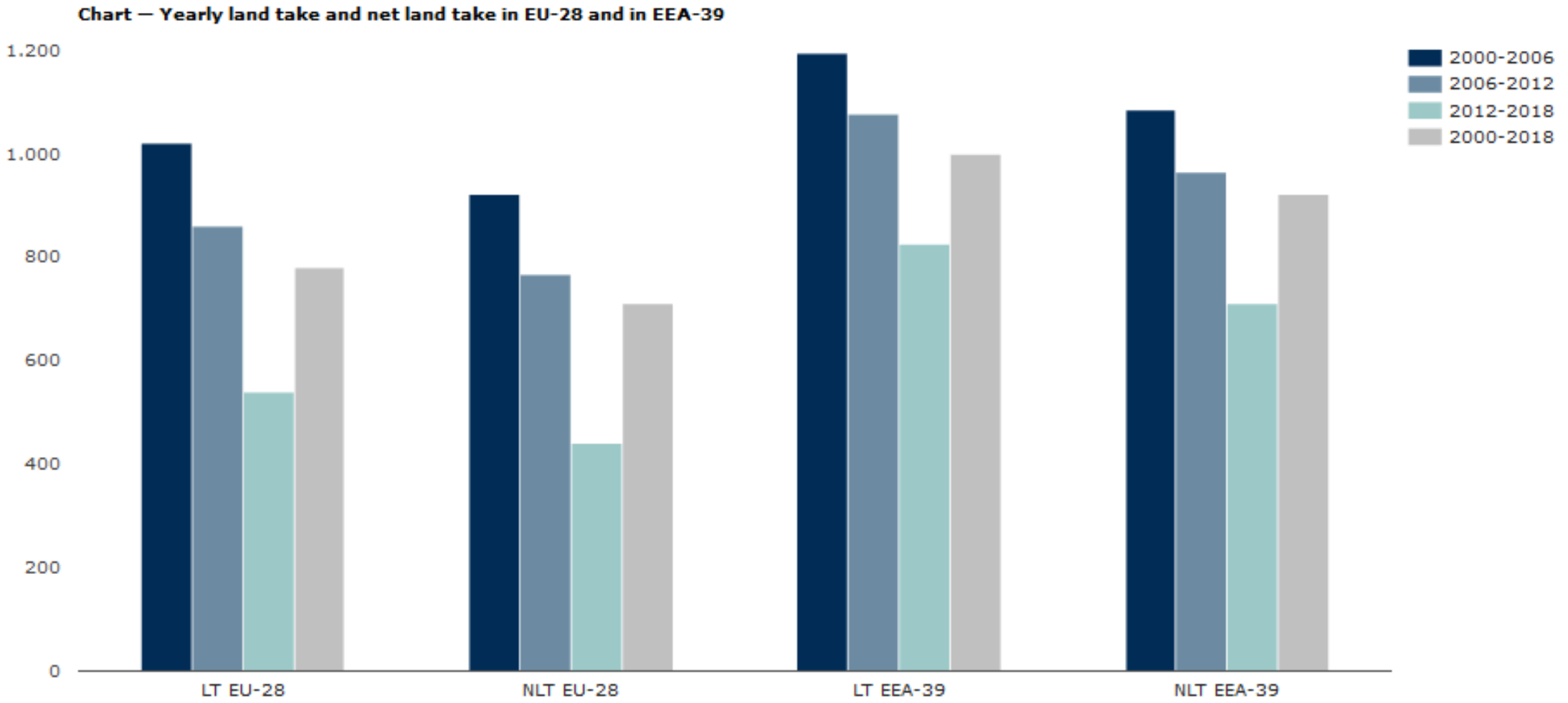
Net land take: from CLC classification to indicator



Land take and net land take



https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment

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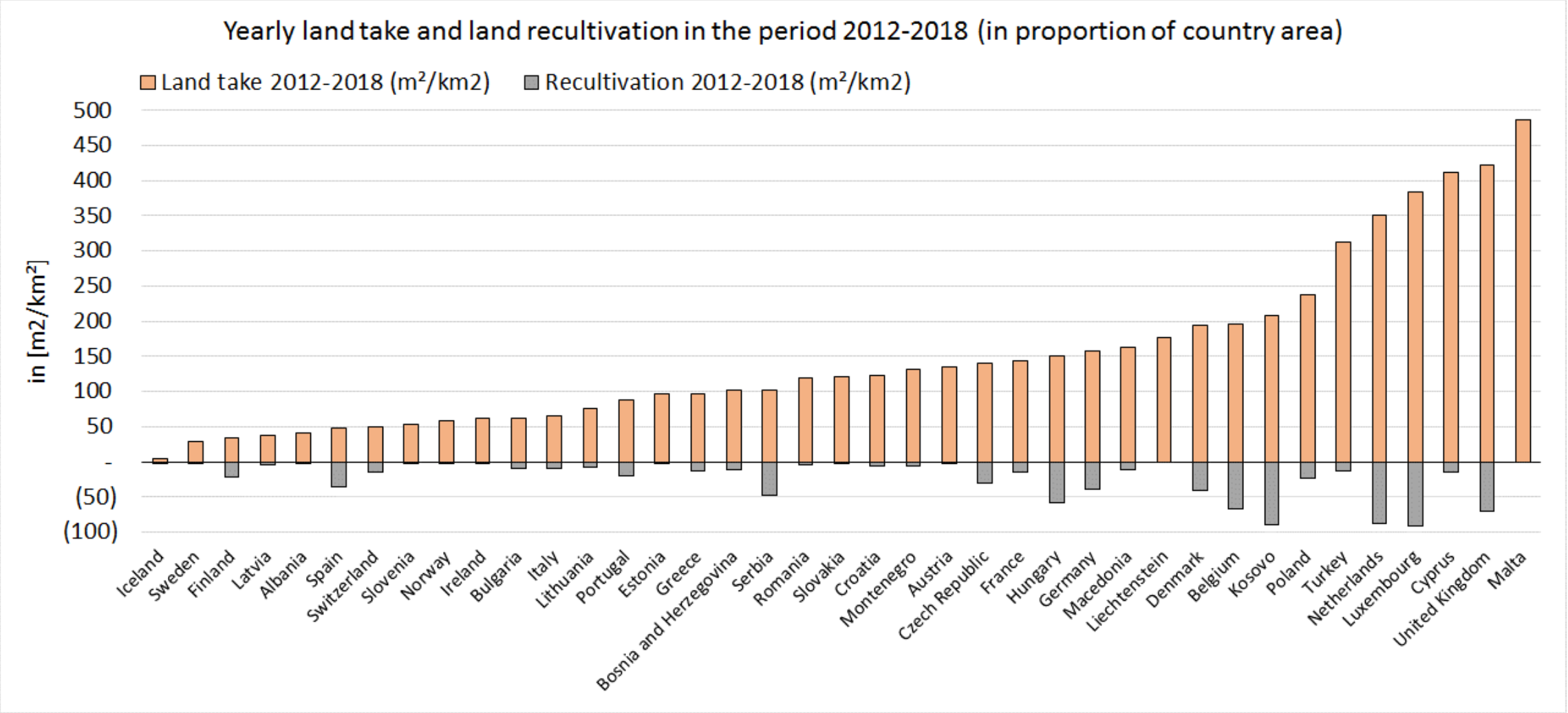
Land take and land recultivation



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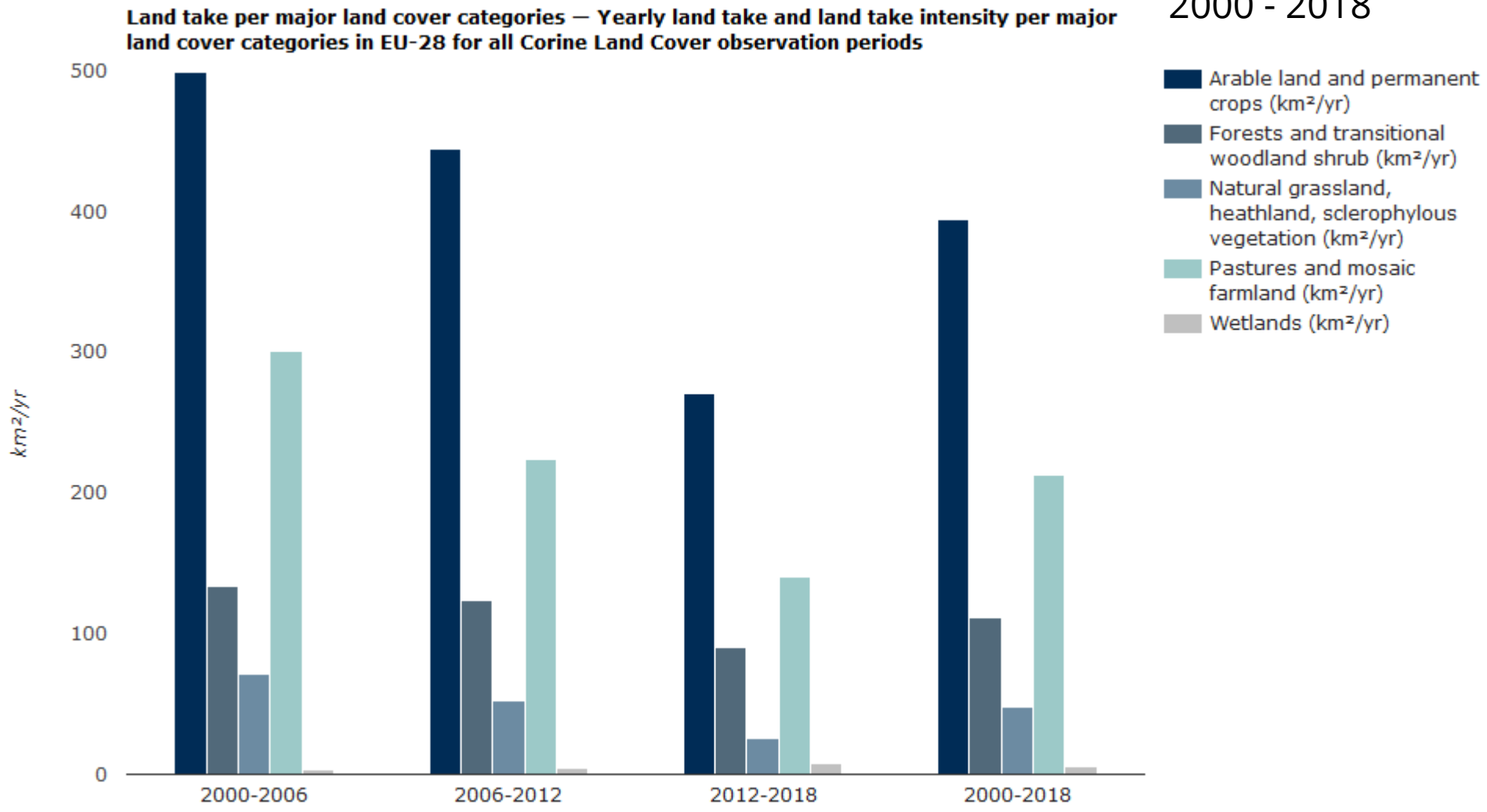
Land take: What types of lands were affected?



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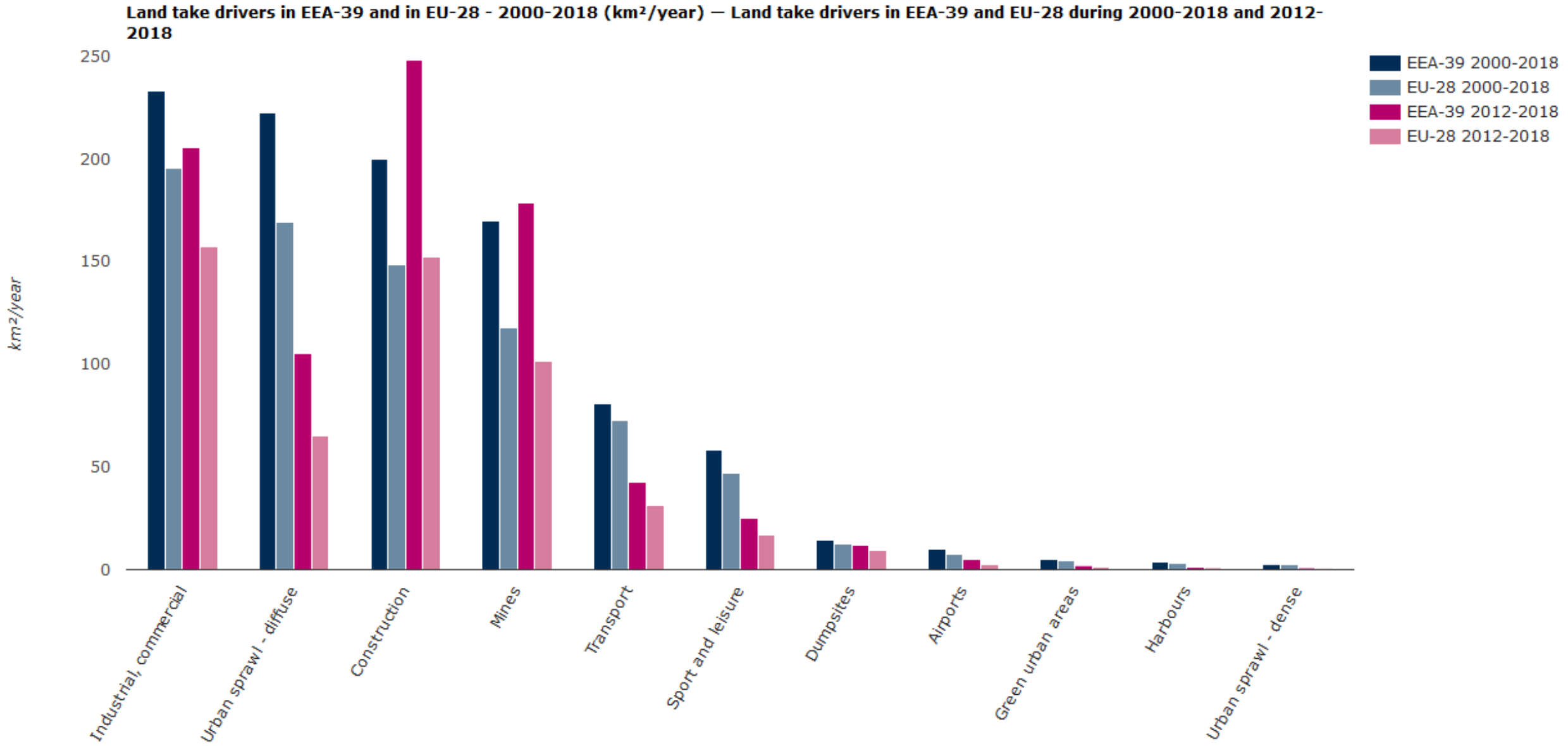
Land take: Drivers



Land take: interactive dashboards

Land take 2000-2018

Dashboard (Tableau) — **Prod-ID:** DAS-106-en — Published 10 Sep 2019 — 1 min read

Topics: Land use | Biodiversity — Ecosystems | Soil

This interactive data viewer provides a set of dashboards giving an overview of the land take and net land take processes for Europe (EEA39 and EU28) derived from the CORINE land cover data series. Statistics are derived for every 6 years of the acquisition period, as well as for the entire period (2000-2018). The viewer facilitates the assessment of land take over a specific period as well as the land use drivers of the observed changes, which can be analyzed within user defined spatial units such as administrative regions, biogeographical regions or land cover classes.

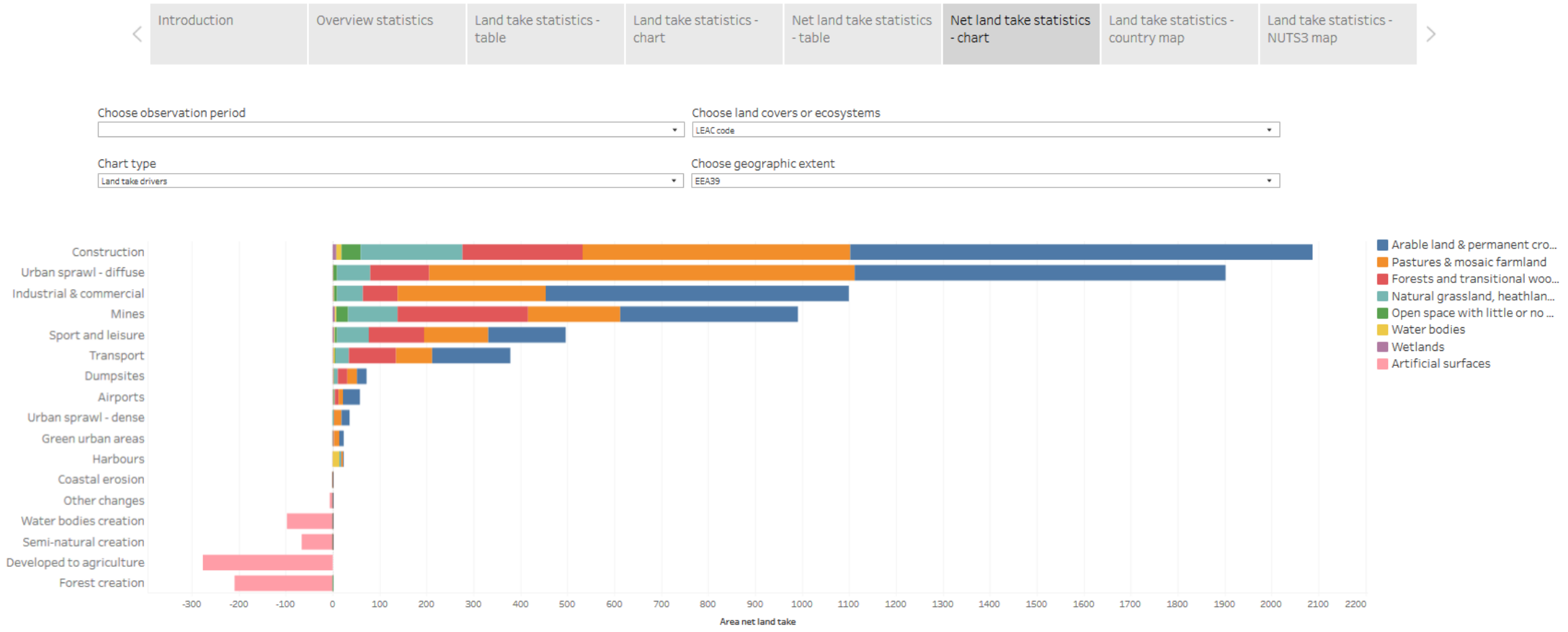
Introduction | Overview statistics | Land take statistics - table | Land take statistics - chart | Net land take statistics - table | Net land take statistics - chart | Land take statistics - country map | Land take statistics - NUTS3 map

Land is a finite resource. The way land is used is one of the principal drivers of environmental change with strong impacts on ecosystems. Land use in Europe is driven by a number of factors such as the increasing demand for living space per person, the link between economic activity, increased mobility and the growth of transport infrastructure, which usually result in urban expansion. Urbanisation rates vary substantially, with coastal and mountain areas among the most affected regions in Europe as a result of increasing demand for recreation and leisure.

Link to EEA indicator: https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment

Land take

This interactive data viewer provides a set of dashboards giving an overview of the land take and net land take processes for Europe (EEA39 and EU28) derived from the CORINE land cover data series. Statistics are derived for every 6 years of the acquisition period, as well as for the entire period (2000-2018). The viewer facilitates the assessment of land take over a specific period as well as the land use drivers of the observed changes, which can be analyzed within user defined spatial units such as administrative regions, biogeographical regions or land cover classes.



https://www.eea.europa.eu/data-and-maps/dashboards/land-take-statistics

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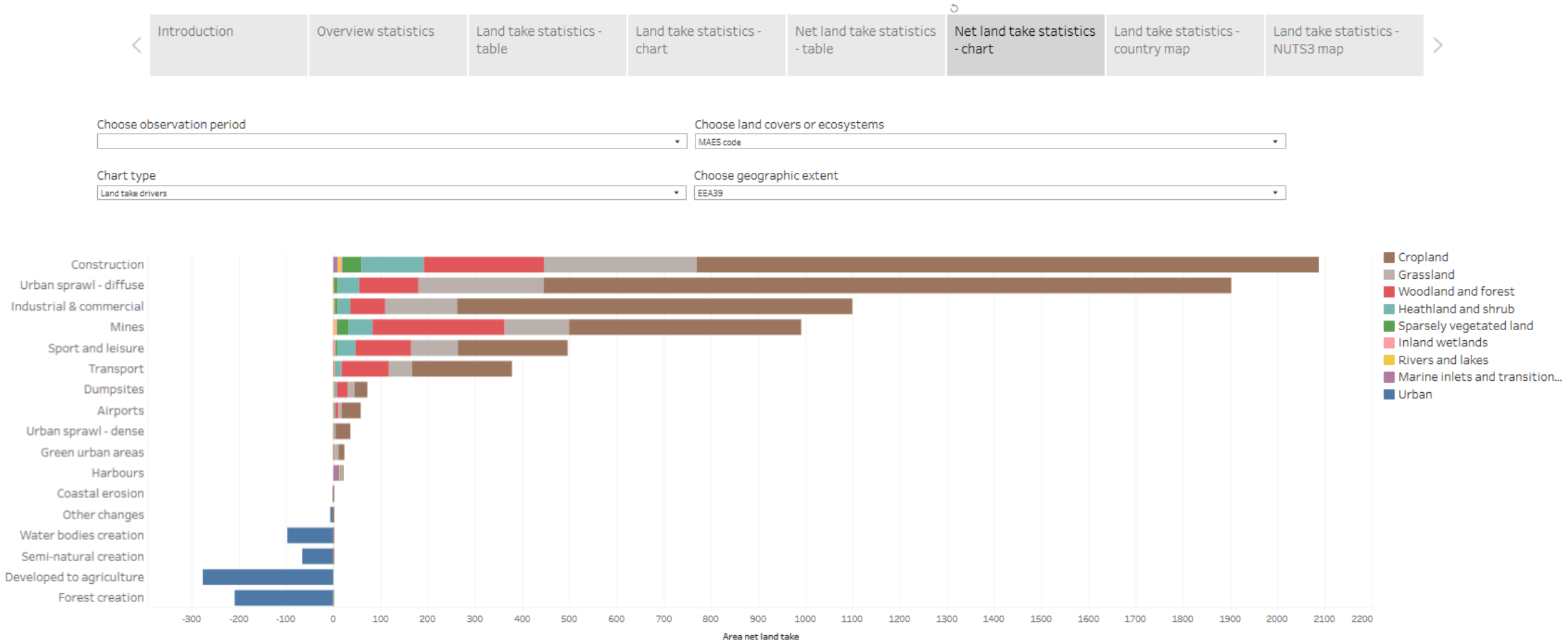
Land take and MAES Mapping Ecosystems and their Services

This interactive data viewer provides a set of dashboards giving an overview of the land take and net land take processes for Europe (EEA39 and EU28) derived from the CORINE land cover data series. Statistics are derived for every 6 years of the acquisition period, as well as for the entire period (2000-2018). The viewer facilitates the assessment of land take over a specific period as well as the land use drivers of the observed changes, which can be analyzed within user defined spatial units such as administrative regions, biogeographical regions or land cover classes.



https://www.eea.europa.eu/data-and-maps/dashboards/land-take-statistics

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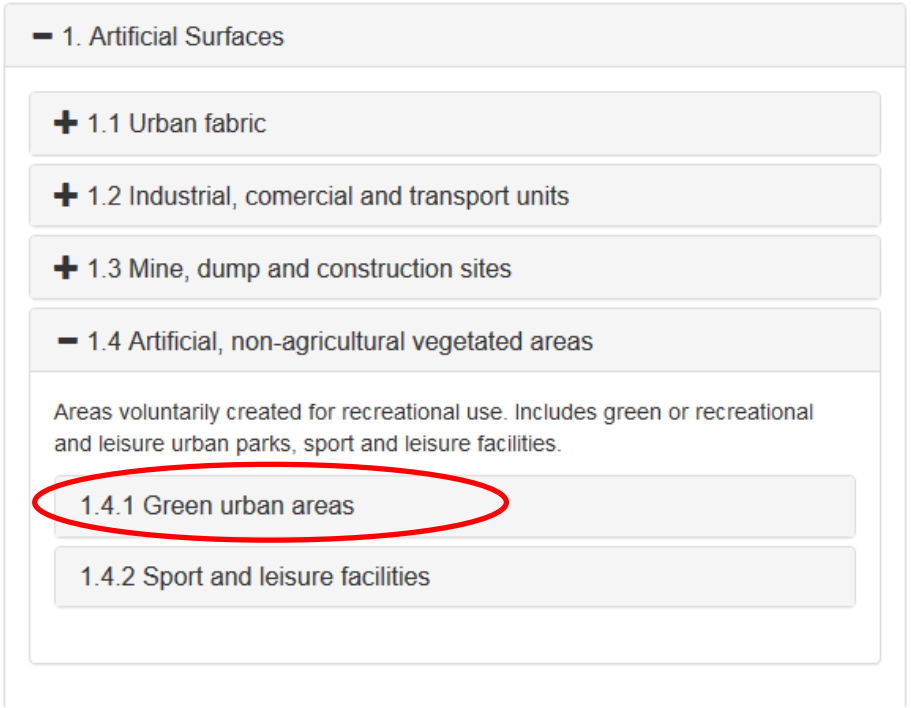
Land take: constraints

- Resolution: only changes above 5 ha are considered
- Land cover flows: inclusion of green urban areas



Alternatives to data source (CLMS)

- Short term
  - Urban Atlas
  - Imperviousness
- Mid term
  - CLC+

Other data sourcea

	CLC	Urban Atlas	Imperviousness
Type of information	Land cover	Land cover	Percentage of sealed area
Coverage	EU39	785 FUAS (EU28 + EFTA countries + West Balkans + Turkey)	EU39
Minimum mapping unit/width	25 ha / 100 m (polygon)	17 Urban classes 0,25 ha 10 rural classes 1 ha	20 m (pixel) / 100 m
Change mapping	≥ 5 ha	0,10 ha 0, 25 ha	20 m (pixel)
Time series	2006	2006	2006
			2009
	2012	2012	2012
			2015
	2018	2018	2018

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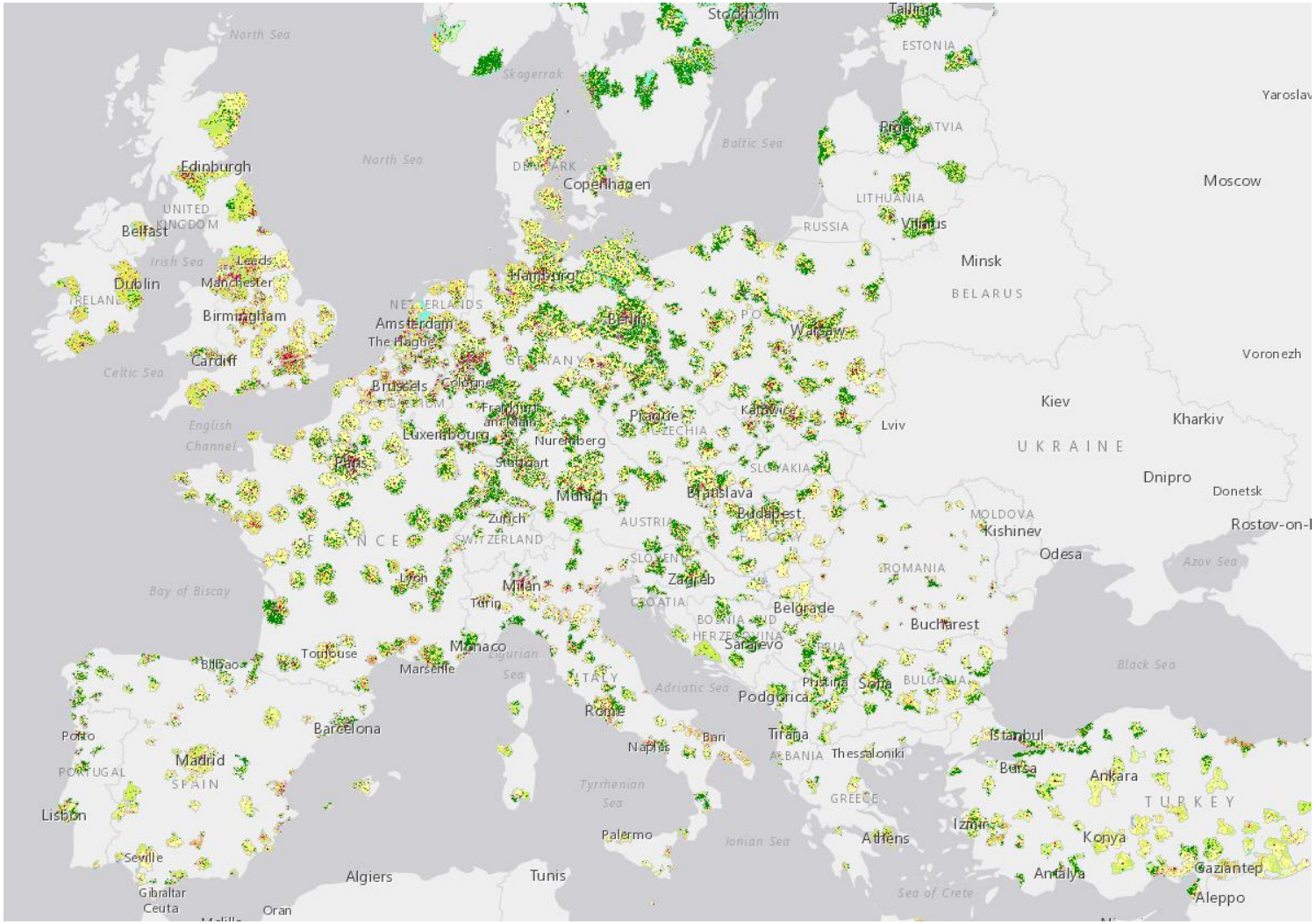
Other data sourcea

	CLC	Urban Atlas	Imperviousness
Type of information	Land cover		
Coverage	EU39	7 …untries + …ey)	
Minimum mapping unit/width	25 ha / 100 m (polygon)	… ha 10 rural classes 1 ha	… m (pixel) / … m
Change mapping	≥ 5 ha	0,10 ha 0, 25 ha	20 m (pixel)
Time series	2006	2006	2006
			2009
	2012	2012	2012
			2015
	2018	2018	2018

Higher resolution
Land cover classes
Additional attributes
Only FUAs

Higher resolution
Binary
More frequent updates
EU39

Urban Atlas



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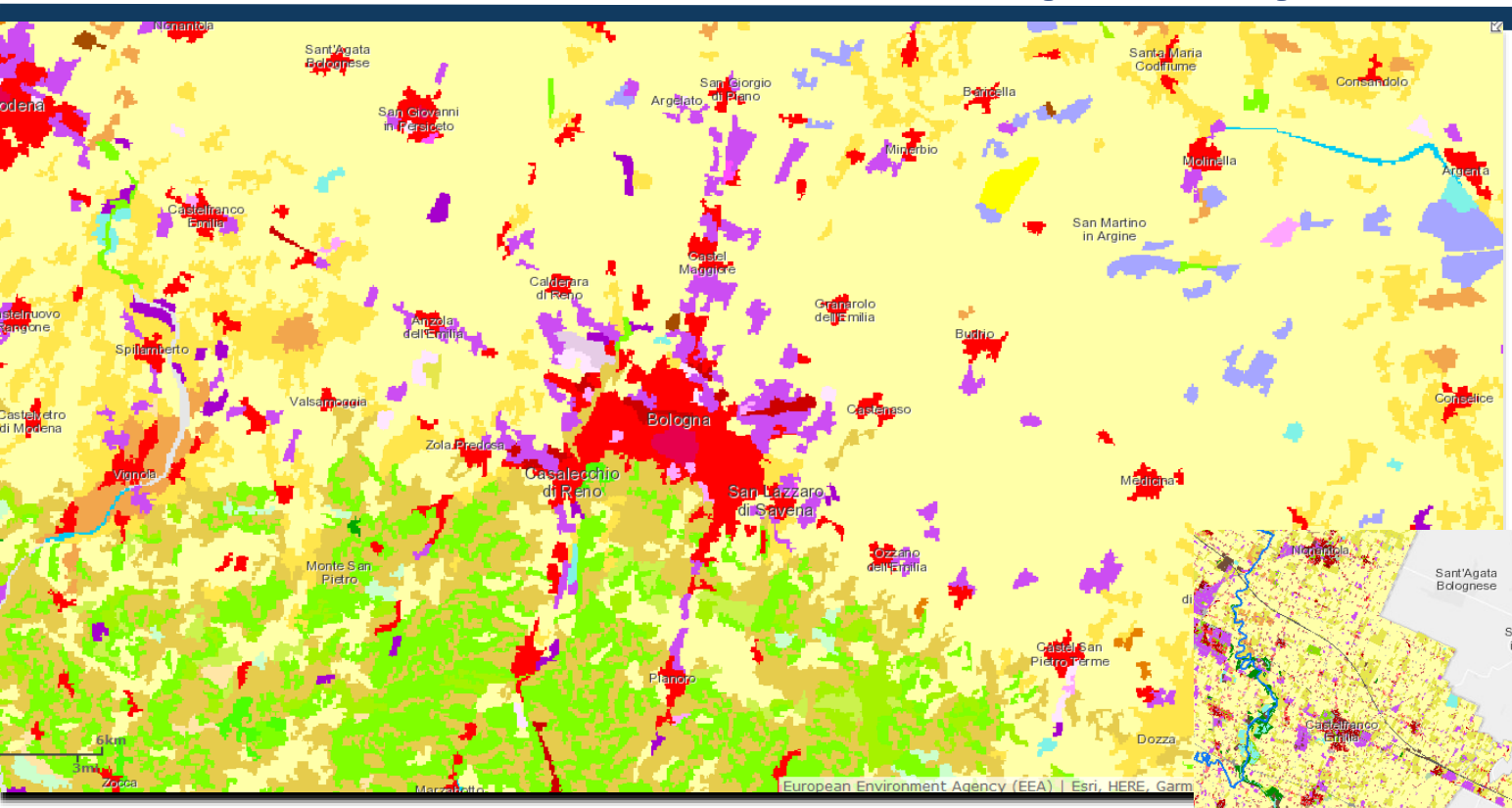
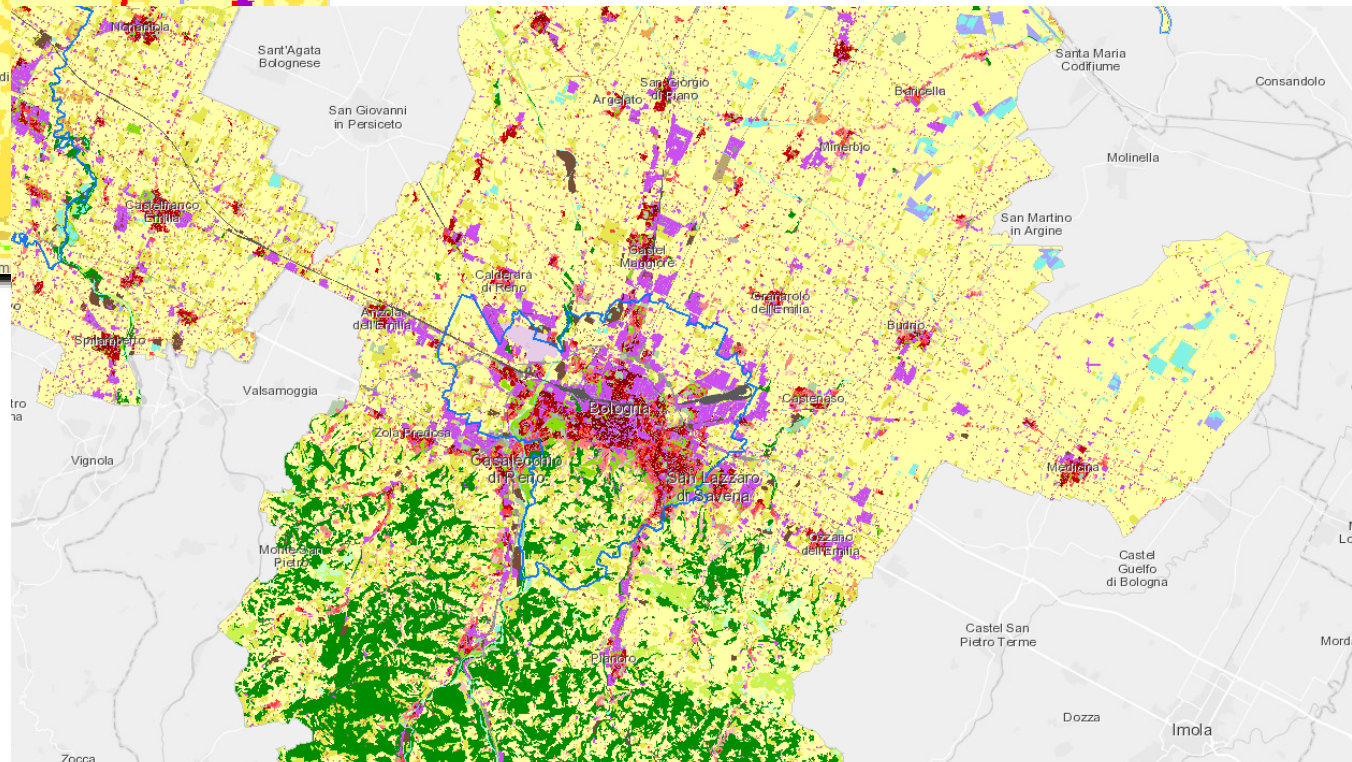
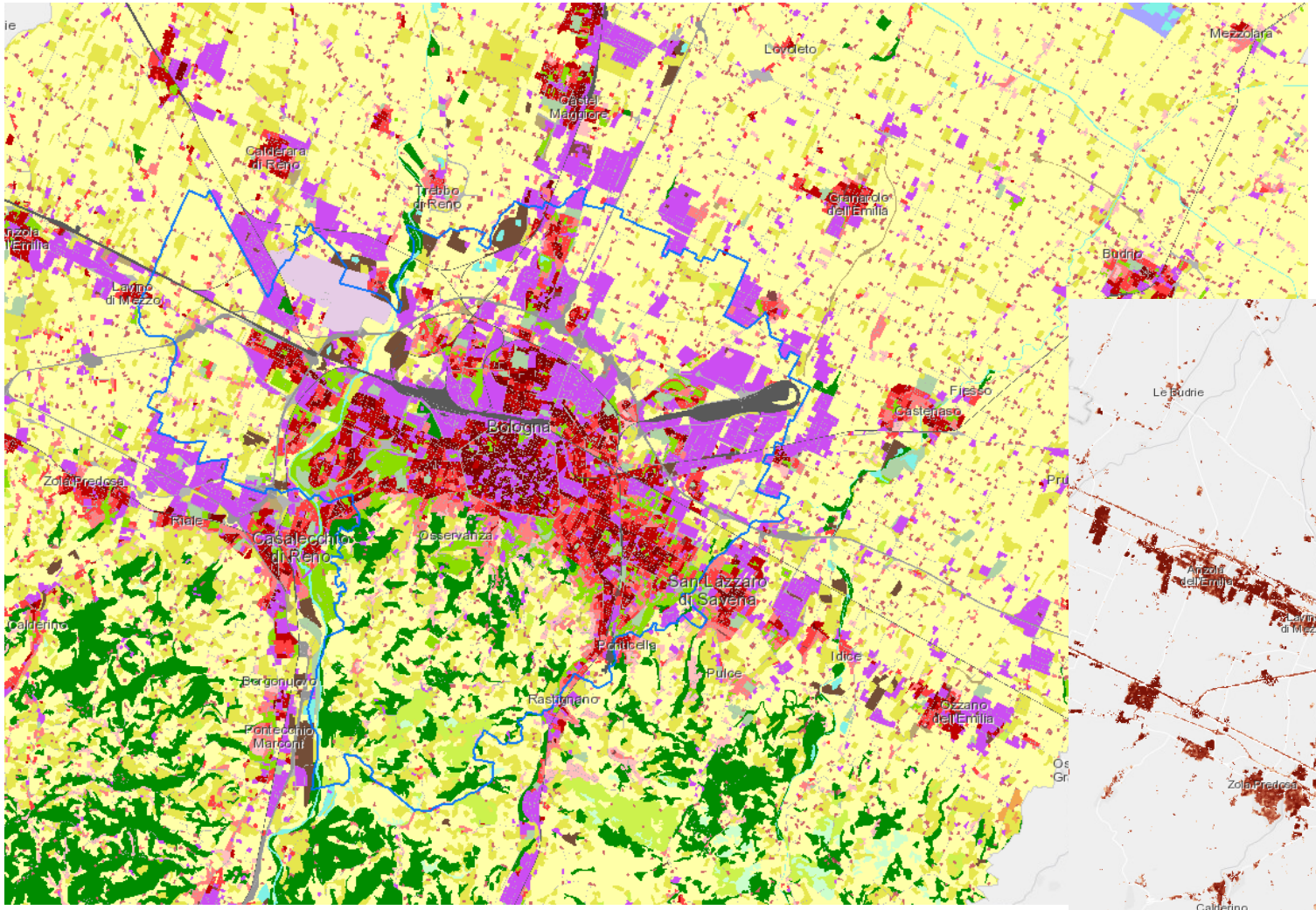
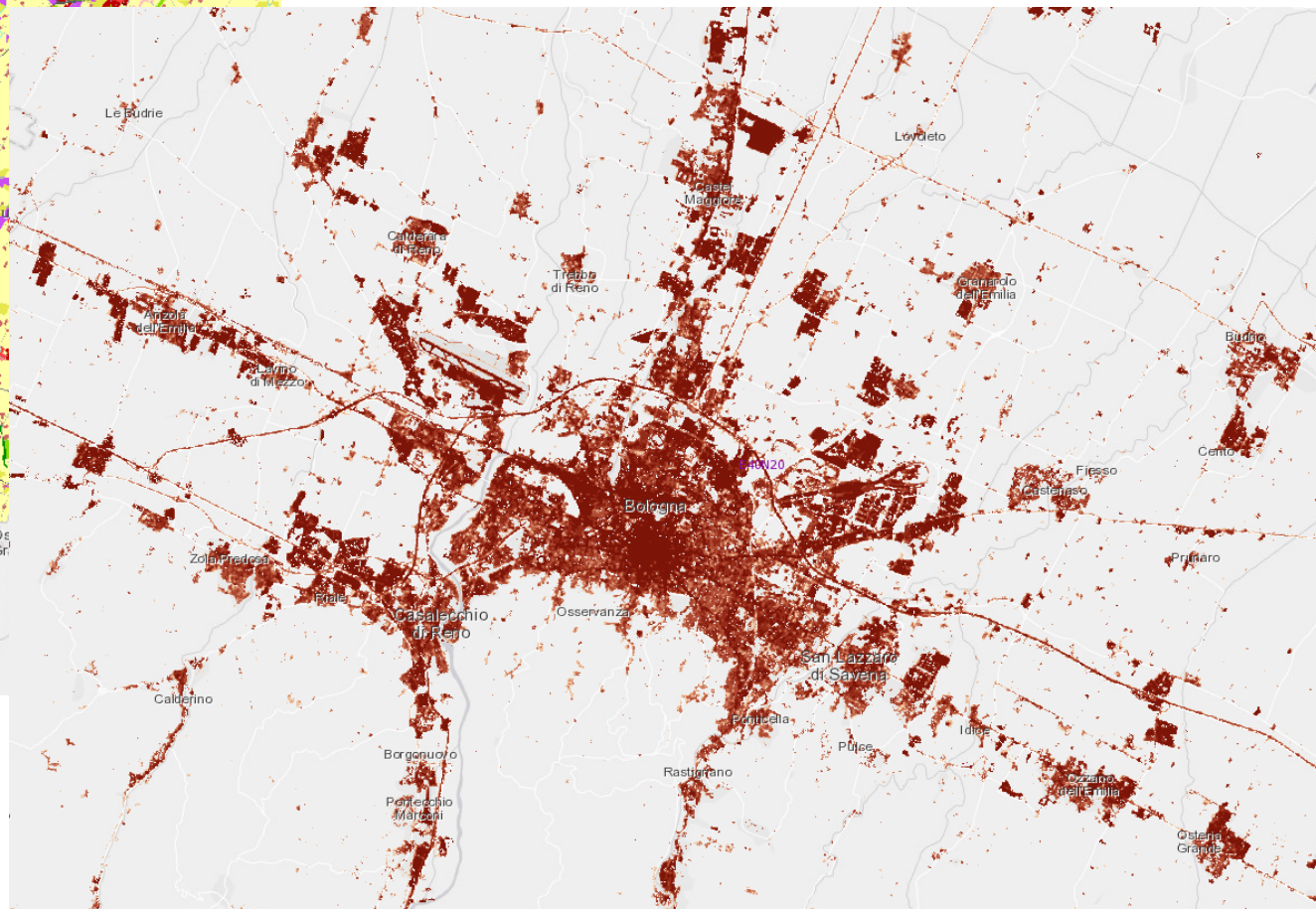
CLC vs Urban Atlas (2012)





Urban Atlas vs Imperviousness

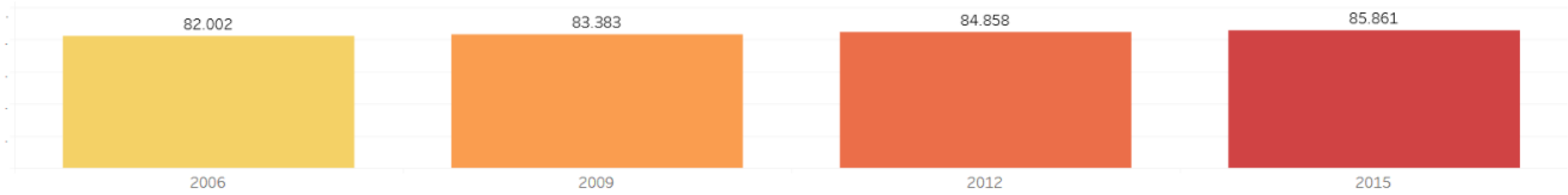




Soil sealing

The indicator | **Europe in numbers** | Sealed surface status per NUTS3 | Sealed surface change per country years | Cumulative surface increase | Sealing increase compared 2006 | Sealed surface by Ecosystem type

Km² of sealed surface by year



A constant increase of sealed surface is registered in Europe, in EEA39 as well as in EU28 countries, while the rate of change decreased in the last period (2012 - 2015) especially in EU28 countries.

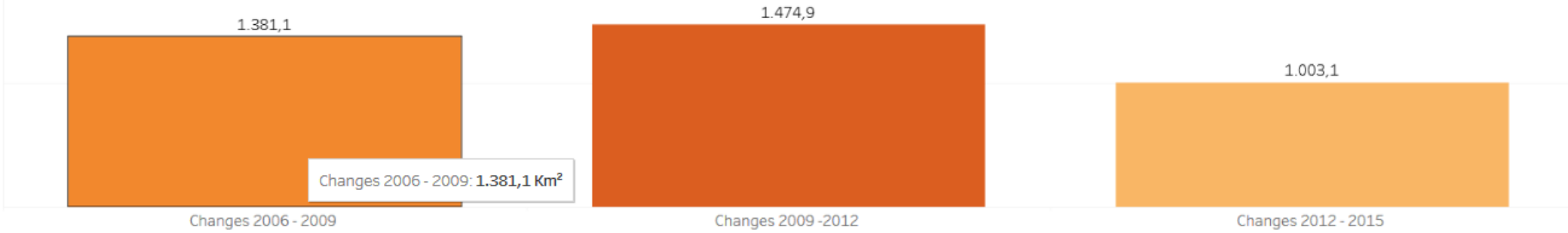
Year
2006
2009
2012
2015

Country coverage
EEA39

Biogeographical regions
(All)

MAES ecosystem type
(Multiple values)

Km² of changes in sealed surface among years



Advised time intervals
Changes 2006 - 2009
Changes 2009 -2012
Changes 2012 - 2015

Revert Refresh Pause

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CLC +

- Higher resolution 0,5 ha MMU
- Clear separation between LC and LU
- Object-oriented description instead of classification
- Complete coverage of themes LC and LU
- Modelling of temporal phenomena
- Applicable on national and European level

https://land.copernicus.eu/user-corner/technical-library/upcoming-product-clc

Conclusions

- CLC provides an European wide assessment on land take, but
  - Resoluttion is too coarse
  - Exclusion of green urban areas from land take? This could be easily solved. However, it could reflect certain degradation

    forest -> green urban area

Conclusions

- Urban Atlas
  - Provides a better resolution
  - Only for FUAs

Conclusions

- Soil sealing
  - Provides a better resolution
  - Higher monitoring frequency (every 3 years)
  - Does not allow to know what type of land has been lost
  - Land take has impacts beyond the exact place where the change is occurring. Change in soil sealing only identifies where the (irreversible) change occur.

Conclusions

- Looking forward
  - Identify type of land lost by crossing CLC and soil sealing (with the limitations of resolution)
  - Calculation of the indicator with CLC+
  - Need to consider land take in context
    - Urban / peri-urban / rural
    - Other dynamics (e.g. land reuse/recycling)

Thank you very much for your attention!

Eva Ivits
Eva.Ivits-Wasser@eea.europa.eu

Jaume Fons-Esteve
jaume.fons@uab.cat

Photo: B. Georgi