European Environment Agency

8th Environment Action Programme

Land take: net land take in cities and commuting zones in Europe

8TH EAP HEADLINE INDICATOR, 2024

European Environment Agency

Net land take in cities and commuting zones in Europe

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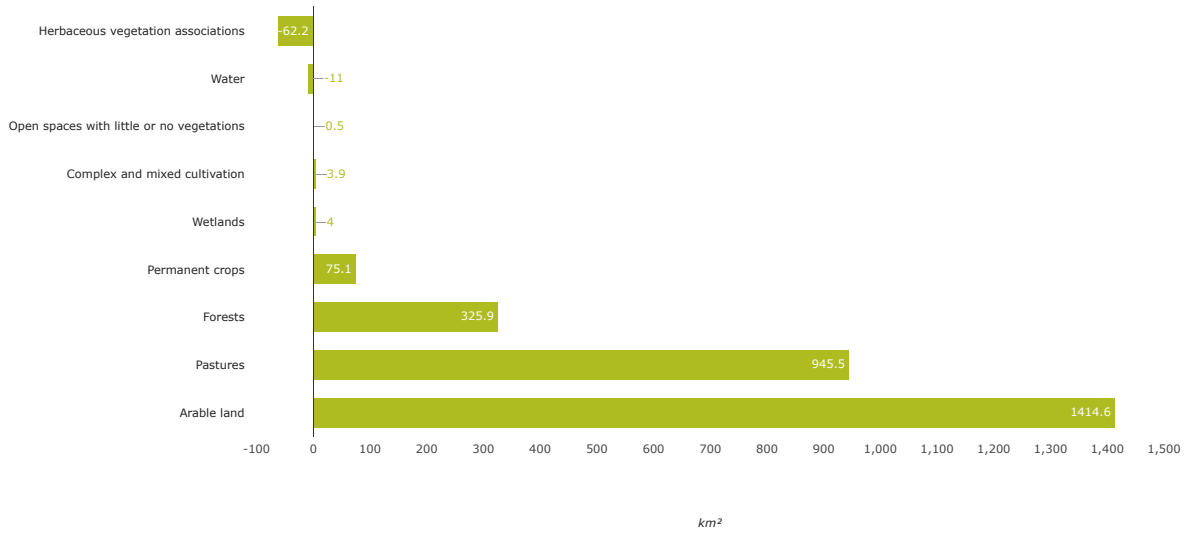
Land conversion to artificial surfaces impairs the ecological functions of land and makes ecosystems less resilient. In Europe, this conversion takes place primarily in cities and commuting zones. Between 2012 and 2018, the net land take in the EU in these zones was 450 km^2 annually. The land that was taken was mostly croplands and pastures, followed by forests. For the EU to reach its aim of 'no-net-land take by 2050' there needs to be significant reductions in the net land take over the years and this seems, at present, uncertain and challenging. It is unclear how the main drivers of land take will change and whether reconverting artificial surfaces to land will increase sufficiently in the future while current projections indicate a likely expansion of built up areas in the coming years.

Figure 1. Net land take in cities and commuting zones by land cover category, 2012-2018, EU-27



Land cover category	Net land take (km2)	Net land take (km2)_Text
Arable land	1414.6	1414.6
Pastures	945.5	945.5
Forests	325.9	325.9
Permanent crops	75.1	75.1
Wetlands	4	4
Complex and mixed cultivation	3.9	3.9
Open spaces with little or no vegetations	0.5	0.5
Water	-11	-11
Herbaceous vegetation associations	-62.2	-62.2

Land take entails the conversion of land to artificial surfaces, which impairs the valuable ecological functions of lands. This leads to less resilient ecosystems, decreased potential for carbon storage and biodiversity maintenance, increased surface run-off during floods and increased effects of heatwaves in cities. It also results in reduced quality of life via the diminished ecological land functions as well as via the direct loss of natural areas for relaxation, regeneration and outdoor activities.

The EU's biodiversity strategy for 2030 [1] addresses land take as one of the major threats to biodiversity, whereas the soil strategy for 2030 [2] sets the aim of 'no net land take by 2050'. The European Commission proposed a nature restoration law [3], which includes, among others: no net loss of green urban spaces by 2030, a 5% increase by 2050, a minimum of 10% tree canopy cover in every European city, town and suburb, and net gain of green space that is integrated to buildings and infrastructure.

Land take mostly (but not exclusively) occurs in cities and their commuting zones — these are also known as functional urban areas (FUAs). Over the 2012-2018 period, the majority (78%) of the net land take happened in commuting zones. The net land take in FUAs during 2012-2018 amounted to 2,696km^2 or 450km^2 annually.

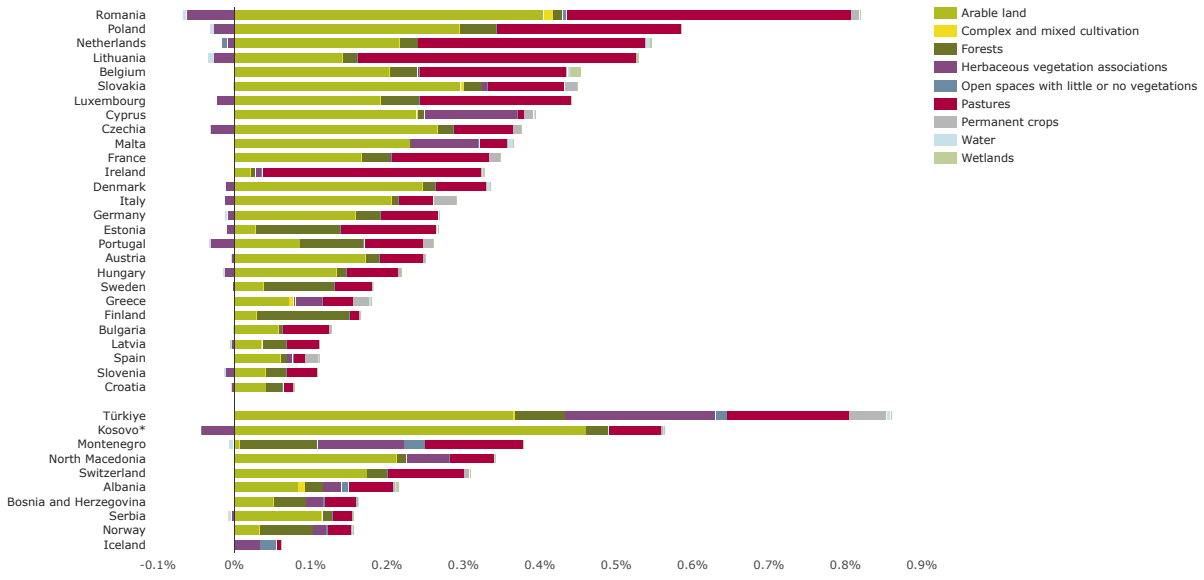
Most land take in FUAs took place in arable lands — a loss of 1,415km² or 47% of all land take. Loss in arable land can impact food security, carbon sequestration and the maintaining of biodiversity. The second largest land take took place in pastures — a loss of 945km² or 36% of all land take. Pastures are among Europe's most important biodiversity hotspots[4] and carbon sinks[5], so being under such pressure is a cause for concern. The area of forests loss (326km^2) was about one quarter of the area of arable lands lost. Forests present significant carbon stocks accumulated through growth of trees and an increase in soil carbon, and are important for habitat provision, flood protection and climate regulation. For the same reasons, although wetlands represent a very small area of FUA territory (2.5%) any loss — and there has been a total loss of 6km^2 in 2012-2018 — is cause for concern.

Assuming a linear evolution in land take, for the EU to meet its aim of reducing its net land take to zero by 2050 would require that from 2019 onwards the EU reduces its net land take by 14km^2 annually. This would mean that by 2030 the EU needs to reduce annual net land take to 282km^2.

Major drivers of land take include population growth, the need for transport infrastructure, cultural preferences and economic growth[6]. It is unclear how these drivers will evolve in the coming years and therefore it is uncertain whether the EU would be reducing its net land take by 2030 sufficiently to stay on track with meeting its 2050 no net land take goal. The recently adopted (2021) Soil Strategy for 2030 sets a series of actions and their implementation could contribute to reducing land take. However, according to a European Commission study[7]built-up areas are likely to expand by more than 3%, reaching 7% of the EU territory by 2030.

Discouraging diffuse urban expansion while promoting compact city planning and the re-naturalisation of land instead would be an important means to reduce the land take rate in the future and reach the 2050 no net land take goal[6].

Figure 2. Net land take by land cover and country, 2012-2018, EEA-38 (in % of the total FUA surface in the country)



Countries	Arable land	Complex and mixed cultivation	Forests	Herbaceous vegetation associations	Open spaces with little or no vegetations	Pastures	Permanent crops	Water	Wet
Romania	0.404	0.013	0.013	-0.062	0.004	0.373	0.012	-0.005	0.00
Poland	0.296	0	0.047	-0.027	0	0.242	0.001	-0.006	0
Netherlands	0.217	0	0.023	-0.009	-0.007	0.298	0.001	0.005	0.00
Lithuania	0.142	0	0.02	-0.026	0	0.365	0	-0.009	0.00
Belgium	0.203	0	0.036	0.004	0	0.193	0	0.004	0.01
Slovakia	0.296	0.004	0.024	0.008	0	0.1	0.018	-0.002	0
Luxembourg	0.191	0	0.052	-0.022	0	0.198	0.001	0	0
Cyprus	0.238	0.003	0.008	0.121	0	0.009	0.013	0.002	0
Czechia	0.265	0.002	0.02	-0.031	0	0.077	0.011	-0.001	0
Malta	0.23	0	0	0.091	0	0.037	0	0.008	0
France	0.166	0	0.038	0.002	0	0.127	0.016	-0.001	0
Ireland	0.022	0	0.006	0.008	0	0.288	0	0.001	0.00
Denmark	0.247	0	0.016	-0.011	0	0.068	0	0.005	0
Italy	0.206	0	0.01	-0.013	0	0.044	0.031	0	0
Germany	0.159	0	0.032	-0.009	0	0.076	0.002	-0.003	0
Estonia	0.028	0	0.111	-0.01	0	0.127	0	0	0.00
Portugal	0.086	0	0.083	-0.031	0.001	0.077	0.013	-0.002	0
Austria	0.171	0	0.019	-0.004	0	0.057	0.003	-0.001	0
Hungary	0.134	0	0.012	-0.012	0	0.068	0.005	-0.003	0
Sweden	0.039	0	0.093	-0.002	0	0.049	0	0.001	0
Greece	0.072	0.006	0.002	0.035	0	0.04	0.021	0.004	0
Finland	0.029	0	0.122	0.001	0	0.012	0	0.001	0
Bulgaria	0.058	0	0.005	0	0	0.061	0.003	-0.002	0.00
Latvia	0.035	0.001	0.033	-0.003	0	0.042	0	-0.002	-0.0(
Spain	0.06	0	0.009	0.008	0.001	0.015	0.017	0.001	0
Slovenia	0.041	0	0.028	-0.012	0	0.04	0	-0.002	0
Croatia	0.041	0.001	0.022	-0.003	0	0.012	0.003	-0.001	0
Türkiye	0.364	0.003	0.066	0.197	0.015	0.16	0.049	0.005	0.00
Kosovo*	0.461	0	0.029	-0.043	-0.001	0.069	0.002	0.002	0
Montenegro	0.008	0	0.101	0.113	0.027	0.13	-0.001	-0.007	0
North Macedonia	0.212	0.001	0.013	0.056	0	0.058	0.001	0	0.00

Countries	Arable land	Complex and mixed cultivation	Forests	Herbaceous vegetation associations	Open spaces with little or no vegetations	Pastures	Permanent crops	Water	Wet
Switzerland	0.174	0	0.027	-0.001	0	0.099	0.008	0.001	0
Albania	0.083	0.01	0.023	0.024	0.009	0.059	0.002	0.001	0.00
Bosnia and Herzegovina	0.051	0.001	0.042	0.022	0.002	0.041	0.004	0	-0.0(
Serbia	0.114	0.001	0.014	-0.004	0	0.026	0	-0.005	0.00
Norway	0.033	0	0.07	0.017	0.002	0.032	0	0.002	0
Iceland	0	0	0	0.034	0.021	0.007	0	0	0

None of the EU countries have re-naturalised more land than that converted to urban areas (Figure 2). There are positive signs in a few countries, however: in Czechia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal and Romania, the re-naturalisation of former urbanised areas appears.

At the national level, compared to their 2012 FUA area, net land take in the EU was highest in FUAs in Romania, Poland and the Netherlands (an increase of between 0.5% and 1%). Croatia, Latvia, Slovenia and Spain increased their urbanised areas the least (below 0.1% increase in FUAs).

EU net land take in arable lands was highest in Denmark, Austria and Italy (>65% of all land take), followed by Czechia, Germany, Hungary, Malta, and Slovakia (around 60% of all land take) (Figure 2).

In most countries, land take did not impact forests, except for Estonia, Finland and Sweden (circa 40% of land take), however this accounted for less than 50km^2 of forest loss. In Ireland and Lithuania, more than 70% of all land take impacted pastures, although in absolute terms, the impacted areas were smaller than 50km^2.

Land take in pastures were highest in Ireland, Lithuania, the Netherlands and Romania, where artificial surfaces increased by circa 0.5% of the FUA area. Wetland loss due to land take was very little as a percentage of the FUA territory. The highest value was observed in Belgium, with 1.6km^2 of net wetland loss.

Supporting information

Definition

The land take indicator addresses the change in the areas of agricultural, forest and other semi-natural land taken for urban and other artificial land development. Land take includes areas sealed by construction and urban infrastructure, urban green areas, and sport and leisure facilities.

The main drivers of land take are grouped as processes resulting in the extension of:

• housing, services and recreation;

• industrial and commercial sites;

• transport networks and infrastructure;

• mines, quarries and waste dump sites;

• construction sites.

Note: the land take changes relate to the extension of urban areas and may also include parcels that were not sealed (e.g. urban green areas, and sport and leisure facilities). This is, in particular, the case for discontinuous urban fabric, which is

considered as a whole. Similarly, monitoring the indicator with satellite images leads to the exclusion of some linear transport infrastructure, which are too narrow to be observed directly.

Methodology

Methodology for indicator calculation

The indicator is currently calculated from the Urban Atlas dataset of the Copernicus Land Monitoring Service for the years 2012 and 2018. Changes from agriculture, forest and semi-natural/natural land, wetlands or water to urban areas are grouped and expressed in km^2 of converted area.

Net land take is calculated taking into account the 'reverse land take process', i.e. when urban areas are converted to semi-natural land. This can happen as, for example, land cover changes from a mineral extraction site to forest. Net land take is hence the result of land take minus reverse land take, expressed in km^2 area.

Methodology for gap filling

Not applicable.

Policy/environmental relevance

Justification for indicator selection

Land is a finite resource and the way it is used is one of the principal drivers of environmental change and has a significant impact on quality of life and ecosystems. In Europe, the proportion of total land use occupied by production (agriculture, forestry, etc.) is one of the highest on the planet and conflicting land use demands require decisions to be made that involve hard trade-offs. Land use in Europe is driven by a number of factors, such as the increasing demand for living space per person, and the link between economic activity, increased mobility and the growth of transport infrastructure, which usually result in land take. Urbanisation rates vary substantially, with coastal and mountain areas being among the most affected regions in Europe as a result of the increasing demand for recreation and leisure.

Land take occurs mostly in peri-urban areas, where the demand for new infrastructure is high and soil quality, for historical reasons of human settlement, is good. The increase in the area of artificial surfaces often impairs or disrupts valuable ecological functions of soils, such as biomass provision, soil biodiversity and soil carbon pool, or water infiltration potential causing flooding. This has negative impacts on climate change, as it decreases the potential for carbon storage and sequestration, and increases surface run-off during flood [8][9]. Land occupied by artificial surfaces and dense infrastructure connects human settlements and fragments landscapes. It is also a significant source of water, soil and air pollution. In addition, lower population densities — a result of urban sprawl — require more energy for transport and heating or cooling. The consequences of urban lifestyles, such as air pollution, noise, greenhouse gas emissions and impacts on ecosystem services, are felt within urban areas and in regions far beyond them.

Policy context and targets

Context description

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to monitoring aspects of the 8th EAP Article 2.1. that requires that 'by 2050 at the latest, people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced. A healthy environment underpins the well-being of all people and is an environment in which biodiversity is conserved, ecosystems thrive, and nature is protected and restored, leading to increased resilience to climate change, weather- and climate-related disasters and other environmental risks. The Union sets the pace for ensuring the prosperity of present and future generations globally, guided by intergenerational responsibility'[10]. The European Commission 8th EAP monitoring Communication specifies that this indicator should monitor whether the EU is on track to meet the 'no land take by 2050' target[11].

In May 2020, the European Commission adopted a biodiversity strategy to 2030, related to protecting and restoring nature. The strategy states that the 'biodiversity crisis and the climate crisis are intrinsically linked. Climate change accelerates the destruction of the natural world through droughts, flooding and wildfires, while the loss and unsustainable use of nature are in turn key drivers of climate change'. Therefore, both the EU biodiversity strategy and the soil strategy for 2030 include the no net land take target by 2050. The soil strategy also addresses land recycling and promotes the circular use of land over greenfield development to limit the acute pressure from soil sealing and land take. The soil strategy further suggests that member states include 'land take hierarchy' in their urban greening plans to 'give priority to reusing and recycling land and to quality urban soils at national, regional and local level, through appropriate regulatory initiatives and by phasing out financial incentives that would go against this hierarchy, such as local fiscal benefits for converting agricultural or natural land into built environment.' In June 2022, the European Commission adopted the proposal for a nature restoration law that aims to put all natural and seminatural ecosystems on the path to recovery by 2030. The proposed law includes specific targets on green urban spaces and peatlands.

‘No net land take’ is also addressed in the land degradation neutrality (LDN) target of the United Nations Convention to Combat Desertification (UNCCD), which aims to maintain the amount and quality of land resources. LDN is promoted by target 15.3 of the UN Sustainable Development Goals (SDGs), which, by 2030, strives to combat desertification and to restore degraded land and soil. Land and soil are also linked to goals that address poverty reduction (SDG 1), health and well-being through reduced pollution (SDG 3), access to clean water and sanitation (SDG 6), the environmental impact of urban sprawl (SDG 11) and climate change (SDG 13). The EU biodiversity strategy to 2020 [1] calls for the restoration of at least 15% of degraded ecosystems in the EU and the expansion of the use of green infrastructure, e.g. to help overcome land fragmentation.

Policy decisions that shape land use need to consider trade-offs among many sectoral interests, including industry, transport, energy, mining, agriculture and forestry. These trade-offs are eventually implemented through spatial planning and land management in the Member States. Although the subsidiarity principle assigns land and urban planning responsibilities to the national and regional government levels, most EU policies have a direct or indirect effect on urban development. In particular, the effective implementation of the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) Directives[12][13] has shown that they can improve the consideration of environmental aspects in planning projects, plans and programmes, contribute to more systematic and transparent planning, and improve participation and consultation. The far-reaching consequences of EU and other policies for spatial impacts are, however, only partially perceived and understood. Tackling these challenges needs the completion of a comprehensive knowledge base and better awareness of the complexity of the problems. Initiatives aimed at achieving such an integrated approach, as requested in the Community strategic guidelines on cohesion 2007-2013[14] imply compliance with the precautionary principle, the efficient use of natural resources and the minimisation of waste and pollution, and must be vigorously pursued and, in particular, implemented.

Targets

While many EU and national policies address land and soil to some extent, legally binding targets, incentives and measures are largely missing at the EU level. Nevertheless, the 8th Environmental Action Program and the soil and biodiversity strategies to 2030 all address and aim at no-net land take by 2030.

The European Commission adopted the proposal for a nature restoration law and intends to adopt the proposal for a soil health law in 2023, including related targets on healthy soil.

Accuracy and uncertainties

Methodology uncertainty

The methodology is straightforward as it is based on calculating observed area changes as long as the definition of land take is followed.

Data set uncertainty

Even though the Urban Atlas dataset represents every $10m^2$ grid cell in Functional Urban Areas, very large-scale sealed surfaces or land use processes converting semi-natural land to artificial surfaces will be underestimated. These processes are not captured by the dataset and hence the absolute land take value could be higher. There is however no indication on an EU level as to the degree of this underestimation.

Rationale uncertainty

Newly urbanised areas (land uptake) may also comprise non-artificial surfaces (private gardens or public green areas). Thus, they may vary in environmental condition and provision of habitats or ecosystem services.

Data sources and providers

- Copernicus Land Monitoring Service - Urban Atlas, European Environment Agency (EEA)

Metadata

DPSIR

Pressure

Topics

 # Land use

Tags

Communting zones # 8th EAP # LSI001 # Artifical surfaces # Fnctional urban areas

Temporal coverage

2012-2018

Geographic coverage

Albania
Austria
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Kosovo (UNSCR 1244/99)
Latvia
Lithuania
Luxembourg
Malta
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Romania
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Türkiye

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

SDG15: Life on land

Unit of measure

km² and percentage

Frequency of dissemination

Once a year

References and footnotes

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