

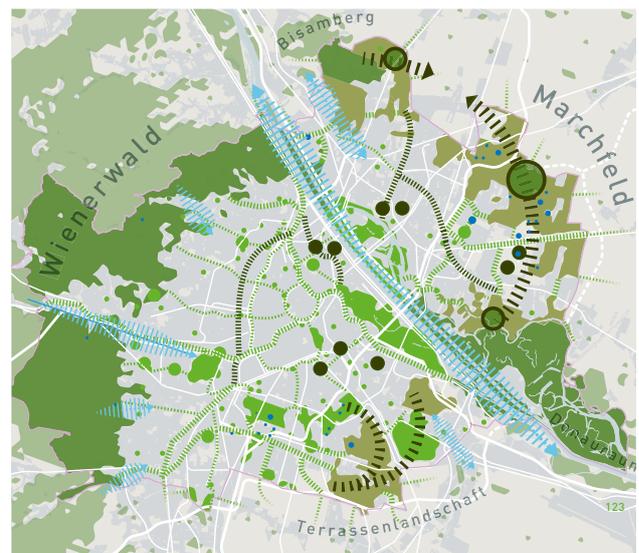


## SUMMARY

Urbanisation is an ongoing trend in Europe leading to land take and soil sealing at the expense of agricultural land and other open landscapes. Despite the extensive loss of productive soils and the valuable ecosystem services that soils provide, the awareness of the magnitude and negative implications of these processes remain relatively low. Systematic solutions are required to reduce the scale of land take and soil sealing. More specifically, an overall strategic aim and framework for sustainable soil management at EU and national level are needed, complemented by binding and quantitative land take targets and adequate financial and technical support at national scale. Municipal spatial planning is one of the most important instruments to foster sustainable city development and highlights the importance of cities to guide this process. This also includes testing and deploying new approaches such as joint regional planning, Open Space concepts or the application of zoning concepts to protect the most fertile and valuable soils from sealing. In this policy brief, we illustrate the scale of the problem and identify ready-made solutions and steps policy makers and practitioners can take across different levels, from city planning to national and European level.

## INTRODUCTION

Europe loses about 1.007 km<sup>2</sup> of soil due to land take annually (EEA 2017), which is approximately a loss the size of the city of Berlin. Land take especially affects metropolitan areas (peri-urban areas) usually characterized by land with high soil quality and some of the most productive agricultural soils. Arable land and grasslands, but also forests and other open land, are being converted to construction land for housing or used to accommodate economic development and create new infrastructures (such as transport). Such soil sealing processes result in an irreversible and total loss of soil functions and ecosystem services provided by soils, including food and biomass, habitats for soil biodiversity, healthy water and nutrient cycles.



**Photo Header** | Vienna (<https://pxhere.com/en/photo/570476>) - CC0 Public Domain

**Photo 1** | Green area concept Vienna, Source: STEP 2025, Stadtentwicklungsplan Wien (City Development Plan Vienna. 2014); URL: <https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008379a.pdf>

## DEFINITIONS OF LAND TAKE AND SOIL SEALING

- **Land take** is also known as “urbanisation”, “increase of artificial surfaces” and represents an increase of settlement areas (or artificial surfaces) over time, usually at the expense of rural areas. This process can result in an increase of scattered settlements in rural regions or in an expansion of urban areas around an urban nucleus (urban sprawl). A clear distinction is usually difficult to make (Prokop et al., 2011).
- **Soil sealing** can be defined as the destruction or covering of soils by buildings, constructions and layers of completely or partly impermeable artificial material (asphalt, concrete, etc.). It is the most intense form of land take and is essentially an irreversible process (Prokop et al., 2011).

Within the European context, two high level policy targets directly deal with the issues of soil sealing and land take:

- the EU Roadmap to Resource Efficient Europe, which demands “no net land take until 2050”
- the UN Sustainable Development Goal 15.3, which aims to “halt and reverse land degradation” until 2030 and which in 2017 introduced the concept of “Land Degradation Neutrality”, which the EU and its Member States have pledged to integrate.

While these targets highlight the issue of efficient land use, they do not involve specific implementation mechanisms. Research also reveals that despite the ongoing loss of soil through sealing and land take, there are rarely any specific targets set at the national level. Data reveals that some European cities have been successful in coping with land take and soil sealing.

To gather more insights on city-level approaches and strategies taken, two different types of surveys

were undertaken within the RE CARE project: 1) the assessment of in-situ data for land take and soil sealing (2006 to 2012) from satellite data, and 2) information from direct interviews with planners in the respective cities. The eight surveyed urban areas include Amsterdam, Cambridge, Milan, Nantes, Regensburg, Stockholm, Vienna and Wroclaw (see Fig. 1). Surveyed urban areas include the core cities and their surroundings as land take above all occurs on the outskirts of cities.



Figure 1 | Overview of surveyed urban areas.

## TRENDS IN SOIL SEALING AND LAND TAKE

Some key observations from statistical analysis in soil sealing changes in the eight selected urban agglomerations between 2006 and 2012 are:

- The amount of sealed soils per capita is always higher in peri-urban area than in core cities (the amount is higher by a factor of 2.1 in peri-urban compared to the corresponding Core Cities, see Fig. 2).
- There is a visible trend that soil sealing per capita decreased in core cities and grew in peri-urban areas. This can be explained with inner-urban development (densification) in the core-cities and more land consuming housing in peri-urban areas plus construction of new infrastructure, such as roads, schools etc.
- Five Core Cities managed to decrease their ratio of built-up area per capita, namely Cambridge, Nantes, Regensburg, Stockholm and Vienna, with the highest decrease in Stockholm (from 206 to 184m<sup>2</sup> per capita).
- Regarding Peri-Urban Areas a decrease of the ratio of built-up area per capita was observed in all cases, with the exception of Regensburg. This indicates that land use efficiency was increasing in six cases, with Stockholm and Cambridge being the most efficient cases (reduction of 69 m<sup>2</sup> per capita).

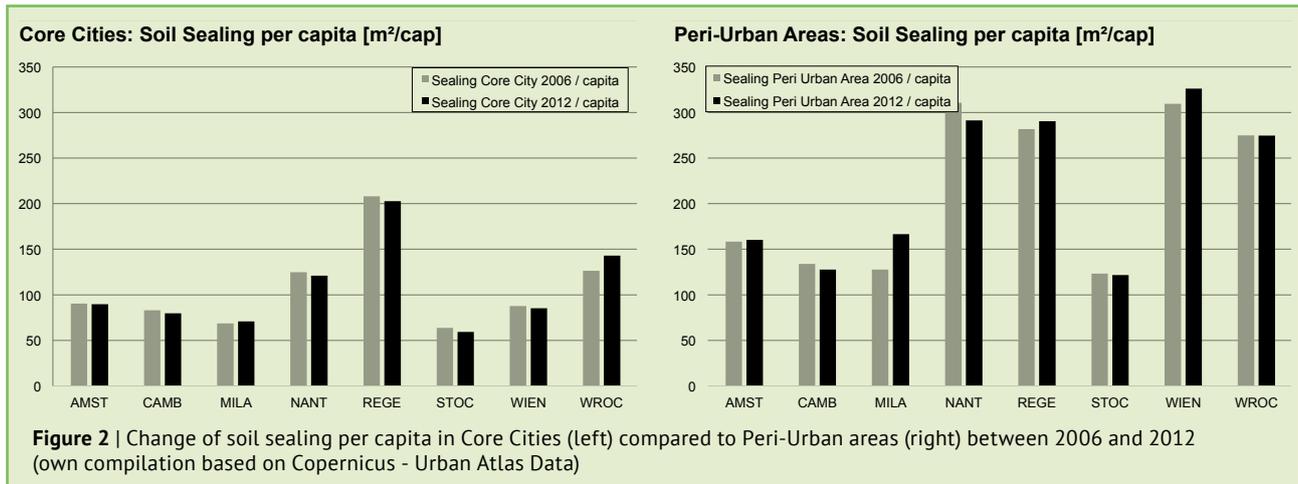


Figure 2 | Change of soil sealing per capita in Core Cities (left) compared to Peri-Urban areas (right) between 2006 and 2012 (own compilation based on Copernicus - Urban Atlas Data)

### DRIVERS BEHIND LAND TAKE AND SOIL SEALING

RE CARE survey revealed two key drivers for land take and soil sealing, namely **population growth and economic development** (which are listed in the table below). These results are in line with observations made at EU level, where the annual land take between 2006 and 2012 was mainly driven by the increasing need for new construction sites, industrial and commercial sites, mines, quarries and dump sites, new housing and transport infrastructure (EEA 2017).

- #### POPULATION GROWTH
- Need for more housing/densification of the inner city
  - Ongoing suburbanisation
  - Need for new infrastructure such as schools and hospitals
  - Need for more and better public transport infrastructure and roads

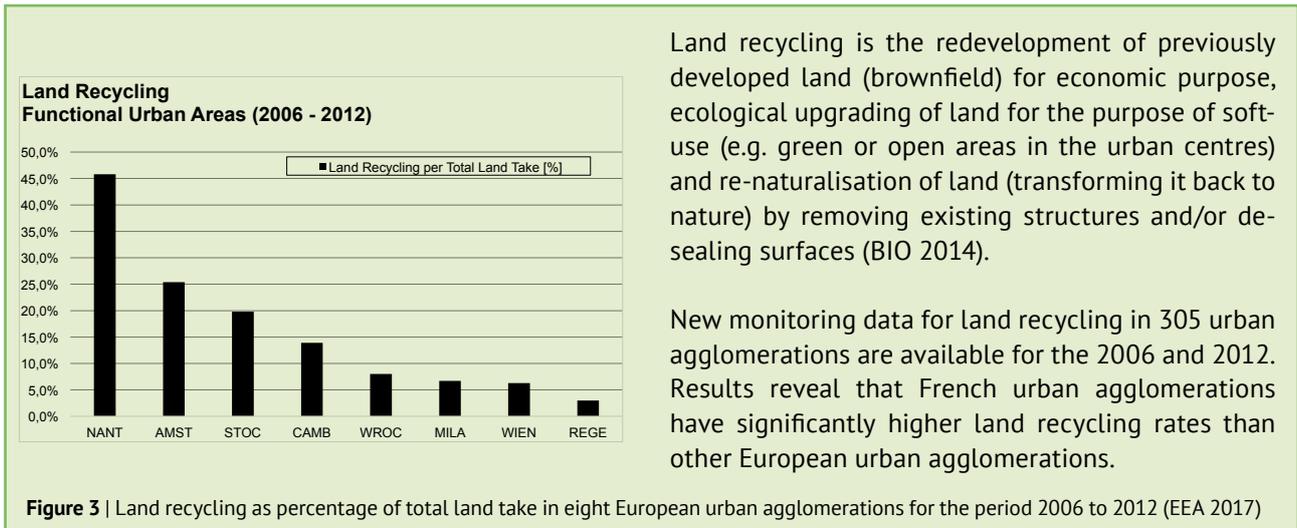
- #### ECONOMIC DEVELOPMENT
- Need for more industrial, commercial and business buildings
  - Need for better transport infrastructure incl. new highways, expressways, local bypasses, improvement of railway tracks and enlargement of the airport
  - Economic competition of municipalities
  - Land speculations
  - Prioritization of economic development over environmental concerns

### POLICY INSTRUMENTS TO ADDRESS THE ISSUE

How do cities cope with those drivers in policy and decision-making? What strategies have been proven promising and successful? What policy action is taken at the national level?

At the **national level**, the city survey exposed a variation in spatial planning legislation among countries.

- Several countries set for example quantitative targets for annual land take (e.g. Austria, Belgium (Flanders), Germany, Luxembourg, the Netherlands, and the UK) that serve as monitoring tools and are often indicative.
- Moreover, the legal protection of green or agricultural areas through environmental legislation governing land use can be a powerful policy instrument. Austria, for example, has a very strict Forest Law, which protects forests to a maximum, as land take on forest soils is very difficult and requires comparable afforestation somewhere else. In Poland, the “Law on agricultural and forest land protection” involves the collection of charges for converting agricultural land into urban functions.
- In France, the “Solidarity and Urban Renewal Act” encourages urban renewal (see also box on land recycling below) over expansion of settlements in undeveloped areas and promotes urban densification instead of converting untouched land for urban development. This law is the basis for the local urban plans. Similarly, the Swedish Planning and Building Act fosters densification of settlements through building on insufficiently utilised sites within existing settlements.



Land recycling is the redevelopment of previously developed land (brownfield) for economic purpose, ecological upgrading of land for the purpose of soft-use (e.g. green or open areas in the urban centres) and re-naturalisation of land (transforming it back to nature) by removing existing structures and/or de-sealing surfaces (BIO 2014).

New monitoring data for land recycling in 305 urban agglomerations are available for the 2006 and 2012. Results reveal that French urban agglomerations have significantly higher land recycling rates than other European urban agglomerations.

Ultimately, municipal spatial planning is the key lever to limit land take and soil sealing since it operationalises the regulatory requirements from the EU and national levels. Policy instruments implemented at city level are manifold and are binding or non-binding as shown in the table 1 below.

**Table 1** | Overview of policy instruments at city level

Policy instruments at city level	Specific examples
Binding legislative instruments	<ul style="list-style-type: none"> <li>Quantitative (binding) targets to limit soil sealing and land take as part of a strategic framework for city development</li> <li>Restrictions on development of green areas</li> <li>Zoning of agricultural priority areas</li> <li>Restrictions on types of developments</li> </ul>
Non-binding instruments	<ul style="list-style-type: none"> <li>Strategic documents (providing non-binding guidance for spatial planning guidance)</li> <li>Integrated joint planning</li> <li>Financial instruments (incentives e.g. for urban regeneration, fiscal transfers between national government and municipalities)</li> </ul>

The following three successful and promising examples seek to illustrate this diversity, which can serve as good practice for other cities:

In the city of Nantes the metropolitan land use plan Nantes sets two quantitative binding targets, i.e.: (i) to reduce by 50% the annual rate of land take from agricultural, natural and forest land with reference to the period 2004-2012; (ii) to protect 15,000 ha of agricultural land from land take until 2030 by fostering agriculture close to the city with short circular food chains and urban farming.

The Green Belt Policy represent a long-standing instrument in the UK that serves as a planning tool

to maintain open land and green areas around cities, protecting it from development, which has been proven successful in the city of Cambridge.

A new policy instrument has been established in the peri-urban area of Vienna: "Joint regional planning" - a co-operation of municipalities outside the core city. In this process, several municipalities commit themselves to uniform planning objectives, which include: (i) identification of inner urban development potentials, such as underused sites or derelict land (ii) awareness raising among citizens and consultancy for building on developed land or conversion of existing buildings, (iii) pro-active developments through municipalities, and (iv) limiting of speculation on real estate prices.



**Photo 2** | Amsterdam, © Alessandro Grussu, License: Attribution: CC BY-NC-ND 2.0

**SUCCESS FACTORS TO INCREASE THE IMPACT OF POLICY INSTRUMENTS**

The survey results highlighted a number of factors that contribute to the success of legislation and policy instruments. Beyond the presence of targeted policy instruments (e.g. thresholds for land take and/or minimum of green space, zoning in spatial planning, or specific protection of agricultural areas and forests), a number of ‘softer’ factors are also important to reduce land take. The most important factors are listed in the table 2 below.

**Table 2** | Overview of success factors to mitigate soil sealing and land take

Success factors	Specific examples
Stakeholder involvement	<ul style="list-style-type: none"> <li>• Involvement in the development of spatial plans</li> <li>• Involvement in the implementation of spatial plans</li> <li>• Assessment of citizens’ preferences</li> </ul>
Horizontal and vertical cooperation at city and cross-municipal level	<ul style="list-style-type: none"> <li>• Cooperation between municipalities and regions and joint planning</li> <li>• Cooperation between governmental authorities, stakeholders, educational and research institutions</li> </ul>
Public awareness raising for soil as a non-renewable resource	<ul style="list-style-type: none"> <li>• Raising awareness among citizens and decision makers for soil and its ecosystem services</li> <li>• Public demand and pressure for sustainable soil and land use planning</li> <li>• Support from research institutes and environmental associations</li> </ul>
Suitable local conditions	<ul style="list-style-type: none"> <li>• Availability of space for inner-development</li> <li>• Absence of large concentrations of industries</li> </ul>

## RECOMMENDATIONS

Building on the RE CARE city survey and relevant studies, the following recommendations for policy actions at EU, national and city/regional scales can be derived.

### Policy recommendations to reduce land take and soil sealing

#### EU

- Establish overall strategic aim and framework
- Improve the implementation of existing and legally binding EU policies
- Dedicate and increase EU funds to more efficient land use
- Foster an exchange of experience and knowledge between Member States

#### National

- Establish a robust framework of national law and regulation that supports municipalities

- Set quantitative land take targets
- Assign a value to soil and its functions and ecosystem services
- Deploy new planning approaches and improve vertical and horizontal cooperation

#### City/ regional

- Prioritising inner over outer development
- Involve stakeholder in the development and implementation of spatial plans

#### EU LEVEL:

- Establish an overall strategic aim and framework for actions to stop and reduce land take and soil sealing in urban areas in the long-term. This work needs to be aligned with ongoing efforts to achieve the Sustainable Development Goals 15.3 that aims for a Land Degradation Neutrality by 2030.
- Improve the implementation of existing and legally binding EU policies, which are key for preventing soil sealing and land take in the Member States such as Nature Directives, Environmental Impact Assessment Directive, Strategic Environmental Assessment Directive, Floods Directive and Water Framework Directive.
- Dedicate and increase EU funds to more efficient land use and to reduce pressure on urban and peri-urban areas. For example, the Rural Development Funds, the LIFE+ programme, Cohesion fund, EU research funds and the planned Trans-European Network for Green Infrastructure (post 2020) could support more strongly sustainable municipal planning, creation of green and blue areas in cities, remediation of contaminated or brownfield sites and the development and implementation of new policy instruments to reduce soil sealing.
- Foster an exchange of experience and knowledge on good practice on how to cope with land take between Member States.

#### NATIONAL LEVEL:

- Establish a robust framework of national law and regulation that support municipalities with financing and capacities to enable them to cope with land take and soil sealing. Provide tailored guidance for municipal



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### CITY/REGIONAL LEVEL:

- Prioritising inner over outer development. More specifically, cities should focus on and invest in building renovation instead of building on new land, reuse of brownfields, which can be supported by incentives to promote urban regeneration processes and energy efficiency in buildings. Developing compact cities with short distances will contribute to reduce transport infrastructures and promote public transport.
- Involve stakeholder (residents, non-governmental organization, and different sectors) in the development and implementation of spatial plans. Such processes allow the factoring in of concerns, demands and preferences from stakeholders and can be a determining factor for whether plans and therewith policies will be successful.

### AT A MORE GENERAL LEVEL ADDRESSING BOTH, THE NATIONAL AND CITY LEVEL, THE FOLLOWING ACTIONS ARE NEEDED:

- Set quantitative land take targets in correspondence with a long-term vision on the country and city development. In addition to setting overall targets, for example limiting land take to a certain number of ha/year, coefficients for urban functions or thresholds for a percentage of land to keep unsealed in new development areas, can serve as operational approaches.
- Assign an economic value to soil and its functions and ecosystem services. More specifically, the Mapping and Assessment of Ecosystem Assessment (MAES)-framework should be implemented at national level addressing soils. At city and regional level, indicators and thresholds can be developed and integrated in spatial planning by accounting for soil functions, specific conditions of cities and sustainable development objectives. On this basis, soil and land can be classified and zoned, fees for land take can be calculated or a scoring system for building rights can be established.
- Move beyond silo-approaches by deploying new promising planning approaches, such as joint regional planning, developing Open Space Concepts or integrated spatial plans. This also requires improving the cooperation across municipalities and council borders (horizontal cooperation) and across different spatial levels (vertical cooperation).

For the successful management of land take and soil sealing, it is necessary to go beyond targeted policy actions at EU, national and city level. Additionally, it is equally important to address the drivers and underlying factors of population growth in the cities and the paradigm of economic growth. How do we envisage the city we want to live in?



**Photo 4** | Barcelona, © Bernhard Latzko, Flickr, Attribution-NoDerivs 2.0 Generic (CC BY-ND 2.0)

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