2 OVERVIEW OF EXISTING POLICIES TO REDUCE AND MITIGATE SOIL SEALING IN THE EU AND MEMBER STATES

2.1 Relevant policy at EU level (short outline)

EU policy directly addressing soil sealing. The most noteworthy EU policy documents with regard to soil protection and the prevention of soil sealing are the Soil Thematic Strategy and the draft Soil Framework Directive.

- **Thematic Strategy for Soil Protection** (COM(2006)231, 22.9.2006). The strategy sets out the model for the European approach to soil for the European Commission. This includes identifying key threats to soil quality, actions to ensure a high level of soil protection, overall objectives and measures to be taken. Sealing is identified as among the key threats and degradation processes on European soils. The dissemination of examples of best practice for limiting soil sealing and inappropriate urban expansion is part of the strategy.

- **Proposal for a Soil Framework Directive** (COM(2006) 232, 22.9.2006). The objective of the draft Directive, part of the strategy mentioned above, is to provide a framework that will enable each Member State to decide how best to protect and use soil in their territory in a sustainable way. It will essentially require Member States to identify areas at risk of soil degradation and to take measures to address those risks.

  With regard to soil sealing the following principles were defined: "For the purposes of preserving the soil functions …Member States shall take appropriate measures to limit sealing or, where sealing is to be carried out, to mitigate its effects in particular by the use of construction techniques and products which will allow as many of those functions as possible to be maintained." (Article 5)

  The European Parliament has adopted its first reading on the proposed Directive in November 2007. The Environment Council has not yet been able to reach an agreement due to the opposition of some Member States forming a blocking minority.

EU policy programmes influencing soil sealing. Several EU policy programmes include a targeted approach towards efficient soil use and the reduction of soil sealing. However, they have an indicative character and do not include binding policy targets.

- **Thematic Strategy on the Urban Environment** (COM(2005)718). The Strategy’s aim is to map and concentrate EU action on urban environment issues, focusing on synergies between other EU policies. There is limited reference to sustainable urban design via appropriate land use planning, helping to reduce urban sprawl, loss of natural habitats and biodiversity. It is commented that integrated management of the urban environment should foster sustainable land-use policies which avoid urban sprawl and reduce soil-sealing.

- **European Spatial Development Perspective (ESDP)**. The ESDP is an informal EU policy developed under Germany’s Presidency. An informal Council of Ministers was

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1 European Commission - Committee on Spatial Development (1999); ESDP - European Spatial Development Perspective
Final Report
Overview of best practices for limiting soil sealing or mitigating its effects in EU-27

held focusing upon spatial planning which lead to the ESDP, setting out a strategic approach to spatial development policies aimed at moving towards a balanced and sustainable development of the territory of the European Union. The dossier does highlight the need to protect Europe’s soils, but focuses primarily on contamination, pollution and erosion issues.

- **Territorial Agenda of the European Union (TAEU)**. The TAEU is also an informal EU policy measure. The TAEU’s focus is primarily upon territorial cohesion issues, making the best use of territorial diversity and identifying development opportunities. Soil and its sealing is not specifically highlighted. The TAEU’s main role in this context is to highlighting the importance of spatial issues in the EU and the role of the urban environment

**EU Directives.** Several EU directives have the aim to protect natural resources such as water, biodiversity or the availability of productive land. Some of them include measures to avoid building activities in sensible areas. Among these the following were found to be relevant:

- **The Water Framework Directive.** Through the use of river basin management planning account has to be taken of the quantity of water available in the catchment and as such sealing is of relevance.
- **The Flood Risk Management Directive.** Emphasis on the development of plans to limit flood risk is taken which includes consideration of runoff and the impacts of sealing.
- **The Environmental Impact Assessment Directive.** In the planning phase of large construction projects all impacts on affected environmental resources have to be taken into account and limited as far as possible. Soil functionality is vital to other environmental services so this should be assessed to avoid inappropriate sealing.
- **The Strategic Environmental Assessment Directive.** Requires plans and programmes to be assessed for their environmental impacts. At this level it is possible to divert e.g. urban development away from high value soils in order to reuse already developed sites.
- **The Habitats and Birds Directives.** Both require the establishment of protected areas, in order to protect certain species and the habitats they require. In doing so the soils are protected to keep them as vital habitats and as such limits sealing of the landscape.

**EU funding mechanisms.** EU funding schemes have the reputation to rigorously support soil consumption. However, new developments in the funding scheme of the EU Structural Funds give reason to hope, since sustainable use of natural resources is more and more given priority (see also JESSICA funds on p.191).

The Trans European Transport Network (TEN-T). The TENT-T Programme promotes the construction of transport infrastructure in Europe. Grants are given for studies as well as direct funds for infrastructure projects and support to pay interests.

The EU Structural and Cohesion Funds. Structural Funds allow the European Union to grant financial assistance to resolve structural economic and social problems. This supports improved urban development which could have negative impacts if this leads to urban

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expansion or more intense development. At the beginning of the century the Structural Funds initiated new funding schemes with special focus on sustainable investments. Among these the JESSICA funds is most noteworthy, since the funds is dedicated to urban renewal and the promotion of social housing. By the end of 2010 about 1.7 billion Euros were allocated to the JESSICA funds.

The European Investment Bank. The bank offers grants for urban renewal and development of infrastructure which could lead to increased sealing.
2.2 Austria

**Geography.** Alpine landscapes are dominant in Austria; two thirds of the national territory is under permanent risk of natural hazards like floods, landslides, and avalanches. The remaining territory (37%) is under high pressure of competing land uses. In the Western provinces permanent settlements are reduced to a few valleys where land use is extremely intense fulfilling the needs of touristic infrastructure, industry, and those of a growing population with increasing standards of living.

**Demography.** Between 1990 and 2006 Austria’s population is grew by 4.4% which is almost twice as much as the EU average. However, growth is restricted to few hot spot areas. Between 1991 and 2001 all urban centres were subject to massive suburbanization with declining population in the city centres. In the same time the majority of rural regions suffered from shrinking population and loss of infrastructure (in many of which land take was still considerable). The average settlement area per capita increased by 160% between 1950 and 2007 from 200 to 520 m² per capita - whereas in the same period Austria’s population grew by 20% - from 6.9 to 8.3 million inhabitants (see Fig. 12). The increase mainly occurred at the expense of arable land and pastures.

### 2.2.1 Land take and sealing

![Sealed surface per region and capita in Austria in 2006](image_url)

**Fig. 11 Austria: Soil sealing per region in 2006**

Source: EEA, EUROSTAT

Hot spots of urban sprawl and soil sealing are the Vienna agglomeration, Linz, Graz and the Inn valley in Tyrol. Inefficient land use is in particular visible in the regions around Vienna, which are highly affected by urban sprawl and low urban densities. In this region the sealed surface is on average above 300 m² per capita (see Fig. 11).
Comparison with other EU Member States. Austria’s inhabitants dispose on average of 496 m² artificial surface, which is 23 % above the EU average. In the period 2000 to 2006 the growth of artificial surface did not exceed population growth. A closer look at the situation reveals that in 2009 already 15 % of the possible residential space (which is only one third of the territory as mentioned above) was covered with buildings and transport infrastructure and 6 % was sealed.

Since 2002 soil sealing and land take are being monitored by the Austrian Environment Agency based on data of the Federal Agency for Surveying and Mapping (BEV)⁴. The development of new sealing per year is a defined national sustainability indicator ⁵ [7].

![Austria: Development of settlement area and population](image)

**Fig. 12 Development of settlement area and population between 1950 and 2009**

Source: Federal Ministry of Agriculture, Forestry, Environment and Water Management [8]

### 2.2.2 Policies of interest

Reduction of urban sprawl, land take and soil sealing are part of a complex regulatory framework on spatial planning. Spatial planning follows a strong federal structure. At the national level Concepts for Spatial Development (ÖREK) are published on a regular basis (usually 10 years); they have an indicative character [9]. ÖREK documents refer to spatial planning priorities for the near future. Spatial planning is legislated at the level of the Federal Provinces. The nine Austrian provinces dispose of their own spatial planning laws which are

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⁴ BEV Bundesamt für Eich- und Vermessungswesen (Federal Agency for Surveying and Mapping), soil sealing is derived as 32 % of the land take
⁵ Headline indicator BO1a „hectare of sealed surface“ published in [39]
regularly adopted and reflect the recommendations of the actual ÖREK document. Final planning decisions are made at the municipality level under the supervision of the provincial governments.

**Soil sealing target.** In 2002 the Austrian Strategy for Sustainable Development declared “until 2010 the increase of annually sealed soil shall be reduced to one tenth of its initial value” [10]. In 2002 the annual rate for soil sealing amounted to 9 hectares per day, most recent data refer to 5 hectares per day, the target defines a sealing rate below 1 hectare per day. Overall objective of this policy target was to stop the increasing fragmentation of landscapes and to conserve soil functions as far as possible. Since then soil sealing is being monitored and published every two years in the Report on Monitoring Sustainable Development [7].

The Strategy recommends enhancing inner urban development, to increase the efficiency of land use and the quality of living in small cities, to allow new land developments only along top public transport lines, to encourage Brownfield sites, and protect landscapes and recreational areas. All Austrian provinces have recently adopted their spatial planning regulations, efficient land use is a priority and new instruments are available to allow reduction of land take.

**Fig. 13 Austria: Development of Land Take and Sealing between 2002 and 2009**


**Reduction of urban sprawl.** Despite the fact that daily sealing rates are decreasing since 2002, Austria did not reach the policy target for 2010. A positive trend can be observed regarding the land take for building plots. The Austrian provinces have initiated several measures of various natures which are expected to have more impact on the reduction of land take and sealing in the future, specific milestones were:
New spatial planning regulations to improve land use efficiency. Since publication of the last Spatial Development Concept in 2001 all provinces have implemented measures in their spatial planning laws to improve land use efficiency.

1/ Building permits with expiration date. About 30% of land with a building permit is still undeveloped. Land with a building permit is considered as a good long term investment and owners have in many cases no intention to actually use their land. This phenomenon has led to enormous urban sprawl. The annual amount of green land being converted into building plots is still considerable with on average 5 to 10 hectares per day or 2 – 4 m² per inhabitant and year. As a consequence the provinces have adopted their spatial planning laws accordingly. New building permits usually expire after 5 years. This means that building permits are withdrawn if the owner has not started to build after five years. This instrument proved to be very efficient for recently acquired building plots. However, there are still numerous building plots with old permits, where this tool cannot be implemented.

2/ Contracts between municipalities and land owners. Seven out of nine provinces have recently introduced this tool in their spatial planning laws. If municipalities sell building land they can arrange a contract with the land owner, defining the future use, the time frame for the realization of the planned development, but also refunding or pre-financing of costs related to the provision of new infrastructure (new streets, canalization, power lines, water supply etc.). This tool gives municipalities the opportunity to make sure that land for building is efficiently used.

3/ Real estate funds at provincial level. Five out of nine provinces have their own real estate funds. The provinces provide low interest loans to municipalities primarily for the acquisition of real estates that are of strategic importance and shall be used for public purposes (schools, kindergartens, homes for elderly, public housing). This tool allows municipalities to realize public developments at strategic places respecting inner urban development and minimal land take.

New funding schemes for housing to improve intensification of settlements. Public aid for housing is an enormous economic factor in Austria and amounts to 1% of the GDP. The provinces have their own funding schemes with the objective to facilitate affordable quality housing for all citizens. In recent years the funding schemes focused on the development of new single family houses with high energy standards. Today all provinces are continually redesigning their funding schemes and integrating land take aspects. New housing on already developed land and modernization of existing buildings are now central issues. The provinces Vorarlberg and Tyrol are most advanced in this respect. To give an example, the housing funds of the province Tyrol supported 2,500 housing units in 2008. Two thirds were directed to new buildings and one third to renovation of the already existing housing stock. One year later the funding rules were changed in favour of renovation. With about the same budget 4,100 housing units received funding, of which 60% were renovated and 40% newly built. The renovation programme influenced the local job market positively, since renovation is more work intensive than building.

“Soil efficient” business developments. In many provinces co-operation of municipalities is highly encouraged for the development of new commercial areas (see best practice below).

Reuse of Brownfield land. Austria has no specific programme to enhance the reuse of Brownfields. In 2004 a survey was carried out to analyse the national Brownfield situation. In this context derelict and underused land from industry and commercial activities was surveyed. Results revealed that the extent of Brownfields was enormous with 130 km², which corresponds to the territory of Graz, Austria’s second largest city. Furthermore, a yearly
increase of brownfields with up to 11 km² was observed. Another interesting finding was that brownfields are dispersed all over the country. Specifically affected are small towns in rural regions with decreasing population and low real estate prices. Recently several soft measures were launched to increase the reuse of brownfields; including a guideline for investors and a new standard for the assessment of property values [8]. Financial risks in the case of contamination are still considered to be the major barrier for investors. An improvement of this situation cannot be expected in the near future.

Protection of the best agricultural land and landscape fragmentation. The spatial planning laws of some Austrian federal states allow identification and delineation of priority “agricultural areas” and/or “protected green areas”. Soil protection is not explicitly mentioned as a goal but is, however, implicitly covered by the various roles soils fulfil in ecosystem functioning. Soil quality is mostly one of the criteria to delineate the priority agricultural areas. Prevention of landscape fragmentation is the key objective to delineate “protected green areas”. Both categories do not allow a conversion into building land and are protected towards new developments. To give an example: in a very small rural community 25 km outside Vienna a major railway station will be completed in the next years providing a direct high speed connection to Vienna. The community can expect numerous new settlers due to this attractive railway connection. In order to avoid vast uncontrolled urban sprawl the community delineated protected green areas in their local zoning plan.

2.2.3 Best practice

Joint regional planning: Vision Rheintal. Rheintal - one of Europe’s most prospering regions - is a region close to the Swiss boarder. The region is an agglomeration of several small cities and highly affected by urban sprawl. 29 municipalities have committed themselves to an integrated approach for the whole region, with special focus on the reduction of land take and soil sealing, improvement of public transport, increasing the quality of living and protection of landscape⁶. A milestone was the resolution and the signature of the regional contract Rheintal by the members of the Rheintal. The county Vorarlberg and the 29 municipalities confirm their common responsibility for the Rheintal and their willingness for collaboration [12].

Inter municipal business settlements. In the past many small municipalities failed in developing their own business parks, because of their limited resources. Many of these projects are today “new brownfields”. It is now common that municipalities combine their resources and share the risks and benefits. The most advanced province in this respect is Upper Austria. TMG is a public agency in charge of facilitating new business settlements in Upper Austria. The development of new business locations is an important tool for municipalities to attract new business settlements and new income. However, many Austrian municipalities have already failed and in fact created new brownfields. As a reaction TMG has developed the concept of “intermunicipal business location” (INKOBA⁷). Municipalities co-operate in developing and advertising one common location and share the costs and revenues. By concentrating the efforts of several municipalities the overall land take is lower compared to several smaller projects and the chance that developed locations are efficiently used is higher. TMG assists in professional planning and finding the right contractual agreements among the partners. In total more than 20 INKOA projects were successfully realised, the largest including 49 municipalities.

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⁶ Vision Rheintal: http://www.vision-rheintal.at/hintergrunde/
⁷ INKOBA: http://www.inkoba.at/
Protection of soil functions. The protection of soil functions is a key objective of the Salzburg soil protection law. The province has recently published a guideline\(^8\) how to respect soil functions in spatial planning, in particular along strategic environment assessments. Practical applications are typically regional development plans (in particular the zoning of building land) and large development projects (see also chapter 5 on soil quality criteria).

2.2.4 Conclusions

In 2006 Austria’s index for artificial surface corresponds to the EU average with 496 m\(^2\) per inhabitant. The index remained fairly stable in the period 2000 to 2006.

However, due to its Alpine structure space for new developments is already scarce in many Austrian regions, in particular in the Western provinces. Up to the turn of the century the big Alpine valleys and the surrounding regions of the big cities were heavily affected by rapidly increasing land take and soil sealing.

Loss of soil through sealing and urban sprawl are fairly recognised in Austrian policy. In 2002 Austria published a National Policy Target for the reduction of soil sealing, which will not be reached. However, since the turn of the century a decreasing trend with regard to land take and soil sealing can be observed. The Austrian provinces have recently adopted their spatial planning laws and introduced new instruments to reduce the annual land take. It is evident that current measures are not sufficient to achieve a more rapid reduction of annual land take. For this reason the Ministry of Environment assigned a policy review, which is currently being published under the title “Enough Ground?” [11]. A key conclusion of the report is that instruments at the planning level exist sufficiently but need to be more intensively implemented (no need for more regulation). The provincial governments have made visible progress due to introducing new instruments in their spatial planning laws and adopting their funding schemes for housing. However, the ambitions in the provinces are very different and an exchange of experience is lacking. For the future concerted action of all political stakeholders is needed in order to improve the overall land use efficiency in Austria. Key avenues to pursue are the ban of controversial public subsidies, the improvement of the quality of living in inner urban areas, the compensation of economic disadvantages when developing inner urban areas, and increasing public awareness already in schools, and to improve the knowledge base of decision makers.

2.3 Belgium

Geography. Belgium has three main geographical regions. Firstly: the coastal plain in the North-West, which consists mainly of sand dunes and polders. Secondly the central plateau, which is a smooth, slowly rising area that has many fertile valleys and is irrigated by many waterways. The third geographical region, called the Ardennes, is a thickly forested plateau; it is very rocky and not very suitable for farming.

Demography. Belgium’s population growth is slightly above the EU average. Like in any other EU member State urban agglomerations are growing faster than rural regions.

2.3.1 Land take and sealing

Land take and sealing. Belgium is highly affected by urban sprawl, fragmentation of landscapes and soil sealing. The Northern part of Belgium is the most fragmented and second most sealed region in Europe.

Fig. 14 Belgium: Soil sealing per region in 2006.
Source: EEA, EUROSTAT

Comparison with other EU Member States. The average artificial surface per capita is very high in Belgium with 600 m² per capita in comparison with other EU Member States. Belgium had the lowest increment of artificial surface between 2000 and 2006 with only 0.4 % and annual land take per capita was below 1 m². Key reasons are the fact that more and more developed land is reused and a visible reurbanisation trend in particular in the Brussels agglomeration, with more people moving back to the city centre.
Population growth amounted to 2.7% in the same period. It was hence possible to increase land use efficiency. This fact is visible in the index for artificial surface per capita which decreased from 613 m² per capita to 600 m². The amount of sealed surface per capita is at 215 m² which is only slightly above the EU average of 200 m² per capita.

Between 1985 and 2009 the amount of land take increased by 30% - from 4,700 km² to 6,150 km² (see also Fig.). About two thirds of the land take were caused by the private sector (households).

![Graph showing the development of land take in Belgium between 1985 and 2009](image)

**Fig. 15** Belgian Development of land take between 1985 and 2009. Source: Directorate-General Statistics and Economic information based on data from the Federal Public Service Finances.

The three Belgium regions are differently affected by urban sprawl and soil sealing:

- **Brussels.** The Brussels-Capital Region, being a large city with a high density of population, has the highest share of built-up area, with 78.4% of the territory covered by residential and commercial buildings, public infrastructure, transport infrastructure, etc. (including also private gardens and recreational areas). The percentage of sealed soil increased from 18% of the territory in 1950 to 37% in 2006, see also Fig. [13].

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9. The increase of land take in this period is about the double compared to the Netherlands (compared with TCB report); i.e. 3.9 m²/cap and year in Belgium in the period 1985 – 2006 and 2.1 m²/cap and year in the Netherlands in the period 1964 – 1998.

10. The city districts with the highest share of sealing were identified to be Etterbeek, Saint Gilles and Saint Josse, with more than 75% sealing.
The Flemish Region. “Flanders is hermetically sealed”, states the Flemish Report on the environment, more than a quarter of the territory is covered by built-up area and about 13.8 % of the territory is actually sealed (MIRA)\(^1\).

The Walloon Region is - compared to the other regions – less urbanised with a share of built-up area of approx. 14 % and an estimated sealing share of 2.6 %.

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**Fig. 16 Brussels: Development of sealed surface between 1955 and 2006.**

*Source: Brussels University, 2006*

2.3.2 **Policies of interest**

**The Flemish Region.** In 1997 the *Spatial Structure Plan for Flanders (RSV)* was enforced for the period 1997-2007. The plan represents a clear commitment to sustainable spatial planning [14] and put special emphasis on reducing urban sprawl. The document claimed a spatial limitation for new developments, with 60 % to be realised in urban areas and only 40 % in rural regions until 2007. The Spatial Plan\(^1\) was revised in 2004 and provides binding regional targets for spatial development, with even more precise development targets and provides a far more integrated approach towards urban development [15].

**Policy evaluation.** Soil sealing and the implementation of the Spatial Structure Plan are being monitored and results are published in the annual Environment Report. In 2007 the Flemish Environment report concludes “Flanders is hermetically sealed”, since according to the latest data surveys 13 % of the Flemish territory was actually sealed. The policy evaluation report MIRA-T “Flanders Environment report – Policy Evaluation” is published in the same year. With regard to Flanders spatial planning policy the following conclusions are

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\(^1\) Milieurapport Vlaanderen (MIRA), http://www.environmentflanders.be/

\(^1\) Ruimtelijk Structuurplan Vlaanderen 2004
drawn: (1) the policy target of 60 % development in urban areas until 2007 was not reached, (2) land take in rural areas is still steadily decreasing, (3) stricter implementation of the Spatial Structure Plan was necessary and meeting the policy target was imperative [16].

In 2010 another revision of the RSV is published. The planning period is extended to 2010. The revised version states “in general it can be observed that the policy target for new developments will be met; i.e. 60 % of new development in inner urban areas. Furthermore, the RSV states that inner urban development is currently supported by the general trend that people tend to move back to urban areas since 2000. The revised RSV requires that more emphasis is put on renovation and conversion of existing buildings and states that about 10 % of existing housing were not meeting current standards [17]. The new Flemish Spatial Policy Plan for the period 2020-2050 focuses on climate change, sustainable development and spatial changes. Besides this, there is also a growing cooperation between the environmental, spatial and transport policy fields and their corresponding planning processes.

Brownfield recycling. The redevelopment of brownfield sites is of key importance in Flanders; space is limited and efficient land use a national priority. The most recent development in this respect is the Brownfield Covenant, a principle which was introduced in August 2007\textsuperscript{13}, with the overall objective to promote the reuse of brownfields by providing incentives for land developers. A Brownfield covenant is an agreement between the Flemish Government and one or more private or public parties which foresees arrangements in order to promote a smooth and efficient realization of a Brownfield project. In this manner the Flemish Government aims to stimulate project developers and investors to redevelop abandoned and contaminated sites (Brownfields), rather than new areas (Greenfields). The process is managed by the Flemish Enterprise Agency\textsuperscript{14} (VLAO). In the first year of operation 21 Brownfield Covenants were approved by Flemish Government. As soon as a Brownfield Covenant is concluded, a number of facilitating measures come into force in the form of juridical-administrative as well as financial advantages for developers and investors (see chapter Luxembourg, IVL, page 104).

The Walloon Region. Since the Walloon Region was not as severely affected by urban sprawl and soil sealing as Flanders the issue was for a long time not a priority on the political agenda. The Development Scheme for Spatial Development (SDER)\textsuperscript{15}, as adopted in 1999, is the central programming document for spatial development. It includes a general commitment to sustainable development and the protection of natural resources but no specific claim to reduce urban sprawl or soil sealing.

The scheme has not been adopted since enforcement and is in many aspects not adequate to meet the future challenges of the Walloon region. In particular noteworthy is a new move of the Environment Minister Mr. Philippe Henry who is currently in charge of revising the SDER. He proposes a joint concept for the Walloon region and the Brussels region. For both regions a continuation of urban sprawl and growth of commuter traffic can be expected if the status is continued. The new SDER shall pave the way for a new mobility concept and the improvement of urban quality. Key objectives are the reduction of private car commuters by improving the public transport system, and to introduce a stricter zoning for land development. According to his plans new development zones shall only be realised along strong public transport routes. The new concept which has many similarities to the Luxembourg concept (IVL see page 104), is subject to a large consultation process and shall

\textsuperscript{13} On June 19th 2007, the decree of March 30th 2007 concerning the Brownfield covenants came into force: Besluit van de Vlaamse Regering van 7 september 2007 betreffende de informatieplichten in het kader van Brownfieldconvenanten
\textsuperscript{14} Agentschap Ondernemen, http://www.vlao.be/default.asp?webpageID=313
\textsuperscript{15} Le Schéma de développement de l’espace régional (SDER), dopté le 27 mai 1999 http://developpement-territorial.wallonie.be/
be implemented from 2012 on.

In the Walloon Region, 23 sectoral plans (plans de secteur (PDS)) aim to manage the pressure that urbanisation puts on the territory by defining zones which can be built on and zones to be used for agriculture, forests, or wildlife. Since 2005, any new zone to be urbanised must be compensated. (http://www.eea.europa.eu/soer/countries/be/land-use-national-responses-belgium)

**Research.** The publication *Village Durable (Sustainable Villages)* is a study with regard to spatial development in the rural regions of Wallonia. In particular the new functions of rural environment are analysed, which are today above all housing, recreational values, and the provision of renewable energies. The publication gives guidance for sustainable development in villages and puts emphasis on the protection of green areas, containment of landscape fragmentation, and restrictions to the zoning of new development land.

### 2.3.3 Best practice

The Spatial Structure Plan for Flanders (RSV) is supported by a specific funding programme for strategic projects for sustainable spatial development. Key objectives are to financially support local governments in carrying out sustainable land development projects. This includes the acquisition of land for strategic development projects, the remediation of run down areas and the establishment of green urban areas. The local governments can submit their proposals to the spatial planning department of the Flemish government, where they are ranked for approval. In 2010 seven strategic projects with a total funding of 2.1 million euro were approved including\(^\text{16}\):

- **Brownfield recycling.** The municipalities of Vilvoorde and Machelen are jointly developing a large brownfield to establish an area for business and recreational use.
- **Station areas.** In the cities Kortrijk, Roeselare, Ingelmunster, and Izegem the areas around the central railway station are currently being renewed in order to attract more train commuters.
- **New recreational areas.** The Zennetal is highly impaired by landscape fragmentation and urbanisation. Four municipalities are co-operating in establishing a large recreational park for residents.

### 2.3.4 Conclusions

**Flanders.** Natural landscapes, recreational areas, and agricultural land are already scarce in Flanders. A very ambitious Spatial Plan was published as early as 1997, which claimed that 60% of all new developments were to be realised in inner urban areas. A policy review in 2007 stated that this target was not met. However, after a second revision of the Spatial Plan first positive results can be observed. It can be assumed that Flanders will meet its policy target by 2012. Currently special emphasis is put on reusing and renovating the existing housing supply. Moreover there is a visible trend that people tend to move back to urban areas.

**Walloon region.** The development scheme for spatial development is currently under revision. The new environment minister plans an integrated approach in co-operation with the Brussels region with the overall objective to reduce urban sprawl and private car traffic, and to allow new developments only along strong public transport routes.

2.4 Bulgaria (short country profile)

Geography. Bulgaria features a highly diverse landscape: the north is dominated by the vast lowlands of the Danube and the south by the highlands and elevated plains. In the east, the Black Sea coast attracts tourists all year round. About 31% of the territory is made up of plains, while plateaus and hills account for 41%. Low mountains (600 to 1,000 m) cover 15%, medium-sized mountains (1,000 to 1,500 m) 10% and high mountains (over 1,500 m) 3%.

Demography. Population density generally low with less than 60 inhabitants per km². The highest population density is characteristic for the South-western Region (103.9 cap/km²). Most of the population (71%) resides in urban areas. This is an indication for a general drop in urbanization in both quantitative and qualitative respect. Bulgaria has one of the lowest population growth rates in the world. With some minor exceptions the population in almost all settlements in the country is diminishing and that not only in the villages, but also in the cities, and even in the large cities.

Land take and sealing. In 2006 the share of artificial surface amounted to 5% and the share of sealed surface to 1.8% which corresponds more or less to the EU average. Between 2000 and 2006 artificial surface growth was very moderate with 0.7%. Due to the already sparse population density, which is shrinking further, the population land use intensity is very low with 722 m² artificial surface per capita. This is twice the EU average.

Fig. 17 Bulgaria: Soil sealing per region in 2006
Source: EEA, EUROSTAT

Policies of interest. The Ministry of regional development and public works is responsible for sealing and spatial planning issues. There is no developed system to effectively control soil sealing or increasing land take.
The National Regional Development Strategy outlines the strategic objectives of the regional development of the country for the period 2005 to 2015 [18]. Specific references to the reduction of land take or soil sealing are not made. The document clearly depicts “central highly urbanised areas” as development centres (see Fig.).

![Fig. 18 Spatial structure of urbanization in the Republic of Bulgaria](image)

Source: NRDS (National Regional Development Strategy) for the period 2005-2015

Relevant legal documents are [28]:

- the **Soil Act**, enforced in 2007, which focuses on soil protection,
- the **Law on Spatial Planning** last amended in 2009 which in particular regulates spatial planning in urbanised territories. Art.9, (2) makes specific reference to restrict the uncontrolled building (i.e. soil sealing). “Unfortunately, this Law has failed to reduce the strong urbanization and uncontrolled building up of resort areas in particular along the Black sea coast in the past 10 years”, is argued by national experts.
- the **Law for the Black Sea coastline** from 2008, last amended in May 2009, aims at protecting coastal landscapes, and
- the **Protected Areas Act** introduces a restrictive regime in relation to construction within the protected areas and the Natura 2000 areas.

**Conclusions.** Pressures from land take and soil sealing are generally low and reduced to a few hot spot areas such as the urban agglomeration of Sofia, the Southern coastline, and mountain resorts in the towns Bansko and Pamporovo.

Bulgaria is struggling with a strongly declining population. Legal instruments to protect soils and control spatial planning in sensitive areas exist but land take and soil sealing are not priority issues in Bulgaria.
2.5 Cyprus (short country profile)

Cyprus acceded to the EU on 1st May 2004 as a de facto divided island. As a result, according to Protocol 10 of the 2003 Accession Treaty, Cyprus as a whole entered the EU, whereas the application of the acquis is suspended in the northern part of the island (defined in the Protocol as the "areas of the Republic of Cyprus in which the Government of the Republic of Cyprus does not exercise effective control").

Geography. Cyprus is with 9,259 km² the third largest island in the Mediterranean Sea. The physical relief of the island is dominated by two mountain ranges. The main cities of Cyprus are Nicosia, Limassol and Larnaka. The Average population density is 82 inhabitants per km².

Demography. Cyprus population grew considerably since its independence in 1960. Between 1990 and 2006, the population increased by 33% which is the highest growth rate in EU 27. Cyprus is dominated by touristic infrastructure which takes much of the available land, which on the other hand is used mainly during the touristic season in summer.

Land take and sealing. With a sealing rate of 3.6 % and a share of artificial surface of 8.5 % Cyprus is under enormous land use pressure. Due to dominating touristic infrastructure land use intensity of artificial surface is the lowest in EU 27; meaning that for each inhabitant 1,032 m² of artificial surface are available (three times EU average).

![Sealed surface per region (NUTS3) in %](image1)

![Sealed surface per capita and region (NUTS3) in m²](image2)

*Fig. 19 Cyprus: Soil sealing per region in 2006*

*Source: EEA, EUROSTAT*

Conclusions. Due to rapidly growing population and touristic infrastructure land use pressures are significant in Cyprus. Water pollution, erosion, and wildlife preservation are perceived as major environmental challenges. Regarding measures to reduce soil sealing or land take the authors were not able to obtain any further information.
2.6 Czech Republic

Geography. The Czech landscape is exceedingly varied. Bohemia, to the west, consists of a basin drained by the Elbe and the Moldau rivers, surrounded by mostly low mountains, such as the Sudetes, with the highest mountain at 1,602 m. Moravia, the eastern part of the country, is also quite hilly. It is drained mainly by the Morava River and secondly by the Odra River. The plains of Bohemia and Moravia are both rich in fertile soils and almost 40 % of the country’s territory is classified as arable land.

Demography. Unlike other new Member States from Central and Eastern Europe Czech population was only slightly shrinking between 1990 and 2000 population (-0.8 %). Since 2000 population is more or less stagnating and from 2006 on moderate population growth can be observed. Recent demographic developments in the Czech Republic show clear urbanisation trends in the metropolitan regions of Prague, Ostrava, Bruno and Pilsen whereas all other regions suffer from decreasing population.

2.6.1 Land take and sealing

In 2006 the index for artificial surface was significantly above EU average\(^\text{17}\) with 490 m\(^2\) per inhabitant. In the period 2000 to 2006 the amount of artificial surface increased by 2 %. The amount of sealed surface is above EU average with 243 m\(^2\) per capita.

![Fig. 20 Czech Republic: Soil sealing per region in 2006](source: EEA, EUROSTAT)

\(^{17}\) EU average according to EU Land Cover layer 2006: 386 m\(^2\) per cap
Data referring to the annual land take are generated by the Czech Authority for Land use Data\(^{18}\) and show a faster increase of land take compared to population growth for the period 2000 to 2008; land take increased by 2.5\%, whereas population only by 1\% (see Fig. 42). The land take for settlements and transport infrastructure is estimated to amount to approximately 16 hectares per day\(^{19}\).

\[
\text{Czech Republic: Development of settlement area and population}
\]

\[\text{Fig. 21 Czech Republic: Development of settlement area and population}
\]

\[
\text{Source: ČÚZK, Czech Authority for Land use Data & EUROSTAT}
\]

The transition of the Czech Republic to a market economy was also reflected in a recent reform of spatial planning competences. In 2006 administrative structures changed significantly and spatial planning competences were delegated from the state level to the regional level. In 2007 the Building Act\(^{19}\) was enforced, which adjusted planning powers of regions and local authorities. The 6,250 Czech municipalities have planning powers, allowing them to approve local developments. The 14 Czech regions have a coordinative role; they regulate land management mainly through policies, strategies and dedicated funding programmes.

\textbf{2.6.2 Policies of interest}

In 2008 the \textit{Spatial Development Policy 2008} of the Czech Republic was published\(^{21}\). The priorities of this document clearly refer to supporting polycentric developments, strengthening brownfield redevelopment, and protecting green zones from land take and fragmentation.

\(^{18}\) ČÚZK Český úřad zeměměřický a katastrální; http://www.cuzk.cz/

\(^{19}\) act 137/2006 Sb.
Regulation of urban sprawl and protection of urban greens. One of the latest achievements is the publication of the *Principles of Urban Policy* by the Ministry for Regional Development. The document lays down the principles of urban spatial planning policy in recognition of the Leipzig Charta\(^\text{20}\). Key achievement is the integrative approach considering environment aspects, spatial planning and regional development.

Three policy documents protect the consumption of green land inside and outside city boarders and give priority to inner urban developments, namely the building code, the act on nature conservation, and the act on the protection of agricultural land.

- High quality soils in the outer city belt are protected by the act on the protection of agricultural land\(^\text{21}\) (see also below).
- The protection of green areas within city boarders is regulated by the Act on Nature Protection\(^\text{22}\).
- To give priority to the development of abandoned areas (old industrial estates) instead of developing green land is regulated by the Building Code\(^\text{23}\).

The above mentioned policy document is complemented by national research project funded by the Ministry of the Environment. The project is called *Suburbanizace*\(^\text{24}\) and aims to assess the extent and intensity of suburbanisation and to increase awareness among the public and developers. Final goal of the project is to promote means of prevention of negative impacts of suburbanization to key public and private actors \([22]\).

Reuse of brownfield land. Already in the end of the 1990ies the Czech Republic started to pick up the issue of brownfield redevelopment as a spatial response to ongoing societal changes. Today the *Czech Invest* acts as central brownfield agency in the Czech Republic - an agency of the Ministry of Industry \([23]\). The agency was founded in 1992 with the intention to attract new investors and to facilitate new business settlements. The focus on brownfield redevelopment emerged several years later and was the output of a PHARE project\(^\text{25}\). Among other findings the project provided a good overview of the whole national brownfield situation, estimating the number of brownfield sites with about 10,000 and qualifying most of these sites as medium-sized real estates with no industrial origin. Brownfield redevelopment received special attention in the ERDF programming periods 2000 – 2006, and 2007 – 2013. Several attempts to enforce a National Brownfield Strategy failed however. Brownfield redevelopment is a key principle of the *Principles of Urban Policy* document, which was recently published and enforced (see above).

Protection of the best agricultural land. Based on the *Act on the Protection of Agricultural Resources*\(^\text{21}\) the conversion of agricultural land to building land requires a compensation fee. Since the fee is not very high (less than 1 Euro per m\(^2\)) many experts are of the opinion that the instrument cannot be considered as a barrier for investors. Since introduction of this mechanism in the year 2000 the annual income from conversion of agricultural land

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\(^{20}\) The “Leipzig Charta on Sustainable European Cities” was signed by the Ministers for urban development from all EU Member States under the German EU presidency in 2007. The Charta represents a clear commitment to sustainable urban development and includes 9 key recommendations. Improvement of the quality of living by creation and conserving green public places and the improvement of public transport are central claims and considered as solutions to reduce urban sprawl.

\(^{21}\) Act No. 334/1992 on Protection of Agricultural Land Resources as amended by Decree No. 13/1994 defining certain details of the protection of agricultural land resources.

\(^{22}\) Act No. 183/2006 about Landscape Planning and Construction Regulations


decreased by more than 50%. This trend matches the general decrease of annual land take after 2000, as provided by the CORINE Land Cover assessment in Tab. 2. This trend can be explained with the completion of major infrastructure projects before 2000.

The Czech Ministries for Agriculture and Environment are currently preparing an amendment of the Act on the Protection of Agricultural Resources in order to increase the fees for withdrawal of land from the agricultural land resources [24]. More information about this compensation instrument can be obtained in chapter 4.1.1 “compensation systems”.

2.6.3 Best practice

Brownfield programme in Ústí. The region of Ústí has 820,000 inhabitants, most of which live in the 46 smaller cities of the region. The region is a clear candidate for massive urban sprawl, since economy is gradually improving and the region represents an important corridor on the route from Prague to Germany. The Ústí Region’s sustainable development strategy for the period up to 2020 includes a specific thematic strategy for brownfield redevelopment. Special focus is put on the redevelopment of environmentally hazardous sites and on putting restrictions on uncontrolled development of greenfield sites outside the settlement boundaries. Specific targets up to 2020 are to reduce the number of brownfield sites, the number of undeveloped environmentally hazardous sites, and the area of new land being built on. In order to achieve this goal Ústí is currently implementing the principle of circular land use management. (Circular land use management primarily focuses on systematically exploiting the potentials of existing structures and reusing derelict land). Ústí is currently partner in a project on territorial co-operation (CIRCUSE see also page 190), focused on this issue. Furthermore, brownfield redevelopment projects with support of the JESSICA funds are currently being planned.

The Urban and Regional Lab (URRL) of the Charles University in Prague is a remarkable group of researchers focusing on research projects related to urban sprawl. The group manages several research projects in this thematic field and publishes also in English [22].

Brownfield regeneration based on the JESSICA funds. In 2010 the region Morawia-Silesia was able to establish a funds of 20 Million Euro for the redevelopment of urban brownfield areas based on the JESSICA funding scheme of the EU structural funds (see also page 191) [25].

2.6.4 Conclusions

Soil protection, limitation of urban sprawl, valuation of agricultural soils, and reuse of brownfield land are well reflected and incorporated in several policy documents. The perception of the problem is clearly visible and several measures are undertaken to avoid further soil loss by sealing. Most measures are very new and therefore lack detailed reviews.

In particular noteworthy is the legal requirement that consumption of high quality agricultural soils needs to be compensated. Since implementation of this mechanism a decreasing trend of soil consumption can be observed. However, according to national experts the fee is too small to present a barrier for new developments. The land take around Prague is expected to grow continually, despite the fact that the best agricultural land is located there, because there are no alternatives for developers. “The current legislation doesn’t protect the land as we would like to, however without it the losses of agricultural land would be significantly

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26 Source: regional web www.kr-ustecky.cz
27 Website: http://www.suburbanizace.cz/
higher," is a statement from an expert of the Environment Ministry [24].

The funding mechanisms of the EU structural funds are seen critical in the light of sustainable spatial development. Many new logistic centres are currently being planned with EU funding and create new land take, many of which will last only a few years. Special incentives to steer new developments to already developed land are missing at the EU funding scale (with the JESSICA funds as the only exception) [26].
2.7 Denmark

**Geography.** Denmark is located on the Jutland peninsula and several islands in the Baltic sea. It sidelines both the Baltic Sea and the North Sea and has a coastline of in total 7,987 km. The local terrain is generally flat with a few gently rolling plains. The 43,096 km² of the country are almost entirely low-lying, and more than 65 % of the land area is cultivated.

**Demography.** 85 % of the population lives in towns and settlements with more than 200 inhabitants and 15 % in the countryside and in smaller villages. About 2.7 million inhabitants live in a 50 km radius around Copenhagen, making it the most densely populated area in Northern Europe.

### 2.7.1 Land take and sealing

**Sealing and land take.** Land use pressures are significant in Denmark. In 2006 about 3.6 % of the national territory is sealed and 7.6 % is classified as artificial land.

![Sealed surface per region and per capita](image)

**Fig. 22 Denmark: Soil sealing per region in 2006**

Source: EEA, EUROSTAT

**Land use changes.** The Danish State of the Environment Report [27] refers to a continuous decrease of nature and open land between 1965 and 2010, from 25 to 10 % of the national territory. In the same time also agricultural land decreased from 62 % to 57 % (see also Fig. 23).
2.7.2 Policies of interest

Spatial planning. The Ministry of the Environment is responsible for spatial planning. Key document of spatial planning is the Planning Act, which was enforced in 2001 and is continuously amended. The Planning Act decentralizes decision-making and promotes public participation.

In 2006 the national planning report “The new map of Denmark” was published. The document is the key programming document for national spatial planning. With regard to land take and soil sealing the following key objectives are of relevance [28].

- For the regions of Greater Copenhagen and Øresund the conversion and development of previously developed business sites and also entire business districts is defined as priority. Furthermore the increase and protection of green spaces, recreational areas and attractive urban environments is also defined as priority in order to establish prerequisites for attracting companies, jobs and employees.

- For the region of Sjælland the avoidance of undesired urban sprawl and the protection of recreational areas to reduce the demand for transport.

Protection of Nature. The Protection of Nature Act (Act No. 9 of 3 January 1992 with later amendments) focuses on the protection of beaches, lakes, watercourses, forests, ancient monuments, natural areas and international protection areas. This law amongst others-
provides the basis for integrating nature management with other social objectives which is the precondition of sustainable development.

**Sustainable development.** The Danish strategy for physical planning from 2009 set a target to preserve a clear border between cities and countryside. This is taken further in the Danish strategy for sustainable development from 2009 stating: “The government prioritizes more compact cities and initiatives to avoid non-intended spreading of city areas into the open land.”

### 2.7.3 Best practice

**Strengthening of small city centres.** The Planning Act encourages small retailers in the centres of Denmark’s many small and medium-sized towns. The main rule of the Act is that general shops may not exceed 3,000 m² of floor space and specialty shops 1,500 m² unless there are “special reasons based on planning considerations”. Three planning instruments are available (1) the delimitation of town centres and the centre of a city district in order to prevent urban sprawl; (2) imposing a maximum total floor space for each given area; and (3) imposing a maximum size on shops. Clear aim of this policy is to promote development in the numerous small and medium-sized towns and reduce the construction of large shops and shopping centres on green fields outside the largest cities [29].

**Transnational spatial planning in the Øresund Region.** The Governments of Denmark and Sweden have a joint aim of developing the Øresund Region into one of the cleanest urban regions in Europe [29]. Key objectives are:

- to counteract urban sprawl and the depopulation of cities, to protect open stretches of landscape and undeveloped areas in coastal areas and to develop the green structure between and around cities and towns;
- to attempt to transform urban areas and increase density by reusing derelict urban land instead of building on green fields; and
- to give priority to urban development in locations with good access to public transport.

### 2.7.4 Conclusions

Denmark is highly affected by urban sprawl and soil sealing. The issue is well recognised at the political agenda and integrated in several policy documents. The issue of sustainable spatial development was established in 2001 with the Planning Act. Specific action lines are increasing the attractiveness of inner urban areas, revitalisation of run down industrial areas, activating centres of small cities, protection of landscapes, and delineating clear city boarders.
2.8 Estonia

Geography. Estonia is a low, flat country with a long, shallow coastline of 1,393 km along the Baltic Sea and with more than 1,500 small islands dotting the shore. The two largest islands are Saaremaa and Hiiumaa, being favourite Estonian vacation spots. The country's highest point, Suur Munamägi (Egg Mountain), is in the hilly southeast and reaches 318 meters above sea level. About 40 % of the main land is covered by forests, and about one fifth by arable land. There are more than 1,400 natural and artificial lakes in Estonia. The largest of them, Lake Peipsi (3,555 km²), forms much of the border between Estonia and Russia. The most important rivers are Narva and Emajõgi.

Demography. Until the turn of the century Estonia suffered from heavy outmigration. Between 1990 and 2000 more than 12 % of the population were lost. Since 2000 a recovery from this trend can be observed, since population is only slightly shrinking.

2.8.1 Land take and sealing

Estonia is a small and very sparsely populated country. One third of the 1.3 million inhabitants live in Tallinn. Up to now Estonia has neither heavily sealed regions nor is the country affected by negative effects of sealing. However, artificial surface has been increasing rapidly since independence. The countryside is characterized by very dispersed settlements. Urban citizens tend to own summer houses. Due to raising living standards the size of dwellings increased and there is a visible trend from urban flats to single family houses. This is the reason why the average amount of artificial surface per inhabitant is very high compared to other EU Member States28.

Comparison with other EU member States. Between 1990 and 2006 the country was affected by a significant increase of annual land take, which more than doubled compared to the period 2000 to 2006. Before the turn of the century artificial surface increased on average by 1.8 m² per year and inhabitant, whereas after the century the average annual increase was at 4 m² per year and inhabitant. The amount of artificial surface per capita amounted to 700 m² in 2006, which is about 75 % higher than the EU average. Increase of land take between 2000 and 2006 was also considerable with 38 m² artificial surface per inhabitant.

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28 In 2006 EU average equals to 518 m² artificial surface per inhabitant, and in Estonia 700 m² per inhabitant.
Fig. 24 Baltic Countries: Soil sealing per region in 2006
Source: EEA, EUROSTAT

**Monitoring.** Until recently Estonia did not have a national observation system for land take changes. In 2010 a research project started with the objective to analyse Estonia’s land take between 2000 and 2010 with more detail (going beyond the CORINE observations). Investigation areas are the counties Harjumaa and Pärnu. [30]

### 2.8.2 Policies of Interest

**Spatial planning.** Generally speaking there is a lack of spatial planning. After independence, the economic growth of the country, and hence deregulation and strengthening of the private sector were priority issues. Spatial planning is under the responsibility of the local authorities. The usually very small Estonian settlements do not have sufficient resources for regional planning; and planning unions do not exist. Therefore regional planning is mostly weak and negative effects of uncontrolled spatial development are currently not perceived.

**Protection of agricultural land.** The relative importance of agriculture in the Estonian economy has declined since the mid-1990s and the competitiveness of Estonia’s agricultural sector is below the EU average, although a large part of the foodstuffs consumed in Estonia are grown in the country. Estonia carries a large stock of fallow agricultural land. Since independence the amount of active agricultural land decreased by 50 % (see also Fig.). One reason for this phenomenon is the fact that large shares of agricultural land were transferred to the original owners, many of which had no use of the land and did not work the land. Potential tenants who would be interested to lease the land are also scarce, since rural regions are heavily affected by out-migration. The Estonian Environmental Information Centre refers to a slight increase of active agricultural land in recent years [32].
2.8.3 Conclusions

Artificial surface is rapidly increasing in Estonia and it can be expected that this trend will continue for a while, since living standards are continually increasing and land is not scarce.

Negative effects of urban sprawl and soil sealing are not visible yet: Estonia has large amounts of fallow land, urban sprawl is not competing with agricultural land since most cities are situated on sandy soils. Flooding in urban areas is not an issue.

However, in 2010 a research group started to analyse land take in Estonia in more detail, the results can be expected in 2011.

Expected negative effects of increasing land take are high costs for maintenance of infrastructure (increasing road network for a small population) and increase in air emissions from private traffic due to growing distances.
2.9 Finland

Geography. With 337,030 km² Finland is the fifth largest country in Europe after Ukraine, Spain, Sweden, and Germany. Of this area 10% is water, 69% forest, 8% cultivated land and 13% other. Finland is the northernmost country on the European continent, one-third of the latitudinal extent of the country lie north of the Arctic Circle. Finland is divided into four regions: archipelago Finland, the coastal zone, the interior Finnish Lake District and upland Finland.

Demography. Finland numbers some 5.3 million inhabitants. Finland’s population is growing continuously, but population growth slowed down after the turn of the century and is currently below the EU average. The average population density amounts to 16 inhabitants per square kilometre. This makes it, after Norway and Iceland, the most sparsely populated country in Europe. Population distribution is very uneven: the population is concentrated on small South-western coastal plain. About 60 % live in towns and cities, with one million living in Helsinki Metropolitan Area alone. The largest cities after Helsinki are Tampere (292,000 capita) and Turku (246,000). In Arctic Lapland, on the other hand, there are only 2 people to every square kilometre.

2.9.1 Land take and sealing

Finland is one of the most sparsely populated Member States in the European Union with only 5.35 million inhabitants living on a territory of 338,441 km². Average population density is only 17 inhabitants per km². The majority of the population lives in the South.

Comparison with other EU Member States. In the period 2000 to 2006 the growth of artificial area was below the EU average with 2.4 % and population growth was also moderate with only 1.6 %. The average sealing rate per capita is considerably high with 384 m² per capita, but due to the low population density and the enormous size of the country Finland is one of the least sealed member state.

Source: EEA-FTSP-Sealing-Enhancement
European Movec; Pop EUSTAT
Umweltbundesamt, 06/2010
A specific feature of importance with regard to housing structures is the large number of summer cottages. Finland has currently more than 400,000 summerhouses and about 800,000 persons belong to a household who owns a summerhouse. The large number of summerhouses requires adequate transport infrastructure and contributes to soil sealing.

Between 1960 and 2005 the territory of urban areas increased by 50 % and the number of buildings within this territory by 150 %. Like in most other EU Member States there is a visible trend of shrinking household sizes due to an aging population. Between 1980 and 2006 the number of single person households doubled, whereas the number of four person households shrank by one third in the same period.

According to country experts urban sprawl in the Southern regions of Finland is expected to continue at the cost of rural areas and green land.

### Fig. 27 Finland: Development of urban areas and households

Source: Official Statistics of Finland, 2007 [33]

#### 2.9.2 Policies of interest

Finland has no specific national legislation or programme that would directly address the reduction of urban sprawl or soil sealing.

**Urban planning.** In the past 20 years urban sprawl has remarkably increased in the South of Finland. Rural municipalities competed with Helsinki and the private housing market boomed [34].

In the case of Helsinki urban planning puts emphasis on “green fingers”. Green recreational areas are preserved within the urban boundaries in order to increase the quality of urban life.
In single cases, contradicting positions occur between the Ministry of Environment and the local authorities. This was the case a few years ago when a shopping mall was planned at the outskirts of Helsinki. The development was stopped by the Ministry because the expected negative environmental effects: i.e. loss of soil and increase in traffic.

**Monitoring.** At the beginning of the 2000 years, a working group led by the Ministry of Environment developed a comprehensive set of indicators to monitor the living environment. Among these indicators the monitoring of “built area”, the “total amount of green areas within city boundaries” and “unpaved land areas” were suggested. A regular monitoring of these indicators was not realized later on, due to the high costs involved. However, awareness of the issues “urban sprawl” and “soil sealing” are growing and first surveys were initiated for the urban areas of Helsinki and Lathi [35].

**Spatial Planning and Building.** Legislation with regard to spatial planning and building does not specifically aim at reducing soil sealing or urban sprawl. However, the *Land Use and Building Act*\(^{29}\) which was enforced in 2000 and represents a clear commitment to sustainable spatial development, central objectives are (1) the protection of the environment and natural resources, (2) the accessibility of new developments in particular with regard to public transport, and (3) the social function (providing for the needs of various population groups) of buildings. The planning hierarchy is as follows:

- **National level.** The Land Use and Building Act is complemented by the National Building Code. More detailed regulations and controls on land use and construction are included in the Land Use and Building Decree.
- **Regional level,** Key planning instrument is the regional land use plan, which needs approval of the Regional Council and confirmation of the Ministry of Environment.
- **Municipality level,** Key documents are the local master plan, which is produced by the local authorities and the local detailed plans.
- **Urban planning and reduction of urban sprawl.**

### 2.9.3 Best practice

**Sustainable building.** In 1998, the Finnish government started an experimental sustainable building programme guaranteeing the framework for ongoing and new construction projects. Based on this initiative the City of Helsinki realised the development project “Eco-Vikki”. Vikki is situated at the outskirts of Helsinki and is centred around biosciences research and education at the University of Helsinki. A new housing district was built according to the latest ecological standards and to meet the emerging housing needs of employees from the university and the science park. The project demonstrated how new living standards can be successfully realised with a minimal impact on the environment. The Eco-Vikki project included row houses and flats, respecting all types of household sizes and budgets. Due to combined parks and gardens all residents live in a green environment and have the possibility to grow their own vegetables. The average “sealed surface per capita” is much lower compared to standard single family houses, likewise the average energy consumption per household is extremely low [36].

\(^{29}\) *Land Use and Building Act (132/1999)* - Unofficial translation of the original Act, PDF format in Finlex, the Data Bank of Finnish Legislation
Research. In some Finnish research and pilot projects the issue of soil sealing is included as secondary topic. In “Action 6: Assessment of climate change and land use impacts in urban environments” of the project “Vulnerability assessment of ecosystem services for climate change impacts and adaptation” (VACCIA) soil sealing is investigated in the area of Helsinki and Lahti which commenced in the 1st January 2009. The project reports published so far are investigating the historical background and the reasons to explain the current status. More detailed data collection and assessments are ongoing [34] [37].

2.9.4 Conclusions

Loss of soil is discussed in Finland together with other topics such as climate change or urban living quality but not as a stand alone topic. This can be explained by the large size of the country. Land for new business locations and housing is still sufficiently available.

However, sustainable construction methods are of great importance in Finland. Due to shrinking household sizes and aging population there is an emerging trend to construct small “green” dwellings with good access to public transport.
2.10 France

Geography. France is the largest EU Member State. The landscape is diverse, with mountains in the East and South, including the Alpine peak of Mont Blanc (4,810 m) – the highest point in Western Europe. Lowland France consists of four river basins, the Seine in the North, the Loire and the Garonne flowing westwards and the Rhône, which flows from Lake Geneva to the Mediterranean Sea.

Demography. With an increase in population of 12% between 1990 and 2006 France is among the most rapidly growing EU Member States. 62,79 million inhabitants are living on a territory of 547,030 km². Hence the average population density is 115 inhabitants per km². All of the 22 French regions are growing continually with the exceptions of Champagne-Ardenne and Franche-Comté.

2.10.1 Land take and sealing

Land Take and Sealing. The share of artificial surface is at 5.2% and for sealed surface at 2.8%, both values are slightly above the EU average. Artificial surface increased by 3% between 2000 and 2006, corresponding more or less to average EU land take. With regard to soil sealing the agglomerations of Paris (Ile de France) and Lyon and the region Nord Pas de Calais are most affected. Highest growth rates of sealing and land take can be observed in the coastal regions adjacent to Marseille (Fig. 17).

Fig. 29 France: Sealed surface per region
Source: Source: EEA, EUROSTAT
According to CORINE Land Cover data no disproportional growth of artificial surface can be observed, since population is growing faster than land take. However, the French Institute for the Environment (IFEN, Institut Français de l'Environnement) published a more detailed assessment in 2006 referring to clearly alarming trends. IFEN concludes that between 1994 and 2004 population in metropolitan areas increased by only 5% whereas land take amounted to 15%. The assessment concluded that land take occurred mainly at the expense of arable land and that there was an urgent need to reuse already developed land for the construction of new infrastructure [38].

The latest environment report (“Environment in France in 2010”) again highlights unsustainable trends with regard to land take [39].

- Growing distances in metropolitan areas. In the 71 main metropolitan urban areas the average distance of new buildings to the city centre was observed to have increased by more than 10% between 2000 and 2008 compared to the period 1980 and 1990.
- Alarming land take in coastal areas. Between 2000 and 2006 land take was two times faster in coastal areas than in metropolitan urban areas. Artificial surface within the first 500 metres from the sea amounted already to 28%.

![Fig. 30 France: Share of artificial surface per department](source: IFEN, 2010)
2.10.3 Policies of interest

In 2006 the National Strategy for Sustainable Development was subject to a revision process. A new sustainability objective with reference to land take reduction was defined, namely “to stop disproportional growth of artificial surface compared to population growth by constructing new infrastructure on already developed land”\(^\text{30}\).

The new strategy for sustainable development for the period 2010 to 2013 was completely streamlined to the “Grenelle Environment” (see below) and put more emphasis on the reduction of land take. In January 2010 a national sustainability indicator with regard to land take was defined and the reduction of land take was stipulated as national strategy for the conservation of natural resources, biodiversity and the fight against further landscape fragmentation [40].

\[\text{Fig. 31 France: Development of artificial surface in urban areas} \]

Source: Enquetes Teruti, 2010

In July 2010 the law Grenelle Environment was enforced, with the objective to establish a comprehensive legal framework for the protection of the environment, reduction of energy consumption, improvement of economic and social stability. The policy framework is based on six major action lines, each of which is supported by legal requirements, pilot applications, and research. The most relevant action line for the reduction of land take and soil sealing is

\[\text{En France, la Stratégie nationale de développement durable révisée fin 2006 a notamment pour objectif de “veiller à freiner le rythme d’artificialisation du territoire, qui est actuellement plus rapide que la dynamique démographique, notamment en localisant les infrastructures sur les espaces déjà artificialisés”}.\]

\(^{30}\)
“the improvement of energy standards of buildings and harmonization of spatial planning”\textsuperscript{31}, which stipulates energy efficient urban structures by supporting inner urban development and avoiding further soil consumption. Specific projects, results or actions with regard to land take reduction shall be realised in this respect [41].

**Brownfield redevelopment.** France disposes of a network of more than 20 public land development agencies (EPF)\textsuperscript{32}, who operate at the regional but also at the local level. Key objective is to develop land for social housing. All EPFs have action lines focused on brownfield redevelopment and some have specific programmes for urban renewal (see also best practice EPF Nord-Pas-de-Calais). EPFs co-operate with local communities and provide funding for land development projects that match the specific local or national objectives [42].

### 2.10.4 Best practice

The public land development agency of Nord-Pas-de-Calais (Etablissement Public Foncier Nord-Pas-de-Calais) evolved from a brownfield development agency to a comprehensive land management agency focusing on (1) renewal of towns on themselves, (2) integration of soil pollution issues, (3) new development of social housing offer, (4) setting up a green and blue pattern on the regional territory and (5) controlling suburbanisation. Among the French regions Nord-Pas-de-Calais belongs to those with significant land use pressures almost comparable to those of Flanders. The sealing rate is on average above 6% and the rate of artificial surface amounts to 14%. Heavy industrial decline in the 1970ies and 1980ies has left an enormous legacy of industrial brownfield land and related economic pressures. Since 1991 the EPF Nord-Pas-de-Calais has developed 5,050 hectares of brownfield land with investments amounting to 176.6 million Euros.

The agency broadened their portfolio from mere brownfield redevelopment towards sustainable regional planning. In 2006 the agency concludes in their multiannual programme from 2007 – 2013 that 2,200 hectares agricultural soils are lost each year to infrastructure developments and that this trend shall be stopped. The 2007 – 2013 funding period shall allocate 383 million euro to three major thematic axes, namely (1) the development of social housing and urban renewal, (2) the realisation of large strategic brownfield redevelopment projects, and (3) the continuation of landscape protection with specific emphasis to connecting habitats and wetlands [43].

### 2.10.5 Conclusions

Land take and soil sealing affect above all metropolitan areas and coastal regions. Fragmentation of landscapes and growing distances of commuters gain more and more importance in French environment policy.

Awareness of the problem is growing continually as can be seen in the definition of a national sustainability indicator for land take. The recently issued law Grenelle Environment stipulates inner urban development and foresees harmonisation of spatial planning procedures. However, the law was only recently published and effects are not yet visible.

\textsuperscript{31} Amélioration énergétique des bâtiments et harmonisation des outils de planification

\textsuperscript{32} Etablissements Publics Fonciers: http://www.epfl.fr/sites/internet/epffrance/Pages/default.aspx
2.11 Germany

Geography. Germany covers an area of 357,111 km² and comprises 16 Federal States. Major landscapes are: the North German Plain, the low mountain ranges, the foothills of the Alps and the Alps themselves. In 2008 land cover shares were documented with 52.4% agricultural land, 30% forest, 13% settlement and traffic area, and 2.4% expanses of water [44].

Demography. With 81.8 million inhabitants (Nov.2009), i.e. 229 inhabitants per km², Germany is the most densely populated country in the EU. Between 1992 and 2004, the area of settlement for private households increased by 22.1% (i.e. 61 ha per day). At the same time Germany’s population has not grown for years and is even declining in some regions. Forecasts predict that this demographic trend will continue in the long term.

2.11.1 Land take and sealing

Sealing and Land Take. The amount of artificial surface per capita is about 10% below the EU average with 365 m² per inhabitant. This can be explained with the high density of urban agglomerations. In the period 2000 to 2006 the growth of artificial surface was slightly faster than population growth. The index “artificial surface per capita” increased by 1.3%. In 2006 the amount of sealed surface per capita amounted to 249 m² which is about 10% above the EU average.

Many German regions are heavily affected by urban sprawl and soil sealing; in particular the Ruhr basin Rarebit – one of the largest urban agglomerations in the European Union – and...
the South-western parts of Germany. On the other hand many regions in the East of Germany are highly affected by shrinking population and considerable amounts of abandoned land with high sealing rates. In the past decades a continuous loss of agricultural land, especially in the surroundings of big cities, was observed. The main reason for this development is the permanent increase of settlement and traffic areas which comprise buildings and surrounding open areas, roads, paths, tracks, recreation areas, sports pitches, operative areas as well as cemeteries. The continuous increase in land take for settlement and traffic areas and consequently the dissection of land, leads to a loss of natural cycles and to a fragmentation of habitats of larger species. The sealed surface is estimated at about 46% of the settlement and traffic area. This is about 6 % of the country's total area. In the past 60 years settlement and traffic areas increased more than twice covering an area of about 46,000 km². This almost comes up to the size of Lower Saxony.

Due to the different economic and social systems of East and West Germany land take developed in a very different manner. This difference arose from economic interests that could develop in a free market economy whereas in Eastern Germany land take from mining of brown coal was the main factor. Tab. 1 shows the increase in land take between 1960 and 1989 and 1993-1997. Statistical for the period 1989 to 1992 could not be identified.

Tab. 1 Germany: Growth of settlement and traffic area between 1960 and 1997 in East and West Germany.

<table>
<thead>
<tr>
<th>Year</th>
<th>East</th>
<th>West</th>
<th>Germany (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1989</td>
<td>6,800</td>
<td>35,400</td>
<td>42,200</td>
</tr>
<tr>
<td>Annual increase in % of total area</td>
<td>0.70</td>
<td>1.74</td>
<td>2.44</td>
</tr>
<tr>
<td>Daily increase in ha</td>
<td>19</td>
<td>97</td>
<td>116</td>
</tr>
<tr>
<td>1993-1997</td>
<td>11,500</td>
<td>33,250</td>
<td>44,750</td>
</tr>
<tr>
<td>Annual increase in % of total area</td>
<td>1.36</td>
<td>1.08</td>
<td>2.44</td>
</tr>
<tr>
<td>Daily increase in ha</td>
<td>31</td>
<td>91</td>
<td>122</td>
</tr>
</tbody>
</table>

Between 1960 and 1989 the increase in settlement and traffic area in former West Germany was about 2.5 % higher than in former East Germany whereas in the period of 1993-1997 land take in East Germany was higher. In the 1990ies the reunification stimulated the building industry and land take increased. In Eastern Germany building on greenfield sites was encouraged by the available funding systems and resulted in uncontrolled urban sprawl: private residential buildings, shopping centres, industrial estates, roads and rail tracks. The decrease and later stagnation of the economic growth resulted in a reduction of land take from 2001 on. Between 2000 and 2006 the increase in artificial surface was slightly higher in West Germany (1.8 %) compared to the former East (1.2 %) [45].

For about 20 years land take is being monitored in Germany. The monitoring refers to the average daily land take for a reference year. In the period 2004 to 2007 land take was observed to amount to 113 hectare per day. For the succeeding period a slight decrease of the average daily land take was observed with only 104 hectare per day. Fig. shows the area (ha) sealed per day in the period 1992 – 2008.

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33 LABO – Länderarbeitskreis für Bodenschutz
34 Land take refers to the conversion of green land to building land for settlement areas and traffic areas. In Germany about 46 % of these areas are actually sealed.
2.11.2 Policies of interest

Spatial planning. In Germany there are four planning levels: the national, the Federal State the regional, and the municipal level. The Spatial Planning Act (Raumordnungsgesetz – ROG 1997) provides the framework for spatial order and planning. The Federal States make this framework operational and have their Planning Act. Each Federal State consists of several planning regions, which are responsible for the preparation of specific regional planning guidelines. Despite this framework at the higher planning levels, the local level still has considerable power in Germany. The building law (Baugesetzbuch – BauGB 2004) regulates the land use planning at the local level. The current version of this legal framework contains a soil conservation article and a powerful link to the Nature Conservation Act35, which requires the compensation of environmental impacts in the case of building measures (see also chapter on compensation measures).

National policy target for land take reduction. In 2002 the national target for the reduction of land take was published in the Strategy for Sustainable Development; the target refers to a reduction from 100 to 30 hectares per day in the period 2002 to 2010 [47]. To reach this target considerable efforts have been undertaken, of which the most remarkable are described below:

35 Bundesnaturschutzgesetz - BNatSchG 2002
- **Recommended Measures.** In 2004, the German Council for Sustainable Development (CSD) published recommendations on how to achieve the “30 ha target”. The recommendations referred to a combination of instruments, including fiscal-economic, regulatory and planning tools. Major objective of the process is to stop the increasing fragmentation and expansion of cities and villages and to support their “inner” development.

- **Specific Research.** The research programme REFINA “Research for the Reduction of Land Consumption and for Sustainable Land Management” (see also page 191) was launched in 2006 and is part of the German National Strategy for Sustainable Development. The programme is jointly funded by three ministries (Education and Research, Transport, Building and Urban Affairs, and Environment, Nature Conservation and Nuclear Safety). More than 100 projects in about 50 research collaborations and individual projects are involved in the REFINA research programme. The REFINA funding budget amounts to € 22 mio. Euro. Funded projects have developed innovative concepts for reducing the rate of land take and for encouraging sustainable land management. Special emphasis is put on inner urban development and reuse of brownfield sites.

- **Policy Evaluation.** In 2007 the Council for Sustainable Development reviews Germany’s policy to reduce land take. Key recommendations are the implementation of powerful economic instruments and to establish a nationwide concept for integrated land management (commitment of all involved sectors) [48].

- **Implementation of powerful economic measures needed.** In 2009 the Commission for Soil Protection concludes that so far implemented measures to reduce Germany’s land take were not sufficient to reach the “30 ha target” and recommends the implementation of tradable development certificates (see also chapter “Compensation systems”). A nationwide pilot is currently being planned which shall include 40 municipalities (including major cities) from all over Germany and operate for four years [49].

The 16 German Federal States have a high degree of autonomy and have realised different strategies and concepts to reduce their annual land take. In the following section the concepts of two Federal States with very contrary challenges are described in more detail.

**Land Management in Baden-Württemberg.** With 35.752 km² and 10.7 million inhabitants Baden-Württemberg is the third largest Federal States. Baden-Württemberg is among the economically strongest and most competitive regions in Europe. Especially as far as industrial technology as well as research and development are concerned, Baden-Württemberg is the most innovative region of the EU. The unemployment rate of 4.8 % (February 2009) is the lowest of the whole country. Based on the GDP (gross domestic product), Baden-Württemberg is one of the wealthier regions of the EU with an index of 128.8 (Germany 115.2, EU27 100).

Between 1950 and 2001 residential- and traffic area increased by 125%, whereas population growth amounted to only 65 % (see also Fig. ). Presently population is declining, However in 2008 still 8.2 ha per day were subject to land take.

In 2004 an alliance[36] to reduce the annual land take in Baden Württemberg was initiated. The alliance was signed by all relevant policy makers and representatives from industry and trade. Overarching principle of the alliance is to integrate efficient land use in all sectors and to create awareness for soil resources, specific action lines were [45]:

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36 The alliance „Gaining Land in Baden-Württemberg“ (Flächen gewinnen in Baden-Württemberg”) was initiated by the Ministry of Environment in 2002. http://www.uvm.baden-wuerttemberg.de/servlet/is/56507/
- **Monitoring and progress evaluation.** Land take is monitored and analysed on a regular basis. Results and their interpretation are being published annually by the Statistical Survey of Baden Württemberg.

- **Public awareness.** A broad public campaign was carried out to inform decision makers and the broad public about the negative impacts of land take and soil sealing and the potentials to avoid them.

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**Fig. 34 Baden-Württemberg: Development of land take and population between 1950 and 2008**

Source: Environment Agency Baden Württemberg

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- **Legal action.** The planning law was adopted in full consideration of reducing land take, this included among others the set-up of comprehensive regional planning and the unification of the competency for the approval of land-use plans. The regional plans have to be produced according to sustainable land management rules, respecting (1) the protection of valuable soils, (2) the strengthening of “inner-development”, and (3) the issuing of development permits only according to approved land requirements.

- **Protection of high quality agricultural land.** The best agricultural land receives better protection. Agricultural land of high quality has to be integrated in the regional plans as areas with high vulnerability and special protection.

- **Strengthening of inner urban development.** Revitalization of city centres and the reuse of brownfields have priority in regional planning. Specific funding is provided for new developments inner-city areas. As far as the traffic sector is concerned priority is to expand existing roads rather than building new ones and the recultivation of no longer used roads. Every 2 years, Baden-Württemberg is allocating a brownfield recycling award. The projects submitted have to be realized on brownfield sites between 2005 - 2010 in Baden-Württemberg.
Rural Development. The Rural Development Programme (ELR – Entwicklung ländlicher Raum) promotes the development of villages in Baden Württemberg. Specific emphasis is put on improving living and working conditions in rural areas, to counteract migration to large metropolitan areas, and to strengthen the centres of small rural cities by reusing existing buildings and brownfield sites. An outstanding project within this funding programme was the MELAP project; 13 model villages committed themselves to avoid new development on green field sites for a period of six years (see also page 85) [54].

Conclusions. Baden Württemberg is one of the wealthiest and densely populated regions in Europe. Increasing urban sprawl and soil sealing were clearly perceived as unsustainable trends. At the turn of the century the government of Baden Württemberg initiated a comprehensive system to reduce the annual increase in land take, including a revision of the planning law, awareness campaigns, incentives for inner urban development, and research efforts.

Statistical observations of the annual land take show a clear declining trend for the period 2001 to 2008. However, in 2008 the daily land take was documented with 8.2 hectare per day which is still far above the anticipated national sustainability target, requiring an index of 3.6 hectare for Baden-Württemberg (Fig. ).

Demographic forecasts predict no significant population growth and a shrinking number of new households per year. Already implemented measures are being continued and are expected to show clearer impacts from year to year.

**Fig. 35** Baden-Württemberg: Land take for settlement area and traffic
Source: Statistical Survey Baden Württemberg, 2009 [55]
Land Management in Saxony. Saxony is one of the smaller German Federal States, with 4.3 million inhabitants and a territory of 18,413 km². Saxony’s number of inhabitants has been decreasing due to migration over the last decades especially in the rural parts of the county. Only in Dresden and Leipzig the population is growing and is expected to grow until 2020. After the German reunion most industrial enterprises were closed and most coal mines and power plants were shut down. However, the economic situation is improving in Saxony; the unemployment rate decreased since the turn of the century and is currently below 12 %\textsuperscript{37}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Fig_36_Saxony_Land_Take_and_Population.png}
\caption{Saxony: Development of Land take and population between 1992 and 2006}
\end{figure}

\textbf{Fig. 36 Saxony: Land Take for Settlement Area and Traffic}

Source: Statistical Survey Baden Württemberg, 2009

Saxony is confronted with several economic and geographic challenges, of which the most serious are a very slowly growing economy, large amounts of brownfield land, serious flood risks in very populated areas, and shrinking rural regions.

Saxony disposes of 18,000 hectare of abandoned land originating from industry and military, of which about 40 % are situated in inner urban areas. Derelict areas in inner urban districts put enormous pressure on city planning; they enhance migration to suburbs and social frictions.

In Saxony a broad range of measures were implemented to reduce the annual land take. They have different objectives ranging from flood prevention to restructuring of city centres.

\begin{itemize}
  \item \textbf{Land Development Plan Saxony.} The Plan was enforced in 2004 and represents the general framework for land development in Saxony; it includes mandatory principles, which have to be respected by all planning authorities. Major objective is the reduction of land take by (1) realising new developments within existing settlement boundaries, (2) and preliminarily on already developed land (in particular brownfield sites), and (3)
\end{itemize}

\textsuperscript{37} Employment Statistics, Agency for Employment (http://www.arbeitsagentur.de)

Original name: Bundesagentur für Arbeit
to implement greening measures on brownfield sites which cannot be reintegrated in the real estate market. Furthermore, the plan requires that large commercial centres (shopping malls) have to be developed in inner urban districts to avoid new traffic streams and urban sprawl. New settlements of industry have to be built on brownfield sites and/or in already existing industrial areas. Co-operation of municipalities to jointly invest in the development of new commercial or industrial areas (in particular on brownfield sites) is highly encouraged. The allocation of “protected green land” in the local zoning plans is mandatory. This category must not be converted into building land and includes agricultural soils of high quality, recreational zones in urban areas, and retention areas [51].

- **Flood Risk Prevention.** In the past Saxony was seriously affected by floodings of the rivers Elbe and Moldau. In particular in 2002 many settlements along the river Elbe were severely flooded and damaged. High soil sealing rates and lack of retention areas enhanced the damages. Saxony reacted with an adoption of the land development rules and the enforcement of the novel Saxon Water Act; (1) building activities in flood risk areas are banned, (2) retention zones were extended, (3) soil sealing rates in flood risk area are being monitored with the aim to avoid any increases in sealing, and (4) desealing of abandoned land is encouraged.

  The city of Dresden puts special emphasis on the preservation of flood retention areas; the soil sealing rate within the city boarder is continuously monitored. Desealing measures are promoted and have to be implemented as compensation for new developments – based on the national nature Conservation Act (see also page 174).

- **Brownfield Redevelopment.** In the funding period 2001 – 2006 of the European Funds for Regional Development (EFRE) Saxony implemented a specific brownfield redevelopment programme. The EFRE Funds supported funded the reuse of more than 100 former industrial sites with about 64.2 Mio. €. Most sites were demolished and subject to greening measures since no commercial use opportune [50].
Final Report
Overview of best practices for limiting soil sealing or mitigating its effects in EU-27

Conclusions. Since the early 1990ies Saxony has been affected by a considerable population loss and an enormous amount of abandoned post-industrial and post-military land. A declining trend for land take can be observed since 1994. Since 2006 land take is documented with about 6 hectare per day which is still far above the anticipated policy target of 2 hectare per day (to be reached until 2020).

In 2007 the Saxon Environment Agency and Geological Survey assessed the state of annual land take in Saxony and published recommendations for the future [55]. The assessment concludes that implemented measures like the new land management plan, awareness campaigns, and the brownfield revitalization programme made a visible impact and led to a reduction of the annual land take. However, without a revision of the current funding system (in particular for new industrial locations) and without clear quantitative limitations for development land—the Saxon policy target for land take cannot be reached.

2.11.3 Best practice
Several outstanding research projects and initiatives have been realised since publication of the “30 hectare target” for the reduction of land take, a few of which are described below.

Rural development. The MELAP project was funded within the rural development programme of the Federal State Baden Württemberg. Over a period of six years 13 model villages committed themselves to avoid new developments on green field sites. The project was based on the assumption that in the concerned villages sufficient developed land was available to meet the needs of the inhabitants and that no further green land needed to be developed.

Fig. 37 Saxony: Land Take for Settlement Area and Traffic
Source: Geological Survey and Environment Agency Saxony, 2007
In practice underused land in inner urban areas is not easy to develop. The land is in most cases very expensive, or not available because owners are not willing to sell, or existing buildings do not meet current standards and are difficult to renovate. The project MELAP aimed at overcoming these challenges. Key results showed that a kick-off funding from public resources is needed to start projects in rural areas, in particular in village centres. The funding was between 0.6 and 1.5 mio. Euro per community. Experiences gained from the MELAP project were incorporated in the new guideline for rural development, which led – amongst others- to a considerable improvement of the funding conditions for the restructuring and reuse of former agriculturally used estates.

Circular Land Use Management represents an integrative policy and governance approach towards land use and is based on the principle “avoid –reuse –compensate”. The prior, systematic objective of Circular Land Use Management is to fully utilise all potentially available, previously used sites. In this system, the use of virgin land is tied to a very limited set of conditions. Research according to this principle was simulated in several German planning regions (Stuttgart, Mölln, Rheinhessen-Nahe, Duisburg and Nordthüringen) in the period 2004 to 2007 and was part of the programme for Experimental Housing and Urban Development. A series of new instruments and guidelines were developing for planners and decision makers to support the Circular land Use principle.

2.11.4 Conclusions

Many German regions are heavily affected by urban sprawl and the negative effects of soil sealing. In 2002 the German government published a national policy target to reduce the annual land take by 70 % until 2020. So far apparently the measures taken have not been sufficient. As figure 32 shows the average daily land take has remained more or less constant over the past years, showing that up to 2010 not much has been achieved in terms of decreasing the daily land take. Hence Germany is still far from reaching the 30-ha-target as the statistics show a continuous trend in land consumption. All German Federal States implemented measures to reduce their land take. Due to the strong independency of the German Federal States different approaches were adopted in this respect. In parallel the government launched a large research programme (REFINA) to support this policy. In 2007 the reduction of land take and implemented measures were evaluated [48]. The evaluation report concluded that although a decreasing trend in annual land take was observed powerful measures were still necessary to reach the “30 hectare” policy target. The report stated that the existing taxation and funding systems were in many aspects too controversial for the reduction of annual land take 40. Either a binding quantitative limitation of development land was needed or clear economic incentives for inner urban development.

In 2009 the Commission for Soil Protection recommends the implementation of tradable development certificates (see also Trading Systems, page 178). A nationwide pilot is currently being planned which shall include 40 municipalities (including major cities) from all over Germany and operate for four years.

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39 Original title „Fläche im Kreis“, see also http://www.flaeche-im-kreis.de/english_version.phtml
40 The income of municipalities highly depends on the number of inhabitants and business companies. This principle more or less governs land take for settlements and transport.
2.12 Greece (short country profile)

Geography. Greece belongs to the most mountainous countries in Europe with about 80% of the territory covered by mountains. Central and Western Greece contain high and steep peaks dissected by canyons and other chalky formations. Greece has about 160 islands, of which less than half are inhabited. Greece's agriculture is marked by a lack of natural resources and therefore concentrated in the plains of Thessaly, Macedonia, and Thrace, where corn, wheat, barley, sugar beets, cotton, and tobacco are harvested. Approximately 70 percent of the land remains uncultivated because of poor soil or because it is covered by forests.

Demography. Population growth between 2000 and 2006 amounted to 2%, which corresponds to about the EU average. About 60% of the total population lives in urban areas. The Population density is 86 people per km². Major urban agglomerations are the Athens region, where about one third of the total population lives, Thessaloniki in the North, and Patra in the South West.

![Soil sealing per region in 2006](image)

Fig. 38 Greece: Soil sealing per region in 2006
Source: EEA, EUROSTAT

Land take and sealing. Land Cover data are only available for the years 1990 and 2000. The official assessment of EEA on land use changes between 1990 and 2000 refers to a relatively high annual land take of about 3,600 hectares per year, corresponding to 3 m² per capita and year. Unlike other countries key sources of land take were dump sites, quarries, and mines. However, the share of artificial surfaces amounted to only 2.1 % in the year 2000, corresponding to less than 50 % of the EU average. Land use intensity is very high in Greece with on average only 248 m² of artificial surfaces per capita. Reasons for this trend are the dense settlement structures of the country. The share of urban population is above 60 % and
41% of Greece’s inhabitants live in cities with more than 100,000 inhabitants.

In 2006 about 1.3% of the total territory was actually sealed, which is very moderate compared to other EU Member States. Regions under high land use pressure are definitely the Athens agglomeration and selected coastal areas, which are subject to intense touristic infrastructure.

It was not possible to obtain any further information on measures to reduce soil sealing or land take.
2.13 Hungary (short country profile)

Geography. Hungary covers an area of 93,030 km² Most of the country has an elevation of fewer than 200 meters. Slightly more than one half of Hungary’s landscape consists of flat to rolling plains of the Pannonian Basin. Although Hungary has several moderately high ranges of mountains, those reaching heights of 300 meters or more cover less than 2 % of the country. The highest point in the country is Kékes (1,014 m) in the Mátra Mountains northeast of Budapest. The lowest spot is 77.6 meters above sea level, located in the south of Hungary, near Szeged.

One of Hungary’s most important natural resources is arable land. It covers half of the territory, which is outstanding in the world. 19 % of the country is covered by forests. These are mainly mountainous areas.

Demography. Like in most new EU Member States the population has been slightly decreasing in recent years, amounting to minus 1.4 % between 2000 and 2006. Twenty percent of the entire population live in Budapest, the capital, while the next largest city has a population almost ten times less. With 10 million inhabitants Hungary has a population density of 108 people/km² However the centre of the country, Budapest and its surroundings are much more densely populated than the national average. Hungary is one of the most capital-centred countries in the world. Budapest, located in the northern centre, is the hub of all main roads and railway lines, which run radially toward the capital. This central area also has the strongest economy.

Source: EEA-FTSB-Sealing-Enhancement
European Mosaic; Pop EUSTAT
Umweltbundesamt, 09/2010

Source: EEA, EUROSTAT

Fig. 39 Hungary: Soil sealing per region in 2006

Source: EEA, EUROSTAT
Land take and sealing. The shares for sealed soil and artificial surface are relatively high compared to the EU average, with 3.2 % and 6 % respectively (EU average is 2.3 % and 4.4 %). However, average rates for land take are rather moderate with on average less than 2 m² per capita and year between 1990 and 2006. The most affected areas are greater Budapest and the region between Budapest and the Austrian boarder.

It was not possible to obtain any further information on measures to reduce soil sealing or land take. A recent expert position from the Ministry of the Environment states “Sealing is not a well and widely known threat in Hungary, as there is no assessment on its effect on the environment. However, after independence an extensive privatisation process started and the number of investments on greenfield sites increased considerably.”