SOS4LIFE
SAVE OUR SOIL FOR LIFE

LIFE15 ENV/IT/000225

ACTION A.1.3

Summary of rules, guidelines, best practices and case studies on limiting land take and on urban resilience to climate change

Project	SOS4LIFE - Save Our Soil For Life
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Title	Summary of rules, guidelines, best practices and case studies on limiting land take and on urban resilience to climate change
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Existing best practices designed to limit, mitigate and compensate soil sealing show that sound spatial planning follows an integrated approach, requiring the full commitment of all relevant public authorities (and not only planning and environmental departments), in particular those governance entities (e.g. municipalities, counties and regions) which are normally responsible for the management of land.
(European Commission - Guidelines on Best practice to limit, mitigate or compensate soil sealing - 2012, p.7)

First, we can learn from what is working right now. Many good practice examples exist, several of them described in these pages. They apply the 'less and better' principle of protecting soil: less sealing and better planning. Secondly, society is becoming increasingly aware of the need to change our attitude towards soil. The European Commission has proposed getting on track to achieve no net land take by 2050.
And thirdly, experts agree on the best way to protect soil: to improve urban and spatial planning and reduce sealing.
To this end, they have agreed a three-step hierarchy of measures: limit - mitigate - compensate.
(European Commission - Hard surfaces, hidden costs - Searching for alternatives to land take and soil sealing - 2013, p.21)

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1. FOREWORD

This report concludes sub-action A.1.3 "Identification and study visits at European level of the best practices for zero land take and for improving urban resilience".

The action was aimed at identifying the methodological approaches implemented in Europe and aimed at limiting, mitigating and compensating soil take, as well as those related to urban resilience to climate change.

The identification of rules, guidelines and best practices in the said fields is instrumental to developing spatial planning strategies designed to enforce the European guidelines on soil protection and urban regeneration at a municipal level, namely with the objective of no (zero) net land take.

This report has been drafted taking into account the research conducted online, in the data banks of the related bodies, through documents and magazines, as well as the study visits to the German cities of Dresden and Stuttgart, which have been working on these topics for over 10 years and are considered as best practices at a European level.

The report consists of 4 parts.

Part one gives an overview of the Italian situation, starting from the domestic regulatory framework for land take mitigation and urban regeneration; it then presents similar regulations in force regionally and locally.

The debate at national level on these issues has not led to the final approval of a regulation yet, while it is clear that the first measures on limiting land take have been taken only through the new regional urban planning laws in an inconsistent way.

The Italian regional regulatory framework consists of a number of bills and creative guidelines; some virtuous mechanisms are envisaged, whereas prescriptions are often missing. This may be due to the lack of a national framework, which at present is only represented by a bill called "Contenimento del consumo del suolo e riuso del suolo edificato" *[Limiting land take and re-use of built-up areas]*.

As a result, municipal urban planning and regulations do not consider the European objective of no net land take, except for the most recently issued regional regulations.

Part two presents the rules and best practices intended to limit, mitigate and compensate land take implemented in other European and non-European countries, with a special focus on the cities or regional areas characterised by the most interesting experiences in this field.

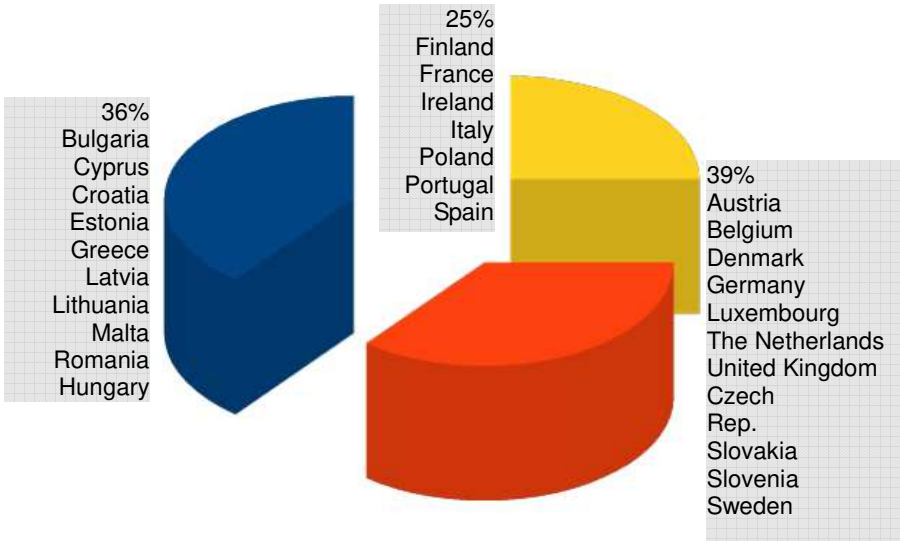
The policies enforced in European countries to limit land take can essentially be divided into three main groups (Gibelli 2008):

1. regulatory, as they foresee the enforcement of laws to limit land take - e.g. Germany and France;
2. morphological-regulatory, which are mainly widespread in Great Britain through the creation of "green belts" identifying the "urban limit";
3. strategic, or capable of guiding the re-use or densification of existing nuclei - e.g. the Netherlands.

National or regional rules regulating soil consumption are a key requisite to ensure soil protection, which is recognised as a limited and non-renewable resource. However, the introduction of specific rules among urban planning and management tools, which often at a local level even override

national ones, would be more effective. For this reason, the cases of Dresden, Stuttgart and Berlin are presented among the best practices illustrated in this section of the report, as these cities have implemented urban management tools integrated with specific prescriptions.

The report prepared in 2012 by the European Commission on the best practices to limit and compensate land take shows that 11 out of 28 member states have implemented specific measures aimed at limiting land take (39%), 7 countries are preparing them (25%) and the remaining 36% do not have specific regulation in this field.



In the first two parts of the report the reference scale is national or regional regulations, down to local urban planning prescriptions, whereas **parts three and four** gather and briefly describe examples at neighbourhood and block level, or even on a smaller scale, of urban regeneration interventions carried out mainly in Europe.

Our interest in these interventions is explained by the willingness to investigate methods for reusing and recycling already urbanised areas, which contribute to reducing land take, but also the design solutions and techniques adopted and aimed at improving urban resilience to climate change, as well as the inputs given by citizens and associations rather than by administrations.

In the search for more sustainable city growth, the strategy limiting land take and promoting urban regeneration is intertwined with adapting to climate change.

In our analysis of the best practices, we also paid special attention to examples of interventions of de-sealing, by considering a number of experiences, including both simple bottom-up interventions - such as de-sealing the pavement in front of a house - and complex ones that are part of complicated urban regeneration operations. As a whole, about twenty case studies were analysed, mainly referred to the European context.

De-paving is always included in the urban regeneration projects we have analysed, although with different percentages, depending on the situations and goals underlying the transformations in the existing cities. Restoring soil permeability is key to achieving or increasing city resilience to climate change, and at the same time to improving the quality and liveability of open spaces, and the comfort, safety and health of the people living there.

Loosening the underlying soil by removing sealing layers, or by reducing impermeable material, also means redesigning the urban landscape through both micro-interventions in appurtenant spaces, and macro-interventions in large regeneration areas, by covering them with plants - wildflower meadows, ornamental grasses, rows of plants or woods. This ensures a number of

benefits also known as ecosystem services.

Permeable and vegetated soil (wooded areas, parks, public/private small and large gardens, sports grounds and outdoor play areas, cemetery areas etc.) in urban and peri-urban areas is the *green infrastructure*. If it is properly designed and linked, it offers many benefits. The green infrastructure has the following functions; it reduces *runoff*, pollutants, greenhouse gases and fine particles; it improves the microclimate and mitigates the heat island effect; it decreases energy consumption (cooling of buildings); it improves the thermo-hygrometric comfort of people in open spaces; it improves the quality, appeal and liveability of streets, squares and parks; it increases biodiversity and supports the mobility of pedestrians and cyclists.

Preserving and restoring green areas in cities is an important goal to achieve, not really for aesthetic-ornamental reasons, but rather for functional and multi-functional ones. Indeed, these systems can act both on adaptation - by increasing city resilience to heavy rains (*enhanced precipitations*) and heat waves - and on mitigation, by increasing CO2 absorption through vegetation.

2. PART ONE - ITALY

2.1 NATIONAL FRAMEWORK: NEW BILL ON LAND TAKE

So far, Italian legislation has mainly concentrated on "soil protection" (Legislative decree 152/06) rather than on soil conservation, with the purpose of protecting the territory from hydrogeological disruption (ISPRA 2015).

The national bill titled "Contenimento del consumo del suolo e riuso del suolo edificato" *[Limiting land take and re-use of built-up areas]* was approved by the Chamber of Deputies on 12 May 2016 and is currently being examined by the Senate of the Republic. For the first time, it introduces the concepts of re-use, urban regeneration and limiting land take among the key principles of territory management (art. 1 para. 2).

The new bill defines «land take» as: *net annual increase of agricultural, natural and semi-natural land covered by impermeable material. Net land take is calculated as the difference between sealed agricultural, natural and semi-natural land and de-sealed areas*.

Source:
https://www.google.it/searchq=immagine+itali+verde&espv=2&biw=1164&bih=835&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjpoei416DQAhXDWxQKHdzQDakQ_AUIBigB#tbm=isch&q=immagine+italia+verde&imgrc=LxMjSK1hGPe4zM%3A

Pursuant to the said bill, the central government will be responsible for:

- defining the **binding progressive reduction, quantity wise,** of land take at national level, and the breakdown by region, as well as the **enforcement criteria of the environmental compensation and mitigation measures**, in line with the objectives set by the EU to achieve zero land take by 2050;
- publishing and updating the data on land take and related mapping on a yearly basis;
- identifying the public bodies, methods and criteria to monitor the reduction of land take - data on land take monitoring are published and made available by the National Institute for Environmental Protection and Research (ISPRA) as aggregated national data, but also by

region, province and municipality;

- defining prescriptions aimed at streamlining the procedures for regeneration interventions in urbanised areas that are considered as degraded from an urban planning, social and economic, landscape and environmental viewpoint, based on pre-set principles;
- granting funds, primarily for interventions of urban regeneration and reclamation of contaminated sites, with the purpose of boosting urban agricultural activities and restoring agriculture in derelict, abandoned or unused land or land that is no longer used for agriculture to municipalities that have adapted their urban planning tools to the principles set by the law and are registered in a specific national registry.

The regeneration of derelict areas needs systematic projects that also foresee the creation of green areas, and aim at promoting slow mobility and implementing diversified public and private functions in order to improve the life quality of citizens. The central government shall encourage these projects through tenders and contests that ensure high-quality architecture - hydro-geomorphological and seismic safety, minimized environmental impact and energy saving - and respect land take limiting, by defining tax benefits for a suitably long period of time. The new regulation does not apply to city centres, similar urban areas, as well as the buildings and sites indicated under articles 10 and 142 of the Code of Cultural Heritage and Landscape, as per Legislative decree no. 42 of 22 January 2004, unless it is expressly authorised by the related superintendence.

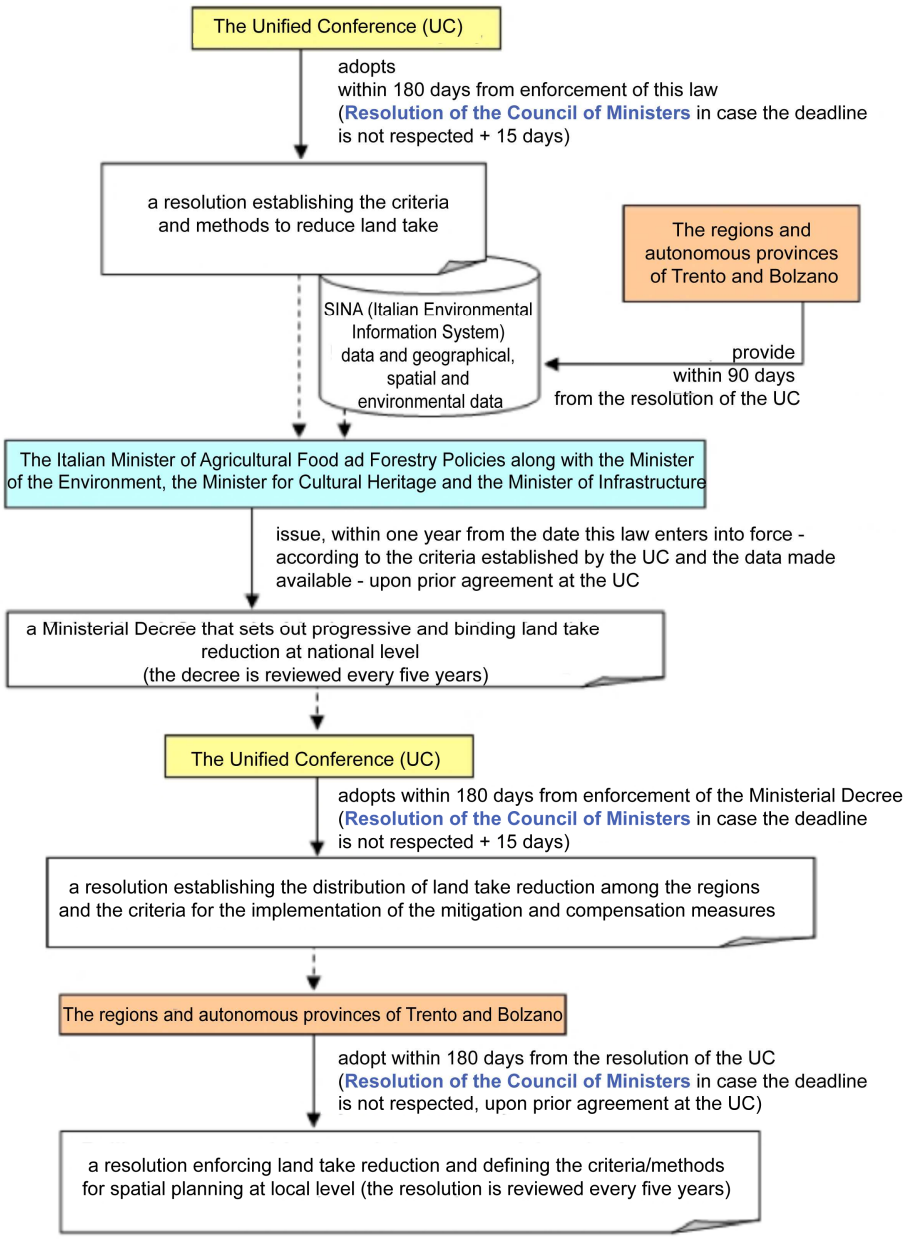
Pursuant to the said bill, the regions will be responsible for:

- enforcing incentivizing provisions for both single and grouped municipalities with the purpose of "promoting urban regeneration strategies, by identifying, among the urban planning tools, the sectors and abandoned former industrial sites that primarily need restructuring and urban renovation", also through equalisation, compensation and incentives, provided that they do not result in further land take and are exclusively implemented in well defined and planned fields and areas;
- adopting provisions for the realisation and update of the census of municipal unused public and private building heritage;
- granting funds primarily for interventions of urban regeneration and reclamation of contaminated sites, with the purpose of boosting urban agricultural activities and restoring agriculture in derelict, abandoned, unused land or land that is no longer used for agriculture to Municipalities that have adapted their urban planning tools to the principles set by law and are registered in a specific national registry.

The municipalities are responsible for:

- compiling, updating and publishing online a census of existing brownfield sites, unused or abandoned buildings and areas;
- verifying, through the said census, whether urban planning entailing land take can be made through regeneration interventions.

The scheme below illustrates the times and methods for identifying the binding reduction in land take.



Source: Chamber of Deputies, Services Studies XVII, Legislature - Documents for the assessment of bills: Limiting land take and re-use of built-up areas A.C.2039-902-948-1176-1909-A File no. 426 - Elements for assessment by the Assembly 22 April 2016

2.2 A FEW REMARKS

The bill under approval establishes mainly quantitative limits to land take.

Nonetheless, the criteria and methods to define the binding and progressive reduction as per art. 3 para. 1, shall be defined taking into account *local peculiarities in particular, the* ***qualitative properties of soils*** *and soil ecosystem services, agricultural production with respect to food security, typical agri-food products, size and location of agricultural areas with respect to urban and peri-urban areas, arboriculture for wood production depending on environmental and production safety, the status of spatial planning...*

The qualitative element is included, although we don't know yet how it will be presented in the

enforcing measures.

In line with European guidelines, the bill foresees limiting, mitigation and compensation of land take.

LIMITING LAND TAKE

Under article 3, para. 1, the bill introduces the definition of binding progressive reduction of land take at national level, in terms of quantity.

Paragraph 5 of the same article sets out to determine the breakdown of land take reduction among the regions, in terms of quantity.

MITIGATION AND COMPENSATION

Mitigations are defined under art. 2, para. 1, letter f, as a coordinated set of actions and measures to be taken at the same time as the land take interventions and aimed at maintaining or improving soil ecosystem functions, minimizing the effects of natural or semi-natural agricultural land fragmentation, and limiting direct or indirect negative effects on the environment, on agro-silvo-pastoral activities, on the landscape, on the hydrogeological system and on human well-being.

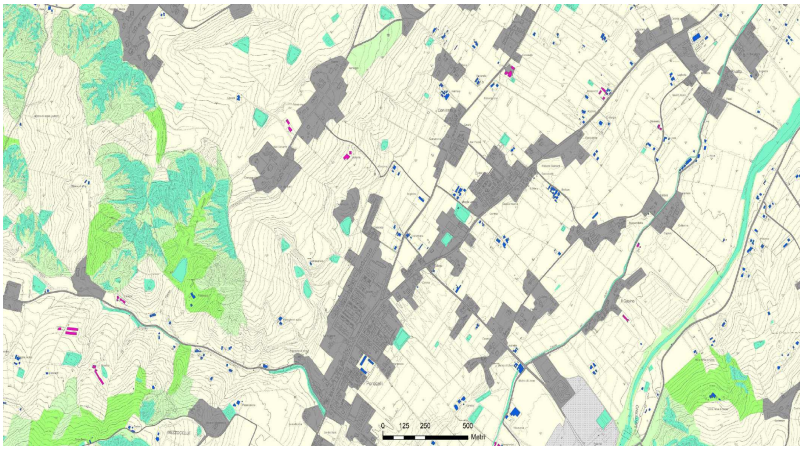
For any land take intervention, "environmental compensation" measures shall be taken with the purpose of recovering, restoring or improving the functions of the already sealed soil - proportionally to the said intervention - by de-sealing and restoring the natural conditions of soil (art. 2, para. 1, letter g).

Article 3, para. 5, sets out the need to establish enforcing criteria for environmental mitigation and compensation measures.

MONITORING

The bill also introduces land take monitoring systems, which are to be managed by ISPRA at central level and by the Regional Environmental Protection Agency (ARPA) at regional level. For proper planning, it is crucial to know land take and constantly update it through monitoring activities.

For example, the Piedmont region (Decision of the regional governing body no. 34-1915 of 27 July 2015) and the Emilia–Romagna region (http://geoportale.regione.emiliaromagna.it/it/contenuti/monitoraggio-del-consumo-di-suolo-in emilia-romagna) have already taken into account land take monitoring.



Source: http://geoportale.regione.emiliaromagna.it/it/contenuti/monitoraggio-del-consumo-di-suolo-in-emilia-romagna

2.3 REGIONAL FRAMEWORK

Below is a summary of the regional regulatory framework in force - or under approval - in Italy, and of the most effective or innovative legal provisions on limiting land take.

2.3.1 ABRUZZO REGION

Bill 62/15 prepared by the regional governing body and submitted to the Regional Council on 20/01/2015.

Under art.1 para. 5, the bill sets out **the urbanisation of agricultural land only when there are no alternative solutions, such as replacing or regenerating existing settlement areas**. The Regional administration shall define a **maximum threshold of permitted land take** for the next five years, divided by province. The Provinces have to adapt their planning instruments accordingly (PTCP - Provincial coordination planning scheme), by defining the criteria for using the said thresholds during municipal urban planning. Pursuant to art. 4, and in accordance with the provisions issued by the Province, the Municipalities have to adapt their general urban planning instruments and explicitly calculate the extension of agricultural and natural land, as well as of the urbanised areas as the difference thereof. For any interventions involving land take it shall be however demonstrated that it is technically impracticable or economically unsustainable to intervene on interstitial non-built-up urban areas or to recover and re-use existing buildings.

Tax incentives are envisaged - reduced building fees and property tax (IMU) - in order to foster urban regeneration interventions.

2.3.2 PROVINCE OF BOLZANO

Provincial law 13/1997 "Provincial urban planning law" as modified by Provincial laws 10/2013 and 10/2014

On **a yearly basis,** the Province of Bolzano defines and publishes **an annual target quantity of building areas. Using new land is possible only when there are no alternatives** to reorganising existing land use.

2.3.3 CALABRIA REGION

Regional law 19/2002 "Norme per la tutela, governo ed uso del territorio" [Rules for land protection, management and use] - Urban planning law of the Calabria region, as amended by regional laws 35/2012, 40/2015 and 28/2016.

Among the principles that inspired the urban planning law, there is the fact that **using new land must be foreseen only when there are no alternatives** like replacing, reorganising and regenerating existing settlement areas, or filling the so-called urban voids or marginal areas, provided that urban standards are satisfied to avoid nuclei that are isolated or scattered throughout the territory. **The law encourages the municipalities to apply the concept of zero land take to the urban planning instruments** by halving the approval time for the Municipal Structural Plan (PSC). To do so, the municipalities have to make a census of the areas and volumes that are still available and unused, already included in areas B, C, D and F. These areas can be re-proposed or changed to urbanised areas, or sites can be urbanised, in the new preliminary document to the PSC, without envisaging further volumes than the ones available in the plan. As a reward, the transitional provisions are not applied to the municipalities that implement zero land take planning, except for the provisions of the previous municipal general urban planning tools.

2.3.4 EMILIA - ROMAGNA REGION

Regional law 20/2000 "Disciplina generale sulla tutela e l'uso del suolo" [General rules governing

the protection and use of land] as amended by Regional laws 6/2009 and 17/2014.

Bill 2017 "Disciplina regionale sulla tutela e l'uso del territorio" [Regional rules governing the protection and use of land]

In the Emilia-Romagna region, a new urban planning draft law "*Disciplina regionale sulla tutela e l'uso del territorio*" *[Regional rules governing the protection and use of land]* is currently under consideration. It will replace the Regional law "*Disciplina generale sulla tutela e l'uso del territorio*" *[General rules governing the protection and use of land]*.

In accordance with the European guidelines and the national regulation under approval, the regional draft law aims to *"limit land take as a common good and non-renewable resource which fulfils functions and produces ecosystem-related services, also with respect to the prevention and mitigation of hydrogeological disruption and to the strategies of mitigation and adaptation to climate changes"* in a zero-balance policy perspective.

One of the key elements is the **introduction of the global quantitative limit for land take** of 3% of the urbanised surface in the region.

- This percentage does not include public works, works of public interest and for strategic settlements aimed at making the territory more appealing and competitive, the expansion of production sites (expansion plots), new production sites of regional interest, buildings located in rural areas for farms, city parks;
- whereas the new production sites and new residential interventions are included in the said 3% only if they are related to urban regeneration projects and social housing.

When assessing the environmental and territorial sustainability of the schemes and operational agreements, alternative choices of sites that do not involve land take are considered. For the approval of the said instruments, specific and precise reasons concerning the need for envisaging the use of non-built areas are taken into account (art. 5 *Limiting land take*, para. 2).

Land take is not permitted for the construction of new residential buildings, except for those needed to implement regeneration interventions in large urbanized, mainly residential areas and for social housing interventions (art. 5 *Limiting land take*, para. 3).

Incentives are envisaged - like one-off tax exemptions, reduced building fees, additional building rights established in relation to the level of improvement of original conditions - for interventions of urban regeneration, building renovation, urban concentration and replacement.

The concept of an **environmental and ecological framework** is extended to include all the areas, works and interventions aimed at countering climate change and its effects on human society and the environment, and at improving the quality of urban environment by reducing greenhouse gases and noise and electromagnetic pollution, and by cleaning up polluted air and water while maintaining soil permeability and ecological rebalancing of urban sites, and mitigating the effects of global warming (heat waves) etc.

The aforesaid **cannot be subject to deduction and cannot be monetized** pursuant to art. 34 para. 1. letter d).

2.3.4.1 MUNICIPALITY OF PARMA

Located in the Emilia-Romagna region, the Municipality of Parma has recently adopted (by decision of the Municipal Council no. 13 of 14/02/2017) an amended version of the Municipal Structural Plan based on urban planning strategies aimed at limiting land take, promoting re-use and recovery of existing building heritage and protecting and enhancing agricultural areas.

Article 1.19 of the technical enforcement rules of the Municipal Structural Plan introduces the

obligation for "*zero land take, following urban transformation processes, by ensuring that every intervention involving the use of agriculture or forestry areas for the construction of buildings or infrastructure is compensated at the same time by "releasing" an urbanized area for agricultural or natural use*".

The rules established in the Municipal Operational Plan will explain the compensation operating modes.

The same article in the Municipal Structural Plan establishes that the Municipal Operational Plan has to assess the quality and quantity of *greenfield sites* used for the implementation of the transformation provisions, as well as the width of the areas characterized by the recovery of sites resulting from the elimination of unsuitable volumes in the agricultural sites outside the centres of neighbourhoods, as well as from the already urbanised and sealed areas that can be re-used for agricultural purposes according to the urban regeneration policies (urban gardens, peri-urban agriculture), or for natural use (forestry areas, ecological rebalancing areas, areas of low use intensity).

The rule also establishes that, as one of the key elements of the sustainability assessment within the Municipal Operational Plan, a zero or negative balance between land take and recovery/restoration shall be achieved taking into account the different weights of crops and plants already existing or envisaged in the project.

Article 1.15 of the Municipal Structural Plan establishes the "Environmental sustainability credit" which is granted by the Municipal Operational Plan in case of commensurate environmental benefits for the whole community, in terms of sustainability and safety, resulting from urban regeneration and renovation that involve major transformations to private and public buildings.

2.3.5 LOMBARDY REGION

Regional law 12/2005 "Legge per il governo del territorio" [Law on territory management]

Regional law 31/2014 "Disposizioni per la riduzione del consumo di suolo e per la riqualificazione del suolo degradato" [Provisions aimed at limiting land take and regenerating degraded soil] as amended by Regional law 38/2015

The Region intends to minimize land take and achieve on the territory the goal of no net land take by 2050, as foreseen by the European Commission.

The Regional Territorial Plan defines the land take measurement indexes by dividing the territory in homogeneous areas with criteria and guidelines to be applied to the urban planning tools in order to limit land take. These guidelines shall be transposed in the Provincial Territorial Plans.

The municipal plans are prepared in compliance with the following principles and criteria:

- **land take is allowed only when it is demonstrated by the plan document that the regeneration and renovation of built-up areas is technically and economically unviable**;
- **no further land take can be foreseen until the expected expansion and transformation at the date the law enters into force are fully implemented**;
- current land take level is measured, **the maximum land take within the municipality is defined and the areas that can be subjected to urban regeneration are identified**;
- a **map of land take** is prepared; it shows agricultural areas, brownfield sites, areas to be reclaimed, degraded land, unused and underused land, free plots, areas subject to recovery and/or urban regeneration projects.

In order to encourage municipalities to promptly apply the aforesaid principles and implement

concrete urban regeneration actions, **regional funding is primarily granted to them**.

A reduced building fee is envisaged for **urban renovation interventions in urban regeneration areas**.

The municipalities can identify the **non-conforming infrastructure situated in agricultural areas and valuable landscape** and foresee **simultaneous destruction and soil de-sealing. Building rights are granted and can be used in specific areas of the consolidated urban fabric.**

2.3.6 MARCHE REGION

Regional law 22/2011 "Norme in materia di riqualificazione urbana sostenibile" [Rules on sustainable urban regeneration]

Regional law 33/2014 "Assestamento del bilancio 2014" [Law governing the preparation of financial statements 2014] as amended by Regional law 16/2015.

Until entry into force of the organic regional law on territory management and in any case, by 31 December 2017, the municipalities shall abide by the following provisions aimed at limiting land take and encouraging maximum use and regeneration of existing buildings:

- **municipalities cannot adopt new general master plans or amendments to existing ones that involve further expansion of building sites in agricultural areas in the municipalities which have not reached at least 75% construction in existing areas with the same urban use**;
- new general master plans or amendments to existing ones can be adopted provided that they are aimed at reducing the expansion of building sites or at recovering degraded urban land or land subject to environmental remediation.

Modifications to existing general master plans are allowed only if they are necessary for the expansion of production activities, provided that the new sites are adjacent to the already existing built-up areas.

2.3.7 PIEDMONT REGION

Regional law 56/1977 "Tutela ed uso del suolo" [Protection and use of land] as amended by Regional laws 3/2013 and 12/2016.

Article 1 of Regional law 56/1977 (as recently amended) sets out that the Region fulfils its urban planning functions by regulating soil protection and **limiting land take so as to achieve the zero-land take objective** (….).

Article 1 bis specifies that urban planning tools at any level, in accordance with the objectives set out in article 1, shall ensure the sustainable development of the territory, also by regenerating urbanised areas and limiting land take to cases where no alternatives exist.

Article 11, para.1, sets out the specific objectives of the municipal or inter-municipal general master plans: re-use of existing buildings and infrastructure for social purposes; regeneration of peripheral or marginal built-up areas and recently created isolated nuclei, also by eliminating unsuitable interventions and restoring deteriorated environmental and landscape conditions and by limiting land take.

Article 31 of the Regional Territorial Plan in force "Contenimento del consumo di suolo" *[Limiting land take]* acknowledges the strategic value of **soil as a non-renewable resource, for which protection and conservation policies are issued in order to limit land take**.

Ecological compensation is defined as a way to control land take by allocating areas for ecological, environmental and landscape purposes, as a compensation for any new soil being used.

The Regional Territorial Plan provides indications and guidelines to local urban planning by steering territorial transformation policies toward a land take limiting approach.

According to the Regional Territorial Plan, the provinces should be involved in monitoring activities with the purpose of setting up a shared information system, as well as in **defining max land take thresholds for municipality categories**, in compliance with what is envisaged in the Landscape Plan.

Failing these parameters, the Regional Territorial Plan sets out that **the increase in land take for settlements shall not exceed 3% of existing urbanised areas over a period of five years**.

At the same time, the Regional Landscape Plan contributes to limiting land take, as it protects the first classes of land capability in agricultural areas, and calls for the conservation of areas of high bio-permeability, high agronomic interest and specific landscape interest.

The regional governing body, by decision no. 34 of 27 July 2015, approved the document "Il **monitoraggio del consumo di suolo** in Piemonte - edizione 2015" ***[Monitoring land take** in Piedmont region - edition 2015]* as a reference document for regional policies on soil protection and for the enforcement of the regional regulation governing urban planning, the goals and strategies of the regional territorial plan and the regional landscape plan on limiting land take.

2.3.8 APULIA REGION

Regional law 21/2008 "Norme per la rigenerazione urbana" [Rules on urban regeneration]

Pursuant to Regional law 21/2008, the urban regeneration integrated plans shall involve totally or partially built-up areas and cannot entail town planning changes aiming at transforming agricultural land into built-up areas, except for any adjacent areas necessary for the creation of green areas and public services up to max. 5% of the total area of intervention.

Nonetheless, such a change shall be compensated through an area which is two times the agricultural area being transformed, aimed to make the existing built-up areas green and permeable (art. 2, para. 3).

2.3.9 TUSCANY REGION

Regional law 65/2014 "Norme per il governo del territorio" [Rules on territory management] as amended by Regional law 43/2016.

The Tuscany region acknowledged soil as a fundamental common good for environmental balance by Regional law 65/2014 "*Norme per il governo del territorio*" *[Rules on territory management]* based on the principle that no element of the territorial heritage can be transformed in an irreversible way:

- **transformations involving non-built-up land** for settlement purposes or for the construction of infrastructure, **are permitted only within urbanised areas** as identified by the structural plan;
- any transformations for non-residential purposes outside urbanised areas and implying the use of non-built-up land shall be authorised by the planning committee, which verifies that they comply with the territorial plan and that there are no sustainable alternatives of re-use and restructuring of existing settlements and infrastructure. The committee also indicates any interventions to compensate the effects on the territory.

This law has been recently amended by Regional law 43/2016 that complements and amends the previous law, with the main objective of streamlining and simplifying some procedures.

2.3.10 PROVINCE OF TRENTO

Provincial law 15/2015 "Legge provinciale per il governo del territorio" [Provincial law on territory management]

The urban planning instruments make it possible to identify:

- **new areas for residential settlements** and the related services **only if it is proved that there is a real housing need to be satisfied, there are no alternative solutions and the maximum settlement load for that territory is respected**;
- **new areas to be used as production sites** - including the ones for the processing and industrial transformation of agri-food and forestry products - **only if it is proven that no alternative solutions exist for the possible and rational use of existing or already built-up areas within the territory of the community**.

In order to limit land take when constructing buildings of public interest, the local authorities encourage the use of existing building heritage and, namely, degraded or abandoned areas and buildings (article 18).

With the purpose of fostering regeneration, the category of "building refurbishment" is extended to include destruction and reconstruction interventions within the original volume, also on different sites, and the expansion of existing buildings up to 20% of the original volume. **Transferable volume credits** are also granted to building regeneration interventions.

2.3.11 VENETO REGION

Regional law 11/2004 "Norme per il governo del territorio e in materia di paesaggio" [Rules on territory management and landscape]

Regional law 4/2015 "Modifiche di leggi regionali e disposizioni in materia di governo del territorio e di aree naturali protette regionali" [Amendments to regional laws and provisions on management of the territory and regional protected natural areas]

Circular no. 1 of 11 February 2016 "Legge regionale 16 marzo 2015, n. 4 - Modifiche di leggi regionali e disposizioni in materia di governo del territorio e di aree naturali protette" [Regional law no. 4 of 16 March 2015 - Amendments to regional laws and provisions on management of the territory and regional protected natural areas]

Bill no. 14 "Disposizioni per il contenimento del consumo di suolo, la rigenerazione urbana e il miglioramento della qualità insediativa" [Provisions for limiting land take, urban regeneration and improving settlement quality]

Regional law 4/2015 established the **obligation for the municipalities to publish on a yearly basis, by 31 January, a notice to invite** the eligible and interested people **to submit** within the following 60 days **the request for the reclassification of building areas, so that the building areas** considered as such by the urban planning instrument in force are transformed into areas subject to a building ban. Within 60 days of receipt, the municipality will evaluate the requests. Those consistent with the objective of limiting land take are accepted by approving a modification to the Action Plan or the General master plan.

Bill no.14 transposes the goal set by the EU to achieve zero land take by 2050 for settlements and infrastructure, with the following principles:

- supporting strategies and actions aimed at restoring natural soils and soil ecosystem services;
- boosting full exploitation of the land used for settlement in urbanised areas;
- regenerating and enhancing the urban building fabric;

- revitalising public spaces;
- making areas at high hydrogeological risk safe;

and it also sets out that the governing body shall define, within a given time:

- limits to land take for town planning and construction purposes;
- recovery objectives for urban areas that are degraded or improperly used;
- policies, tools and positive actions to achieve the goals along with other regional and local bodies;
- the related control and monitoring procedures.

In order to foster building regeneration measures, the following is permitted:

- re-use of the volumes or usable floor areas of demolished buildings onsite or in other areas within the established urban fabric;
- changing the original land use;
- increase in incentives - also as an exception to current town planning regulations - up to 15% considering quality and eco-sustainability standards (or up to 30% if considering urban quality improvement);
- reduced building fee;
- granting of incentives as building loans that can be freely marketed.

In order to foster building regeneration measures, the following is envisaged:

- interventions in specific areas considered of public interest also for the eligibility of derogations to the current town planning and construction regulations;
- based on public-private agreements, programme agreements, integrated programmes, specially agreed building permits or permits which derogate from current regulation are allowed;
- volume-related incentives up to 30% of existing volume or usable floor area;
- transferring the volume or usable floor area into another area within the established urban fabric or any adjacent area;
- transformation into building loans;
- envisaging different land use.

2.3.12 UMBRIA REGION

Regional law 1/2015 "Testo unico governo del territorio e materia collegate" [Consolidated law on territory management and related matters] as amended by Regional law 13/2016

Based on the definitions given in the national bill and the regional law and EU guidelines, the Umbria region has recently started an operational pîlot project aimed at creating a land take mapping on a regional scale.

Programming and town planning in the Umbria region have the following goals (art. 95, para. 1, of law on territory management):

- regeneration of city centres and seismic risk reduction in existing buildings;
- **urban development adequate** to the environmental and historic context, and to the real

production and residential needs, **maintaining agricultural land take within the limits** set by paragraph 3;

- recovery and regeneration of derelict industrial areas, enhancing areas that are part of the industrial archaeology heritage, completing the existing ones by improving infrastructure and services;
- fostering urban regeneration interventions and renovation of degraded urban areas; realisation and regeneration of areas allocated to installations at high risk of accidents.

With the purpose of following the principle of sustainable use of the territory, **the new settlements** identified by the General master plan (art. 95, para. 2) **must be adjacent to areas and settlements already foreseen by current town planning regulations and by the regulation under approval**, respecting the ecological network.

In order to maintain current planning of residential settlements and those for production and services, and to limit agricultural land take and restore existing building heritage, the General master plans **can encompass an increase in settlement sites up to 10% of forecasts** in terms of existing surfaces in the general spatial planning regulation in force on 13 November 1997. However, it is without prejudice to the need to reduce the aforesaid percentage to achieve a rebalancing, based on the demographic trend of the last ten years (art. 95, para. 3).

3. PART TWO - EUROPE

Below is an overview of the regulations and national/local guidelines on limiting land take in force in European countries.

Although not comprehensive, this review clearly shows that many countries have tried to find a solution to the problem of land take, although not a definite one. Some countries have fixed quantitative limits, others have implemented compensation systems, while others have planned how to limit urban growth and sprawl. Some countries have taken mitigation measures, whilst others rely on financial compensation as a deterrent, and others still prefer to focus on urban regeneration. Often, more than one of these approaches coexist.

There is no perfect recipe. However, some countries in Europe started to tackle land take long time ago, with the purpose of finding a more sustainable growth model, although with different approaches.

For sure we can learn from the experience of others and find a way to deal with land take.

3.1 GERMANY

Germany set the goal to limit land take many years ago.

In 1999, they defined a nationwide quantitative limit to transformations equal to 30 ha/day by 2020 and 0 ha/day by 2050. They also implemented a number of strategic policies to limit, compensate and mitigate land take, including (German Advisory Council on the Environment, 2011):

- strengthening national and regional planning versus local planning;
- prevention principle;
- preventive ecological compensation and municipal eco-accounts;
- reducing direct or indirect incentives which may encourage transformation of free areas, rather than regenerating brownfield sites;
- setting up new public offices to deal with land fragmentation;
- tax reform and limiting the construction of new buildings;
- standardized monitoring of land use and transformations;
- implementing statistics to the various scales;
- more than 300 pîlot projects nationally (REFINA programme);
- stricter rules on the transformation of agricultural areas;
- large federal cultural plan aimed at raising awareness of the role of land and the damage caused by land take;
- widening the powers of the German Environment Agency on states and municipalities.

Pursuant to the *BauGesetzBuch "BauGB" [Federal Building Code]* issued in 2001, all municipalities have the obligation to submit any building-town planning transformation to a preventive assessment of the impact on the ecosystem and landscape, and compensation of the thus determined impact. Giving back to nature what we take from it - this is the guiding principle pursued through two criteria, in order of importance:

- avoiding taking natural space;
- giving back what has been taken, when the "zero" option is not viable, by combining the

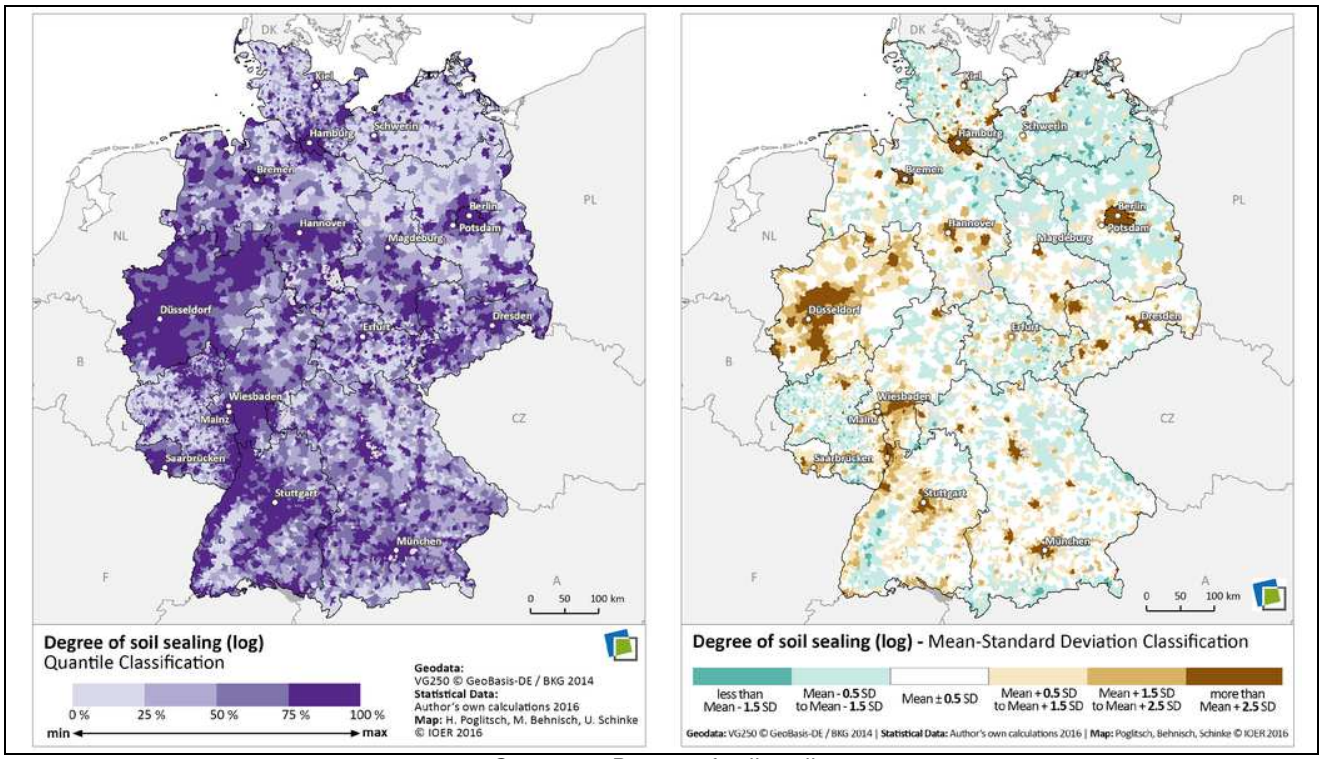
development needs with a land take compensation policy.

This entails a major cultural change: the scheme relies on the right to collective use of nature, thus going beyond the concept that increasing the green areas of a building plot is enough for a transformation to be environmentally compatible.

The Federal Building Code refers to the *Bundesnaturschutzgesetz "BnatSchG 2002" [Federal Nature Protection Act]* which sets out that any interventions that may cause landscape fragmentation must be avoided or minimized, or compensated or mitigated, given the link between construction and nature protection interventions.

Within this national framework, some regions and municipalities have developed specific local strategies. The following have been selected by way of example:

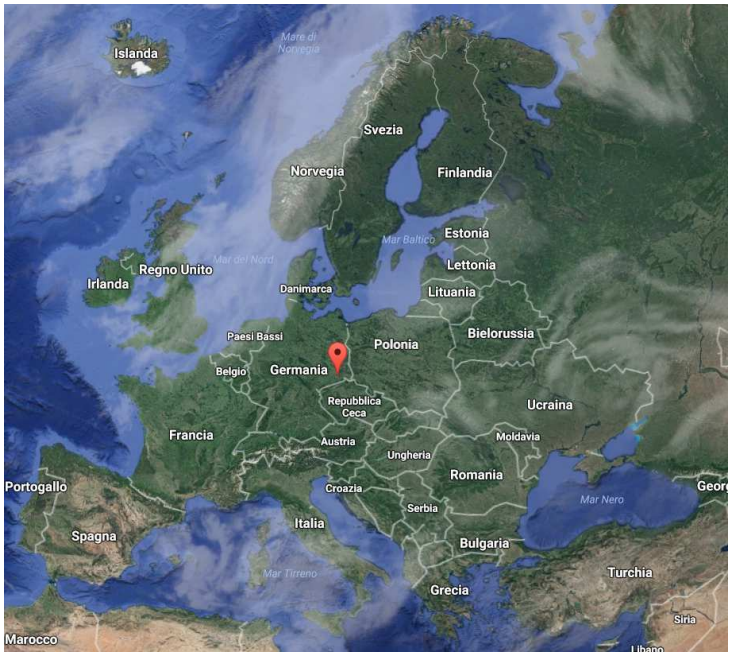
- Dresden and the *"Bodenausgleichskonto" [Soil Compensation Account];*
- Stuttgart and the *"Bodenindikation" [soil indicator]*;
- Bavaria and the *"Ökokonto" [eco-account]* and *"Flächenpool" [green registry]*;
- Barnstorf and the promotion of town centre regeneration;
- Berlin and the "Potentials for Impervious Coverage Reduction" project.



Germany - Degree of soil sealing
Source: Martin Behnisch, Hanna Poglitsch and Tobias Krüger
Soil Sealing and the Complex Bundle of Influential Factors: Germany as a Case Study (2016)

3.1.1 DRESDEN

COMPENSATION MEASURE - *"BODENAUSGLEICHSKONTO" [soil compensation account]*



Coordinates 51°02′N 13°44′E
Altitude 113 m a.s.l.
Area 328.30 sq. km
Population 541,986 (31.12.2013)
Density 1,632 people /sq. km

Source:
https://www.google.it/maps/place/Dresda+Germania/@52.9086112,19.5081862,4083180m/data=!3m1!1e3!4m5!3m4!1s0x4709cf29101ad6a9:0x421b1cb4288feb0!8m2!3d51.05040884d13.7372621

Dresden is a German city, capital of the Federal State of Saxony. Dresden was an important industrial centre of the former German Democratic Republic. It is located in the broad basin of the River Elbe, which has flooded many times over the years (the most recent devastating flood was in 2002). During World War II, the city was heavily bombed; the city centre was seriously damaged and some areas were razed to the ground.

Today, high-quality non-urbanised green areas in Dresden (mainly forest and agricultural land and other natural areas) account for over 60% of the territory. This is critical to the climate in the city: along with the hills located just behind the urban area, the presence and conservation of these areas positively affect the climate and ensure air change. The interconnected green spaces create a dense network of green corridors.

The city of Dresden has defined a long-term planning target to protect soil functions, which declares that built-up land for settlements and traffic is to be confined to 40% of the total urban land. This means that all high-quality non-urbanised areas are protected.

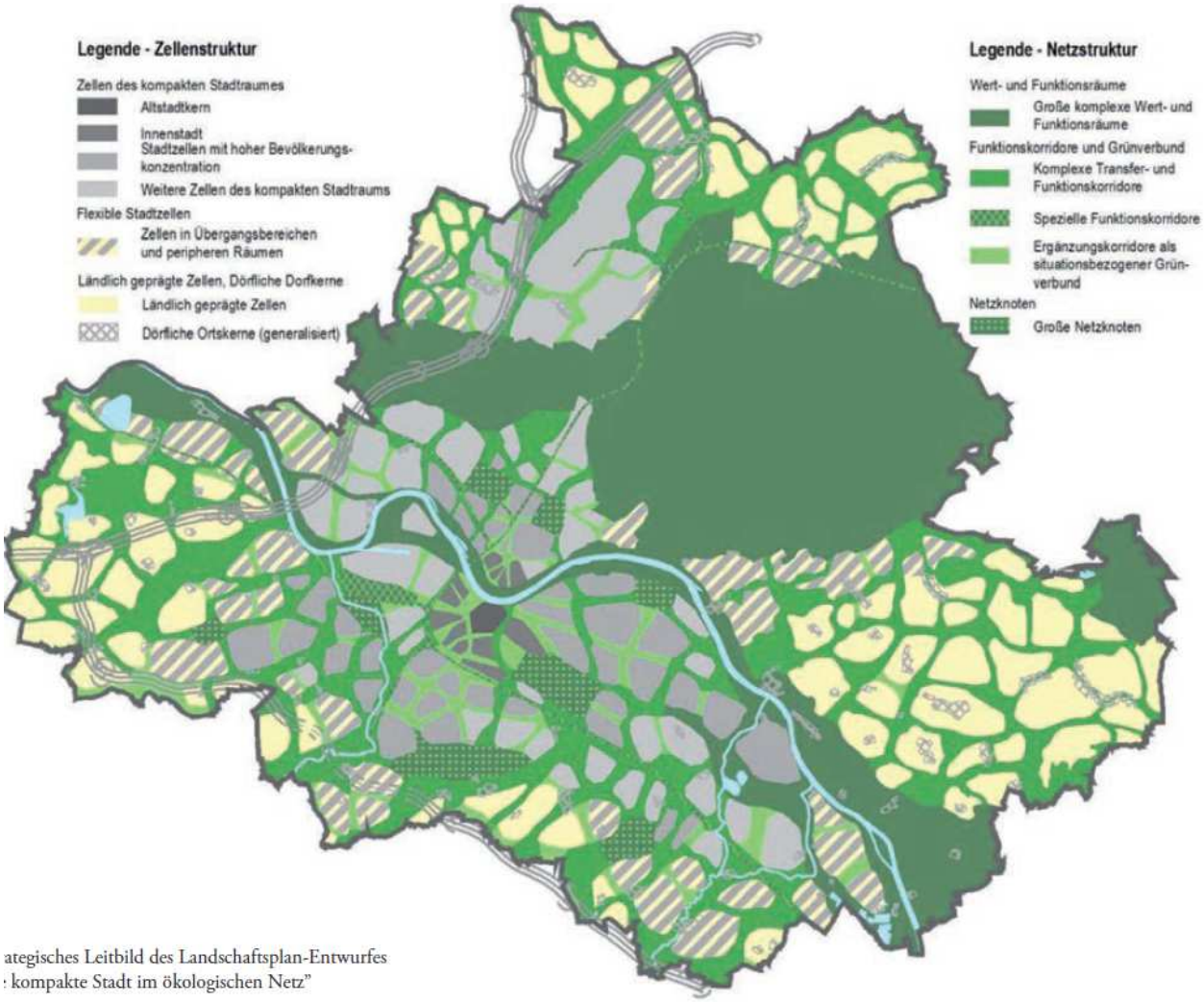
The strategy implemented by Dresden starts from spatial and landscape planning to encompass the following:

- creating a more compact city within a dense ecological network (integrated urban development);
- taking into account climate and adaptation to climate changes by implementing the ecological

network with new green areas (green corridors) so as to ensure ventilation, water retention etc.;

- protecting the landscape and soil;
- using urbanised areas in a multifunctional way in order to save land;
- defining land take compensation methods.

The efficient local public transport and wide cycle network that foster a more sustainable mobility are paramount to achieving the goal of a more compact city.



Landscape plan - Dresden, the compact city in the ecological network

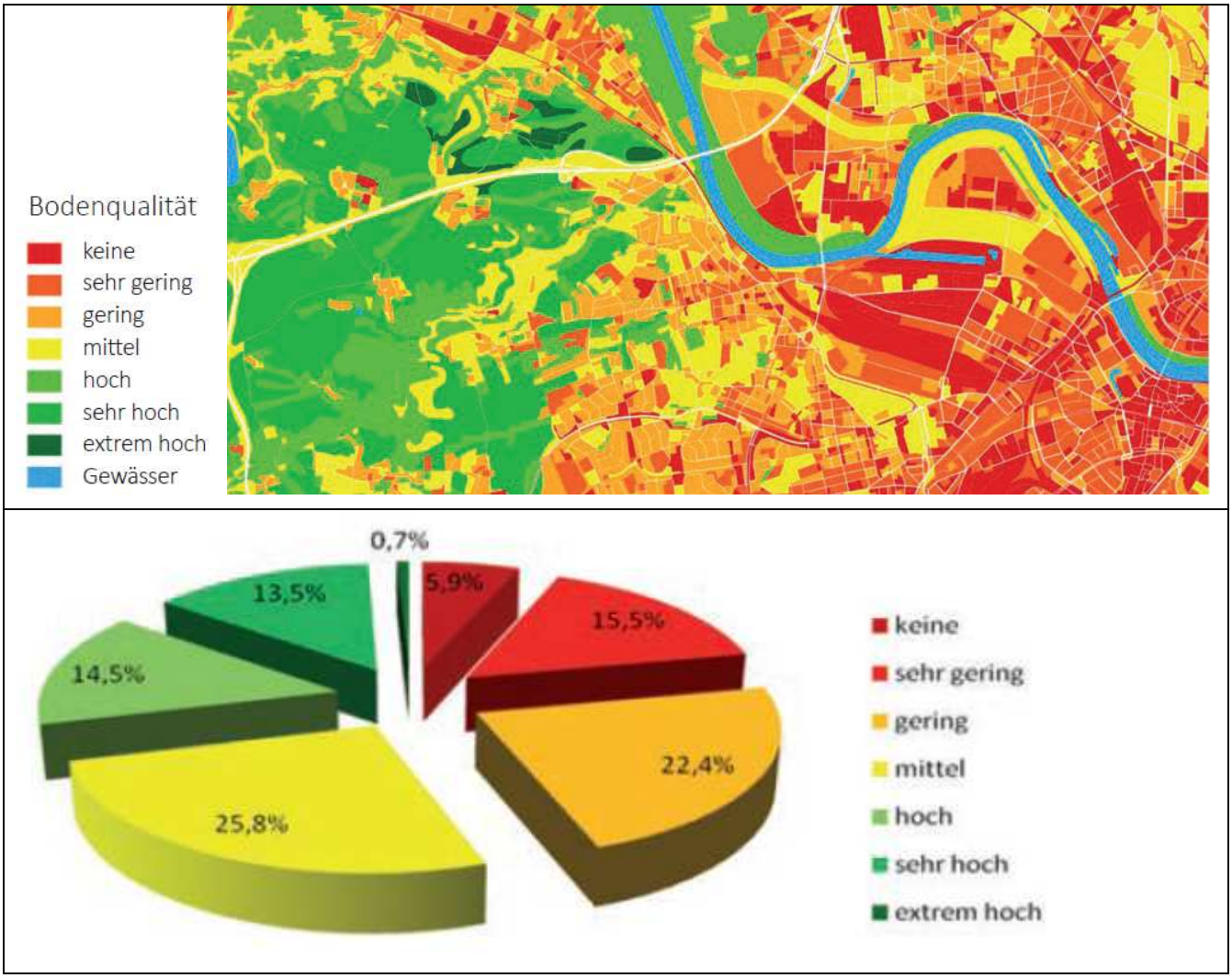
Source: Umweltamt Dresden

To ensure land take does not exceed the threshold of 40% and, at the same time, promote a sustainable urban development, the city of Dresden:

- favours inner urban development through urban regeneration and re-use of urbanised areas - a more compact city makes it possible to confine soil sealing as much as possible within already urbanised areas;
- does not rule out the use of new land, however, all new developments are made on poor

quality land and compensation is always guaranteed.

Dresden has prepared a 7-class soil quality map based on soil fertility/productivity. Every soil quality class is assigned a different level of protection. The possibility to use land for construction purposes is inversely proportional to soil quality.



Soil quality map and percentage breakdown

Source: Landeshauptstadt Dresden Umweltamt (2015) Umweltbericht 2011 bis 2014

This map along with other data and themes are entered in a web-GIS that can be accessed to and implemented by all public offices and can be used by citizens.

The landscape plan entails all levels that have to be protected - soil, water, biotypes etc. - and contains all information provided by the offices. It is taken into account in urban planning.

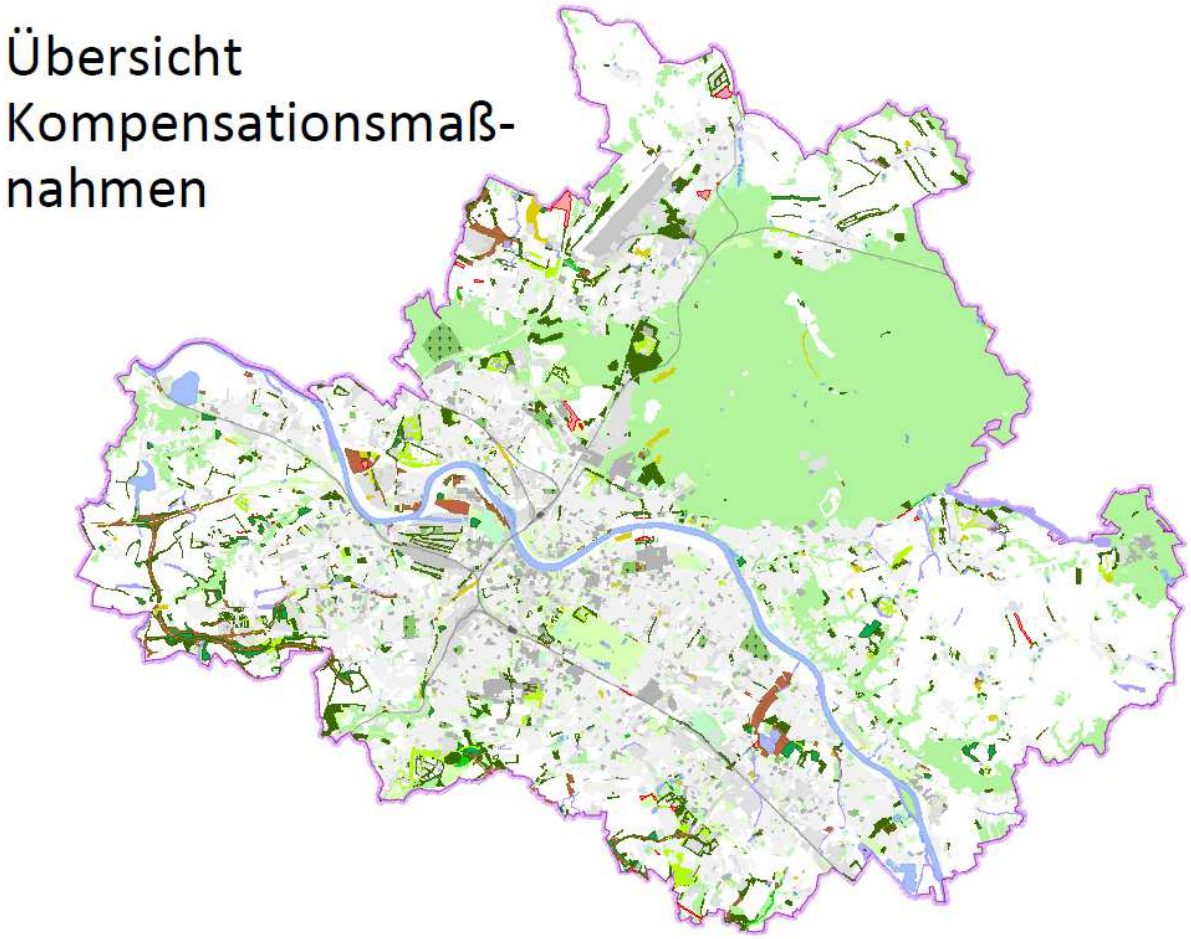
The municipal master plan defines the building opportunities and use of areas. In general, it does not authorise the use of agricultural areas - a large part of which is used for biomass production - and state-owned forests for construction purposes.

Given that construction in an area free of buildings affects the natural balance causing land loss, the city of Dresden established the Bodenausgleichskonto" *[Soil Compensation Account]* in 2002.

This compensation mechanism goes beyond the provisions of the national regulations and the ones enforced in Saxony.

The municipal plan of Dresden establishes that new developments - including infrastructure - require compensation in the form of de-sealing - sometimes preventive demolition - and restoring or greening measures somewhere else.

Compensations are primarily performed in areas identified by the landscape plan, with the aim of further integrating and strengthening the existing ecological network.



Map of compensations

Source: Umweltamt Dresden

Compensations are carried out taking into account:

- the availability of areas, as the compensation is not carried out in the construction/infrastructure development area, but somewhere else and private areas are hardly found;
- costs for real estate companies.

Urban regeneration interventions do not normally imply compensation, because the land is already consumed and the areas are mostly sealed. This is a zero-balance measure.

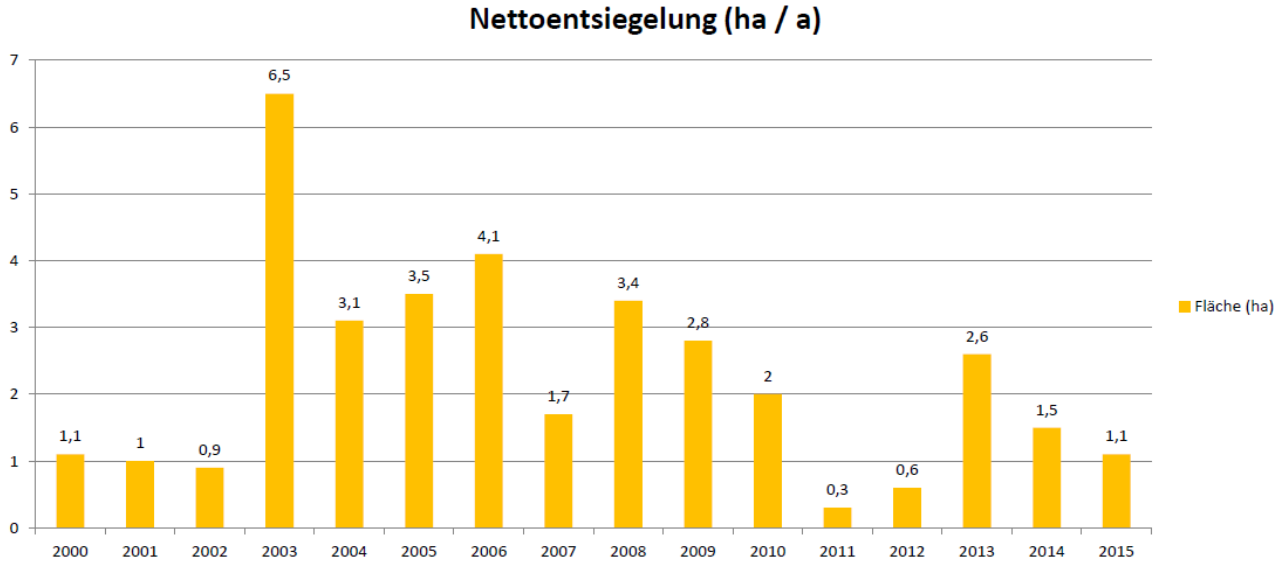
In most of the cases in the city, no compensation is applied, even in areas that are free of buildings. There are still many areas that were built-up before the World War II bombings where

rebuilding is permitted.

De-sealing is managed by the municipality, but the costs are paid by private investors. The well-established system is such that work is contracted to specialised companies on the basis of a project designed by an internal team of developers. This way, areas are restored according to quality standards.

From 2000 to 2005 over 36 hectares were de-sealed at an average cost of 20 euro/sq. m. (average cost paid to the municipality by the developers who have to compensate for new developments).

The real estate company is responsible for the maintenance and care of a de-sealed green area for a period of 25 years.



Compensation de-sealing over the period 2000-2015 (hectares per year)

Source: Umweltamt Dresden

So far in Dresden, a variety of interventions have been carried out to limit land take:

- demolition of buildings and soil restoration in forested areas;
- removal of culverted stretches of watercourses and related renaturalisation;
- demolition and conversion of often highly polluted brownfields into green spaces;
- demolition and de-sealing of production sites and restoring of agricultural land;
- de-sealing and subsequent construction of cycle and pedestrian paths in green spaces.

	Radeberger Strasse - Derelict hat making factory before demolition
	Area of the factory after demolition
	Area of the factory after de-sealing, with restored soil functions before reforestation

Source: Landeshauptstadt Dresden Umweltamt (2015) Umweltbericht 2011 bis 2014

Not all interventions were carried by private developers.

In some cases - mainly when real estate development was almost impossible for private investors due to the high cost of remediation of the areas - the urban regeneration was carried out at public level, through national and/or regional funds.

This is the case, for example, of the demolition, safety upgrade and reconversion into a small business and production area, and partly public green area, of the large site located in Cunnerdorsfer Strasse that at the time of the former GDR was home to an important factory where minerals containing uranium were treated.

Example of regeneration for production purposes (after safety upgrade) of a state-owned brownfield site where minerals containing uranium were treated.

Source: Umweltamt Dresden

The land take limiting strategy developed and implemented by Dresden is constantly monitored and periodically checked by the local administration with the purpose of assessing the effects thereof and adopting any corrective measures.

All compensations carried out are accurately illustrated and evaluated in periodical reports.

For the material and information about Dresden we would like to thank Wolfang Socher from the Environment Agency of the city of Dresden.

Ausgleichsmaßnahme
Militärbrache Langebrück

Bild 1: Lageplan aus cardo

Objekt:	ehemalige Nachrichteneinheit der NVA
Maßnahme:	Abbruch Asylbewerberheim Langebrück
Ort:	Dresden-Langebrück
Gemarkung / Flurstück:	Dresdner Heide / 122/4
Fläche:	Gesamtfläche 6,4 ha, davon Abbruch-Fläche 21.905 m²
Kosten:	219 500 EURO
Realisierung:	Oktober 2007 bis März 2009
Fördermittel:	Investitionszuschuß EFRE Stadtentwicklung Brachflächen/Eigenanteil Ausgleichsmittel
Grundstückseigentümer:	Landeshauptstadt Dresden

Bild 2: Wohnblock mit Baracken

- **Situation vorher**
  - Militärbrache, teilweise seit 1990 als Asylbewerberheim genutzt
- **Projektzielsetzung**
  - Rückbau aller militärischer Anlagen, Wiederbewaldung
- **Umsetzung/Realisierung**
  - Entkernung des Wohnblocks, Trennung Sperrmüll und Schrott (AGH-Maßnahme)
  - Abbruch der Gebäude (Wohnblock, Fahrzeughalle, Wachbaracke und 13 Holzbaracken), Entsiegelung bis zum Untergrund
  - sonstiger Abbruch (Straßenlampen, Eingangstor, Zisterne u.a.)
  - Entsiegelung der Betonstraßen und Wege
  - Entsorgung der Bauschuttmassen
  - Erstaufforstung einer Teilfläche als Laubmischwald, die restliche Fläche bleibt der Sukzession überlassen

Example of compensation carried out in Dresden - Summary sheet of demolition and de-sealing

Source: Umweltamt Dresden

3.1.2 STUTTGART

LIMITING MEASURE - "BODENINDIKATION" *[soil indicator]*

https://www.google.it/maps/place/Stoccarda,+Germania/@51.4438207,12.8797411,4043147m/data=!3m1!1e3!4m5!3m4!1s0x4799db34c1ad8fd3:0x79d5c11c7791cfe4!8m2!3d48.7758459!4d9.1829321

Coordinates 48°47′N9°11′E
Altitude 245 and 247m a.s.l.
Area 207.35 sq. km
Population 597,939 (31/12/2011)
Density 2,883.72 people / sq. km

Stuttgart is a German city, capital of the Federal State of Baden-Württemberg.

Located not far from the Black Forest and the Neckar River, in a valley enclosed by hills, the highest point in the city is 549 m a.s.l. and the lowest 207 m a.s.l. Many businesses are situated in the Neckar River valley, which has always been a polluted area.

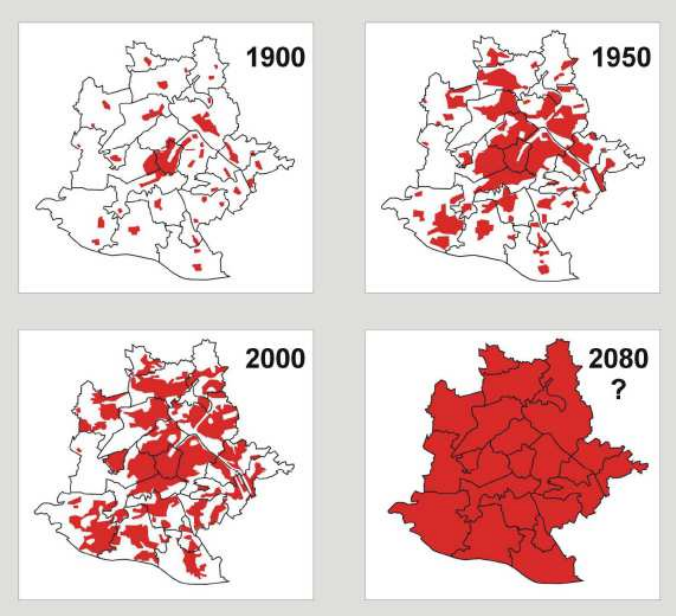
The urbanized area out of the total territory has increased over time from 6% in 1900 to 28% in 1980 and up to 50% in 2000. The municipal government realised that if land take continued at this pace, it would reach 100% of developable land areas by 2080.

Based on the evidence that the development model implemented so far was no longer sustainable, new planning and management tools were developed at local level in order to promote a more responsible land use and to limit new urbanized areas.

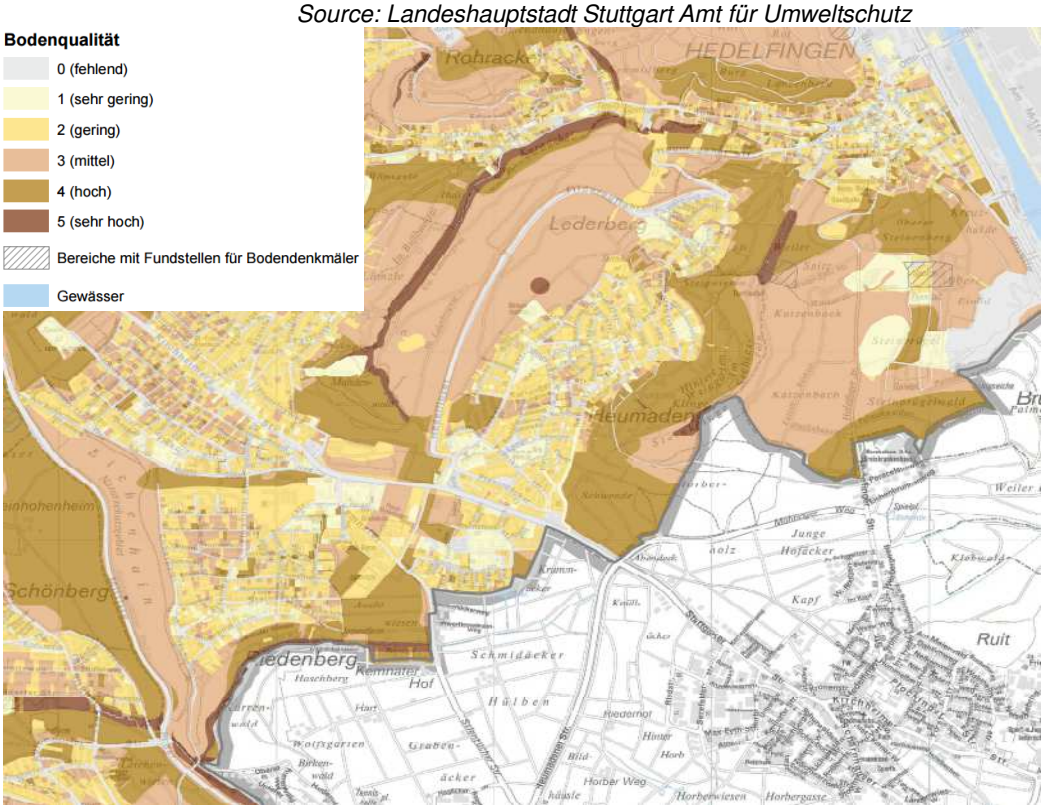
Both policy-makers and citizens are increasingly aware that soil protection is paramount, not only in terms of quantity (area), but also in terms of quality.

The method adopted by the city of Stuttgart can be described in brief as follows:

1) creating a detailed map of soil quality;
2) defining a consumption index to measure land take, which takes into account both the quantity and quality of consumed soil;
3) setting an objective in terms of yearly land take points;
4) monitoring land take - with an assessment and report every two years;
5) giving priority to developments inside the urbanised areas - rehabilitation and regeneration of urbanised areas - and limiting new developments (outside urbanised areas) as much as possible, even if compensated;
6) safeguarding high-quality soil through specific regulations.



Land take trend in Stuttgart
Source: Landeshauptstadt Stuttgart Amt für Umweltschutz



Map of soil quality
Source: http://www.stuttgart.de/img/mdb/item/19830/114870.pdf

Stuttgart has been testing this strategy for 10 years (2006-2016).

Below are more details about the strategy and its operating modes.

To assess the environmental impact of any intervention, it is necessary to analyse the quantity and quality of the potentially occupied soil.

Soil evaluation is based on a map in which soil quality - intended as the capacity to perform natural functions and deliver ecosystem services - is characterized by six levels from 0 to 5 (0 not assessable - 1 very low - 2 low - 3 medium - 4 high - 5 very high).

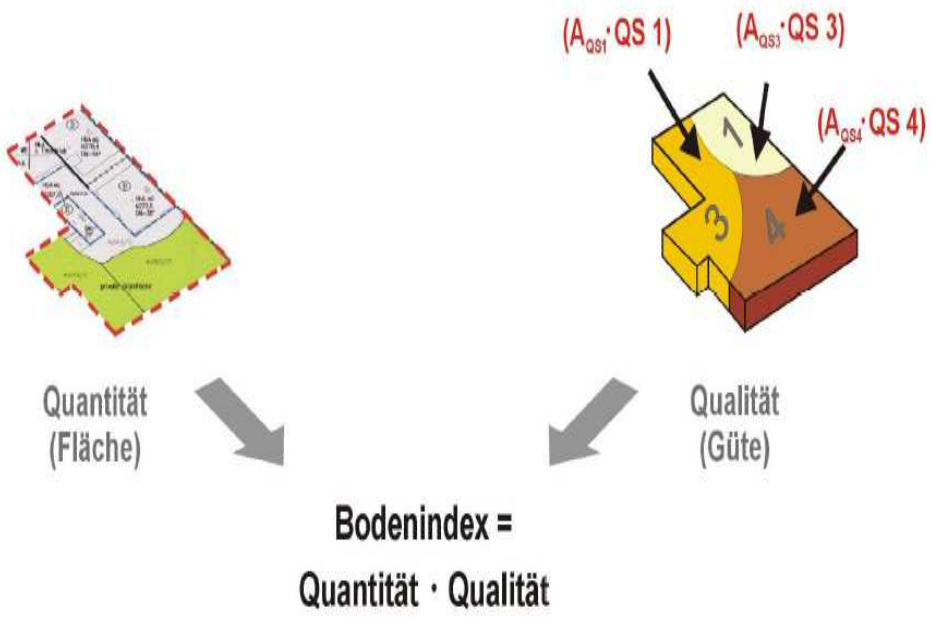
Soil quality in the map is the sum of ecosystem functions to be protected and anthropogenic impacts like pollution and sealing.

The soil indicator - quantity by quality - also helps support spatial planning decisions.

SOIL INDICATOR

$$Bx = \text{quantity } [A_{QS}] \cdot \text{ quality } [QS]$$

$$Bx_t=(A_{QS1}\cdot QS1)+(A_{QS2}\cdot QS2)+(A_{QS3}\cdot QS3)+(A_{QS4}\cdot QS4)$$



Soil indicator - Quantity and Quality
Source: Das Bodenschutzkonzept Stuttgart (BOKS) (Kurzfassung) January 2007

The guiding principle is to preserve soils with the highest quality levels.

Soil quality is assessed based on the following parameters:

1) filter and lung function (clay content, humus, soil pH);
2) water purification and storage;
3) organic matter;
4) hydraulic functions;
5) biodiversity;
6) soil type.

Soils with the highest quality are the most effective on climate and support to life.

A report is prepared every two years to evaluate the achievement of the goal of limiting land take.

Land take in outer areas - new urbanisations - must be compensated.

New outer urbanisation

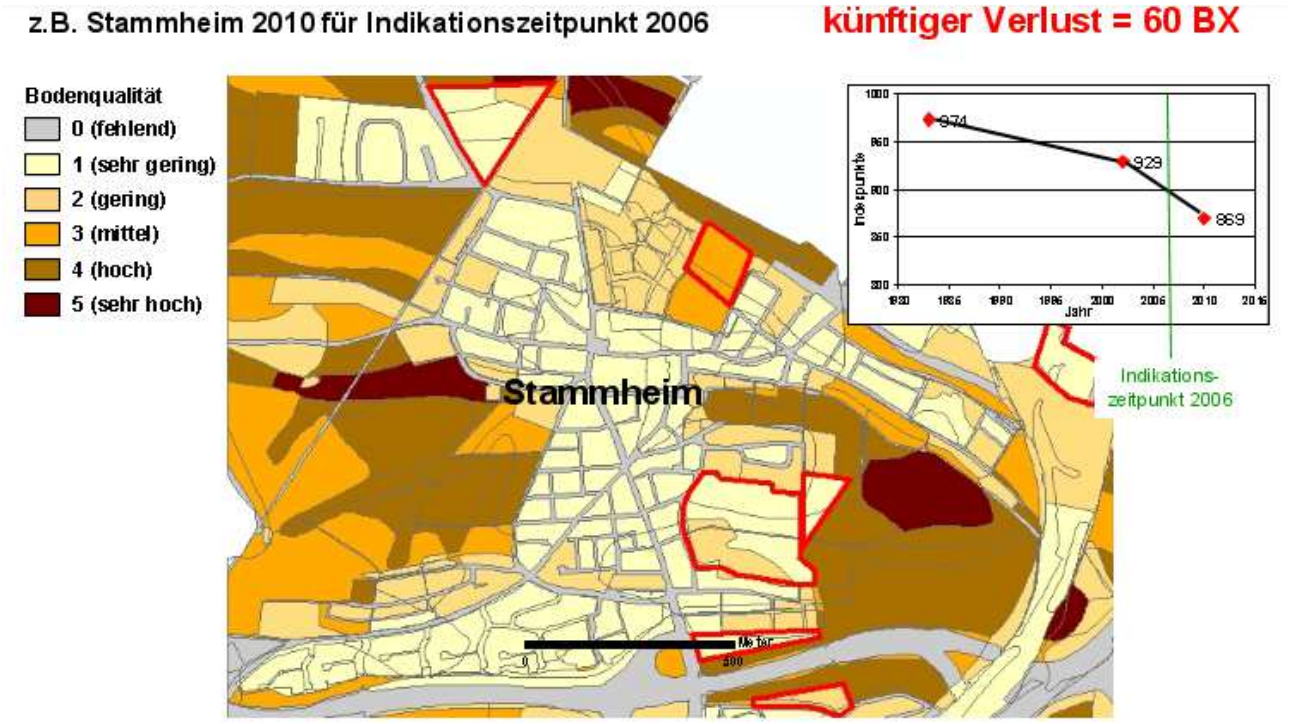
Source: Landeshauptstadt Stuttgart Amt für Umweltschutz

However, regardless of how much one compensates, urbanised soil is lost.

It is not possible to recover all ecosystem functions which are lost via soil transformation and sealing. From a mathematical viewpoint, the loss of soil cannot be fully compensated, leaving a deficit. Avoiding land take would be the best thing.

Furthermore, compensation has a high technical cost and makes it possible to restore only part of soil functions.

In the City of Stuttgart, de-sealing is a useful and effective compensation method, especially in small sealed areas. However, it is not suitable for large surfaces.



Soil quality in compensated areas

Source: Landeshauptstadt Stuttgart Amt für Umweltschutz

De-sealing can cause further land take, because the sealing layers that are removed must be disposed of in a landfill.

The urbanisation of new areas necessarily implies the implementation of compensation measures that however have contraindications - not only de-sealing, but also renaturalisation or biodiversity interventions have some contraindications.

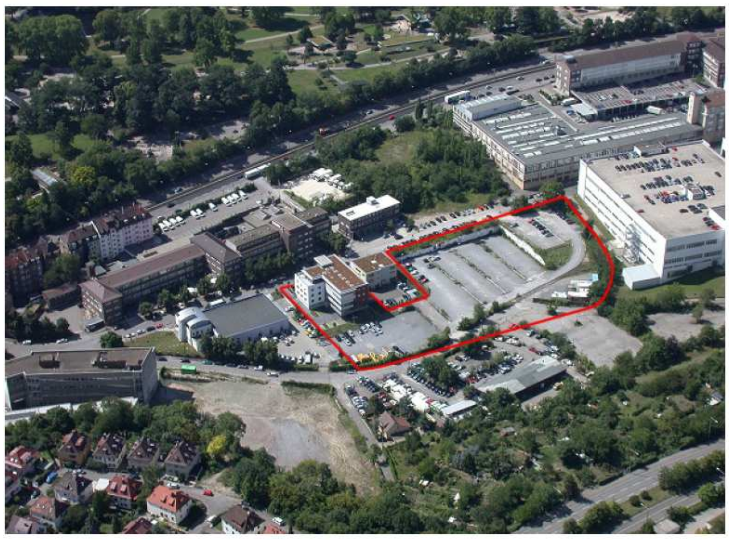
As a result, the damage caused by taking new land can be hardly offset through compensation.

This is why the City of Stuttgart prioritises the recovery of derelict sites, including reclaiming degraded land, and promotes developments within the urbanised territory, thus considerably limiting the use of new soil (even if compensated).

By focusing on internal urbanised areas that are already degraded and need regeneration and renovation, it is much easier to reach the national goal of limiting land take by acting positively on the trend and considerably reducing consumption, while at the same time promoting growth and development.

To support this strategy, the City of Stuttgart has launched a project for the management of derelict sites (NBS - http://gis6.stuttgart.de/nbs/stplnbs.html) with the aim of reconverting them into residential, commercial or mixed areas.

A database of all sites in the city which can be potentially re-used has been prepared and is constantly updated. A sheet is filled out for each area, containing information about the plot, building potential, number of building levels, use and availability of the area. Areas with a building surface of at least 2,000 sq. m. are usually listed. The database includes over 400 areas, accounting for more than 600 ha, and is managed via GIS. Investors can find information on the available areas and their features on the municipality's website where 40 sheets have been published. By implementing the database, new areas for regeneration are always available, and they represent an alternative to new urbanisations.



Stadtplan

Luftbild

Standort

Am westlichen Rand des Stadtbezirks Bad Cannstatt im Arbeitsstättengebiet Pragstraße. Liegt im Vorranggebiet für die Stadterneuerung; Aufwertung aus städtebaulicher Sicht erwünscht.
Infos zum Stadtbezirk: Bad Cannstatt im Internet
Vermarktung/Vermietung: Wizemann Areal

Verkehrliche Situation

Über die Pragstraße (B10), Löwentorstraße und den nahegelegenen Pragsattel (B27, B295) gut an das überörtl. Straßenverkehrsnetz angeschlossen. Stadtbahnlinie U13 nach Bad Cannstatt (S-Bahn) und zum Pragsattel mit Anschluss an die Innenstadt und die nördl. Stadtbezirke. Buslinien 55 und 56 auf der Löwentorstraße zum Nordbahnhof (S-Bahn) und nach Bad Cannstatt.

Grundstück

ca. 1,1 ha

Realisierbare Geschossfläche

9.800 qm

Eigentümer

Privat

Derzeitige Nutzung

Brachfläche, Stellplätze

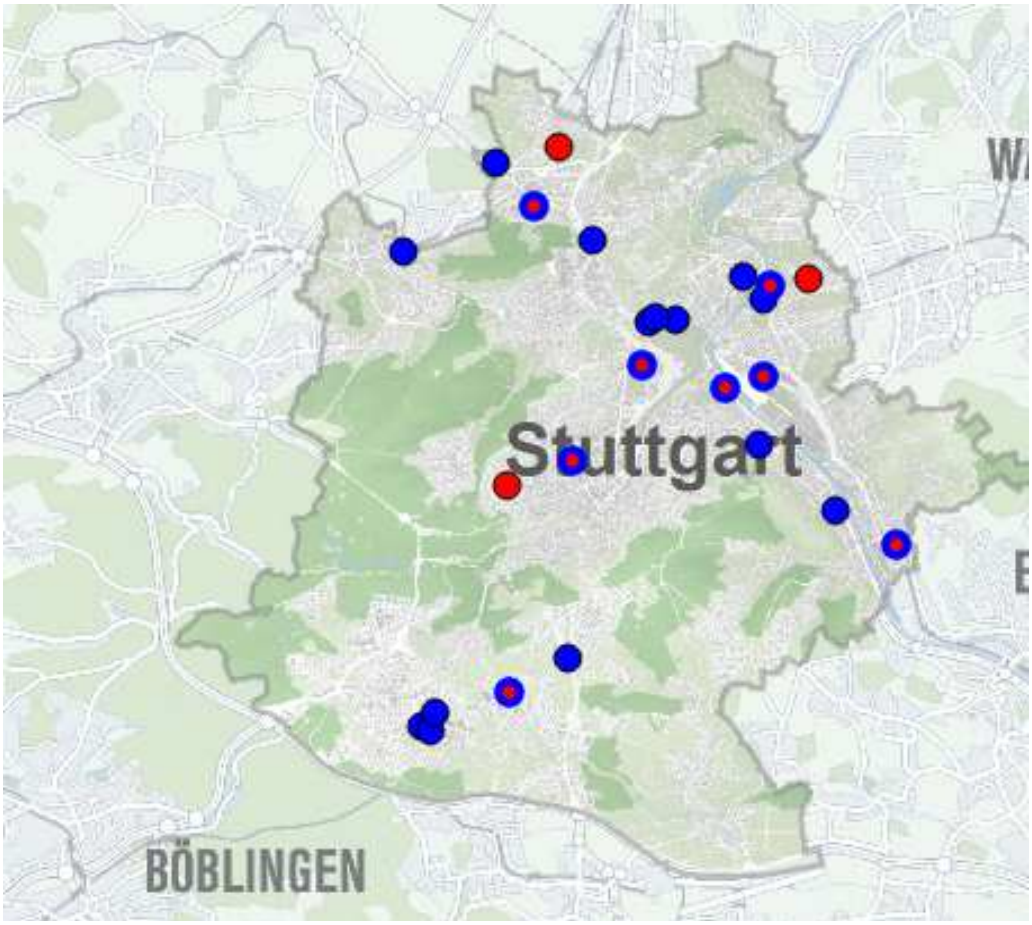
Planungsrechtliche Situation

FNP Stuttgart: Gewerbliche Baufläche (G).
Im Bebauungsplan als Gewerbegebiet festgesetzt.
Vorbereitende Untersuchungen nach § 141 BauGB

Künftige mögliche Nutzung

Gewerbe. Gebäudehöhe max. 11 bzw. 15 m

Example of a sheet for an area that needs regeneration
Source: http://gis6.stuttgart.de/nbs/stplnbs.html



Map of the areas to be regenerated
Source: http://gis6.stuttgart.de/nbs/stplnbs.html

The blue dots on the map of available areas for regeneration indicate the sites for commercial use, the red dots indicate the residential sites and the red and blue dots refer to mixed use.

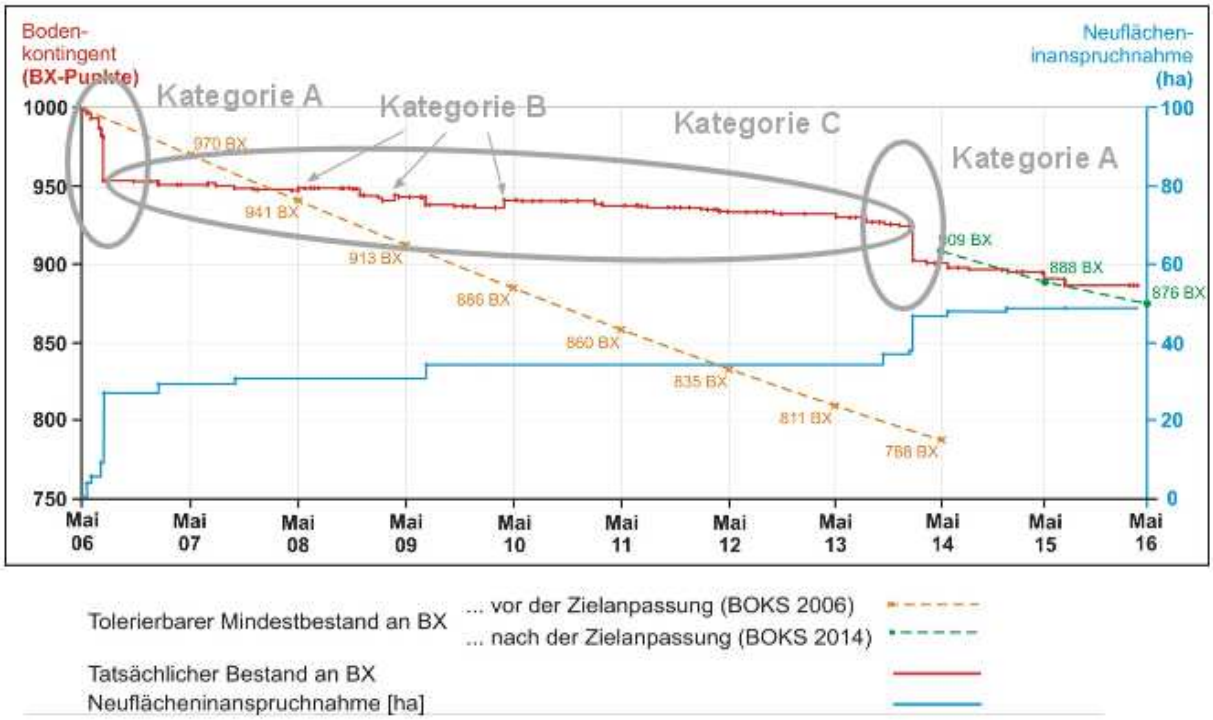
The internal development potential (urban regeneration) limits the loss of soil.

Areas to be regenerated amount to 87% of all planned areas and caused a land take equal to 37%.

On the contrary, only 13% of all planned areas were urbanised (outer areas), but they caused nonetheless a loss of soil equal to 63%.

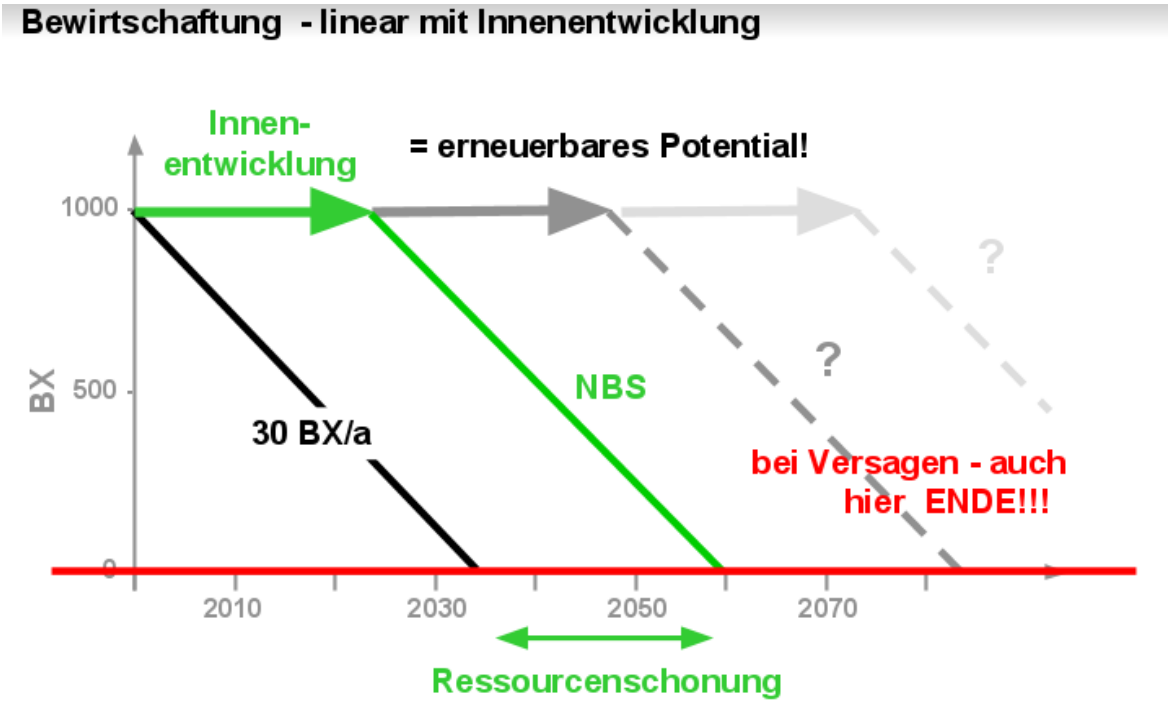
The City of Stuttgart has set the goal of reaching almost zero consumption of external soil (on new areas) in the near future. This is the only way to preserve non-urbanised soils.

For the material and information on Stuttgart we wish to thank Hermann J. Kirchholtes, Gerd Wolff, Ulrich Reuter, Petra Blumlein, Robert Schulze Dieckhoff from the departments of Spatial Planning and Environmental protection of the Municipality of Stuttgart.



Land take over the period 2006-2016

Source: Landeshauptstadt Stuttgart Amt für Umweltschutz



Impact of internal development potential (urban regeneration) on land take.

Source: Landeshauptstadt Stuttgart Amt für Umweltschutz

3.1.3 BAVARIA

COMPENSATION MEASURE - "ÖKOKONTO" *[eco-account]* and "FLÄCHENPOOL" *[green registry]*

Coordinates 48°08′N 11°34′E
Area 70,551 sq. km
Population 12,604,244 (31.12.2013)
Density 178.65 people /sq. km

Source: https://www.google.it/maps/place/Baviera,+Germania/@49.0052743,14.606428,3594431m/data=!3m1!1e3!4m5!3m4!1s0x479f044c0fdf53a9:0x11d25a409387960!8m2!3d48.7904472!4d11.4978895

The regional development programme of Bavaria includes an "agreement for land saving" entered into by the regional government, municipalities and associations, with the aim of limiting land take and at the same time strengthening the economy by increasing the ownership share of the houses.

Bavaria has transposed the provisions of the national law on nature preservation (BNatSchG 2002 amended in 2009) into its own 2003 regulation *"Bauen im Einklang mit Natur und Landschaft" [Building in harmony with nature and landscape]*. Municipal planning includes two instruments for ecological compensation: the eco-account system (*"Ökokonto"*) and the green registry (*"Flächenpool"*).

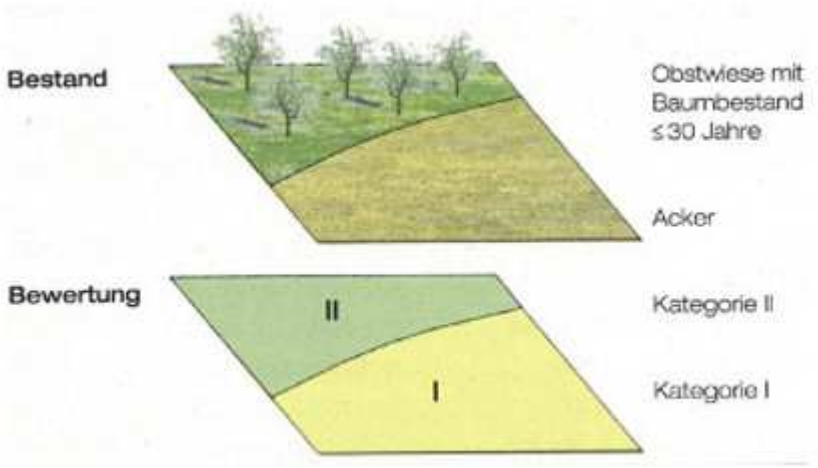
Any land use change, due to building or urbanisation, has an impact on the environment that must be subjected to an environmental assessment and compensated.

In order to limit land take, every municipality creates a green registry (*"Flächenpool"*) of areas that are to be subject to renaturalisation. The developer carrying out compensation must acquire compensation credits to offset the ecological and environmental damage and permanent residual impacts caused by the development project.

The areas included in the "green registry" can only and permanently be used as green areas and must be available before issuing a building permit. This system ensures that compensation can be carried out every time a development project is implemented.

The "green registry" is made of public areas; however, if no public area is available, it is also possible to foresee purchasing private areas, trading areas or defining agreements for the renaturalisation of private areas.

If no areas are available in the "green registry", the Municipality cannot issue building permits.



Source: https://www.innenministerium.bayern.de/buw/staedtebau/oekologie/leitfadeneingriffsregelung/index.php

The eco-account system (*"Ökokonto"*) quantifies the compensatory measures according to the following main principles:

- ecological importance (high, medium or low) of the area to be transformed based on land use and sealing as assessed by the Bavarian Environment Agency;
- sealing ratio: impact of land use change in terms of new sealed land;
- any measures aimed at reducing or mitigating the impact - they affect the quantification of the compensatory measures;
- different intensity of residual impacts, calculated by combining the first two parameters in a matrix.

The compensation area is calculated by using a compensation factor (FDC) that varies according to the quality of soils to be transformed and expected sealing.

Compensation area = land use change area x FDC

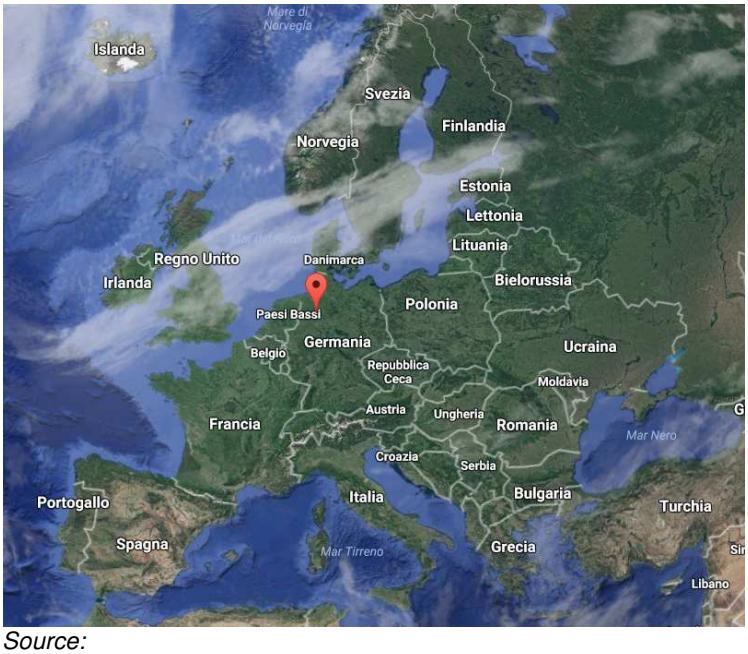
Compensation is carried out before the land use change it refers to.

Compensations are mainly renaturalisation of watercourses, reforestation or afforestation, or land use prescriptions.

Compensatory measures for the renaturalisation of watercourses.
Source: http://www.lfu.bayern.de/natur/oekoflaechenkataster/index.htm

3.1.4 BARNSTORF

REGENERATION - Enhancing the city centre



Source: https://www.google.it/maps/place/49406+Barnstorf,+Germania/@49.8965541,10.0376373,4677491m/data=!3m1!1e3!4m5!3m4!1s0x47b0b517d6c43411:0x83b95b596d90d503!8m2!3d52.7064102!4d8.4976082

Coordinates 52°43′N 8°31′E

Area 52.36 sq. km
Population 5913 (31.12.2008)
Density 112.93 people /sq. km

Barnstorf is a small town located in Lower Saxony, northern Germany. As part of the sustainable management of the territory, the municipality has censused the free lots available in the built-up area with the aim of countering the depopulation of the inner city, strengthening inner developments and revitalizing the city centre.

The map available online contains macro information for each lot such as lot area, zoning, presence of buildings, land use, level of use of structures, etc.

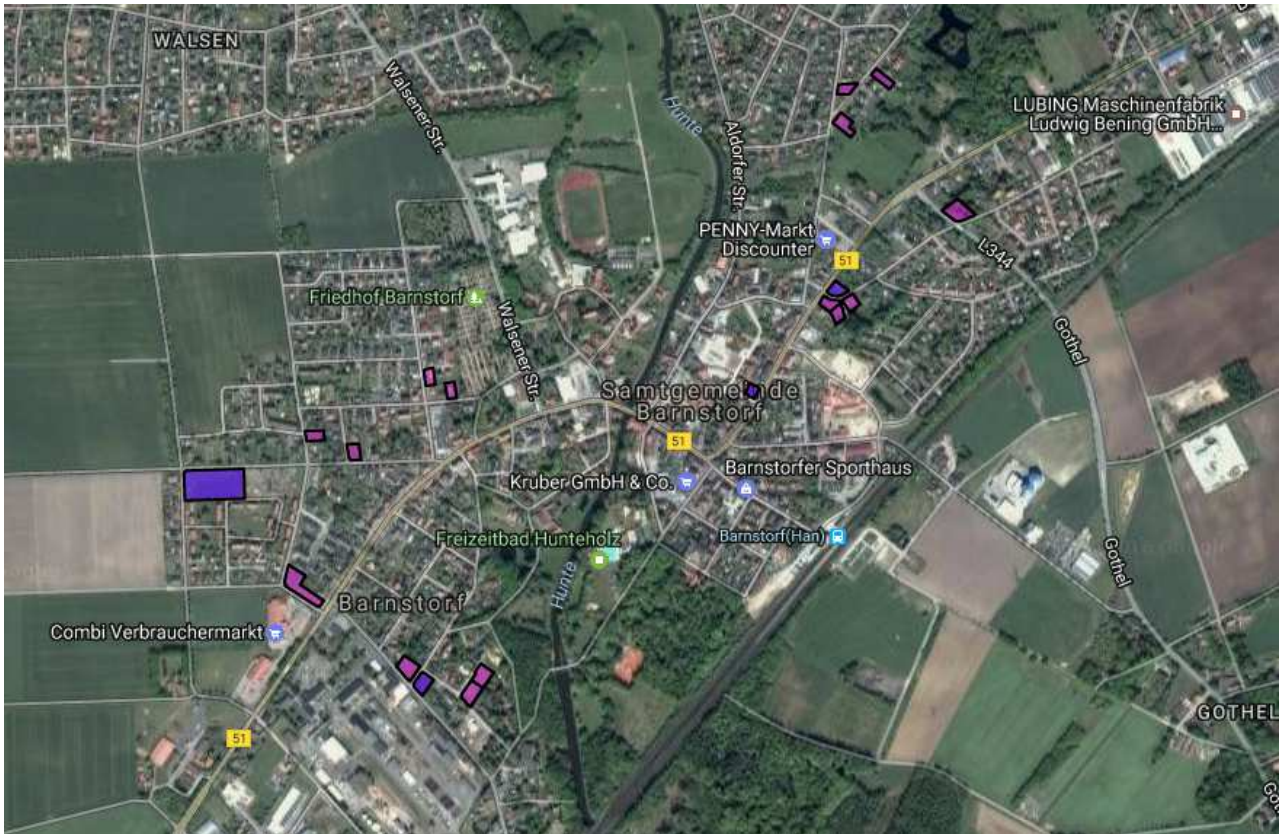
This strategy is part of an extensive sustainable approach to managing the territory. It sets out that, starting from 2009, new residential and commercial areas can only be developed by re-using already built-up areas. New developments are permitted only in some exceptional cases, after carefully assessing the costs and benefits for the citizens.

Despite being private, free lots are available because the municipality has preliminarily shared the programme with the owners. The municipality allocates funds to further support the programme, as an additional financial incentive for interventions aimed at enhancing free or abandoned lots in the town centre.

In the censused lots one can:

- buy and renovate old buildings;
- build new buildings on the free lots;
- demolish old buildings and build new ones on the same site.

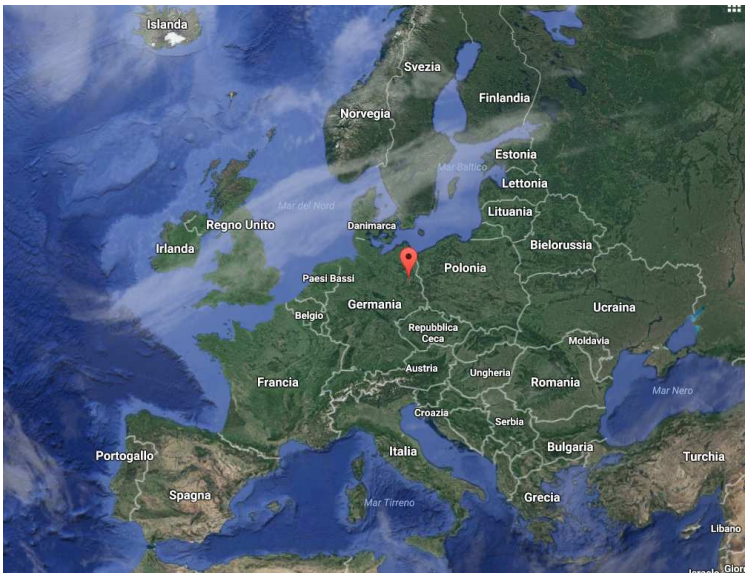
Funding is granted as an interest rate subsidy: the amount varies and also takes into account household composition.



Barnstorf
Source: http://www.vermessungsingenieur.de/baulueckenkatasterBarnstorf.php

3.1.5 BERLIN

LIMITING LAND USE - "Potentials for Impervious Coverage Reduction" project



Source: https://www.google.it/maps/place/Berlino,+Germania/@51.2555389,9.9217273,3956642m/data=!3m1!1e3!4m5!3m4!1s0x47a84e373f035901:0x42120465b5e3b70!8m2!3d52.5200066!4d13.404954

Coordinates	52°31′07″N 13°24′29″E
Area	891,85 sq. km
Population	3,531,201 (2015)
Density	3959.41 people /sq. km

Berlin is the Capital of the Federal Republic of Germany and seat of government.
It is also a Federal State (city-state) of Germany.

The State of Berlin is aware that land take for the construction of new buildings causes the loss of soil functions with permanent negative impacts on the effectiveness of the natural balance.

Soils have many functions that must be protected: habitat for vegetation and soil organisms, retention and filter capacity for underground water, buffer capacity for organic contaminants, key function for agriculture and a healthy life, archives of natural and cultural history. These key soil functions must be protected by taking suitable measures aimed at preserving soil in future spatial planning.

Soil is even more important due to ongoing climate change and the need for preserving biodiversity.

Soil sealing is one of 16 key indicators used by the State of Berlin to measure sustainable development.

In addition to enforcing (quantitative) national regulations aimed at limiting land take and being fully aware of the importance of proper spatial planning, the State of Berlin has adopted analysis and management tools that combine soil protection with environmental impact assessment for the new settlements.

Firstly, the soil functions throughout the territory of Berlin were specifically evaluated.

Soil functions were weighted differently depending on quality, thus leading to the identification of soils that need higher-level protection:

- soils with archive value (natural and cultural history) and soils that host rare almost natural vegetation that deserve extraordinary protection because they cannot be recovered;

– soils that regulate the water balance and have a buffer and filter capacity that need to be protected, even more so if the said two functions coexist;

– soils that ensure high yield of crops.

As a result, soil functions were prioritized from the most important and sensitive ones.

To assess soil quality, five protection categories were identified, from the maximum protection level to the lowest. They imply recommendations and limitations to town planning interventions and building projects.

The soil protection levels are as follows:

– maximum protection level,

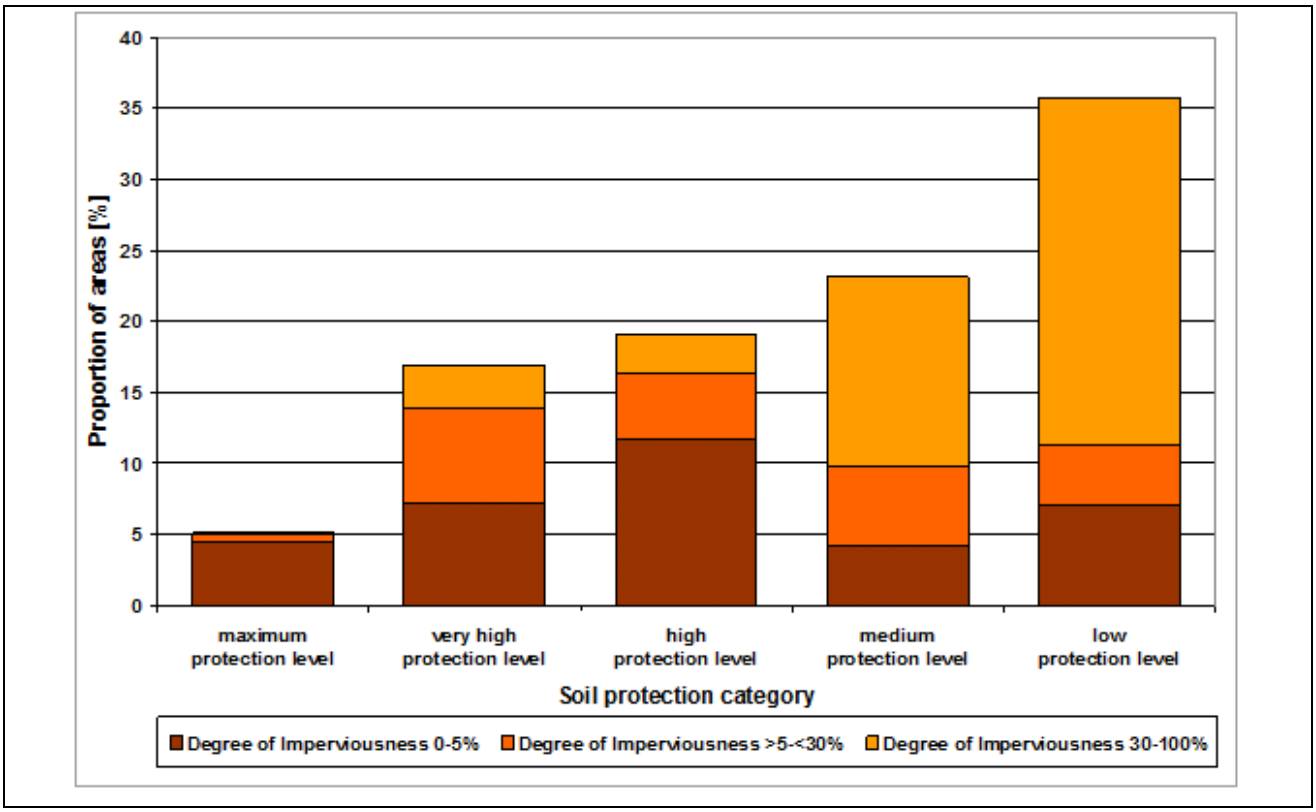
– very high protection level,

– high protection level,

– medium protection level,

– low protection level (soils with no special features).

Soil categories are indicated on thematic mapping.



Area shares of soil protection categories by imperviousness class (percentages, without roads and waters)

Source: http://www.stadtentwicklung.berlin.de/umwelt/umweltatlas/edb113_04.htm#Abb7

The maps also show the sealing levels of the different areas in the municipality in different colours.

The areas where sealing is 5% or less are considered as fully de-sealed, interrupted only by scattered buildings, pathways or other including woodland, fields and pastures, vegetable gardens, single family houses, parks and other open spaces which can also have quasi-natural land.

Areas with sealing exceeding 30% are mainly residential, commercial and productive areas, as well as areas used for transportation - roads, railways, etc.

Maps also include regulatory provisions (Planning Notes for soil protection) which contain important recommendations on soil protection planning. On the basis of the weight assigned to soil functions and soil sensitivity in Berlin, soils can be individually evaluated when, for example, planning urban development rules require diverting construction from soils that are scientifically ranked as high value soils and finding alternative sites.

In addition to soil assessment and classification, and enforcing rules to spare high value soils from land use change, Berlin focused on compensation for the new sealed soils.

When building in a sealed area, it is difficult to compensate sealing.

In theory, the sealing of a new area would be best compensated by de-sealing another area.

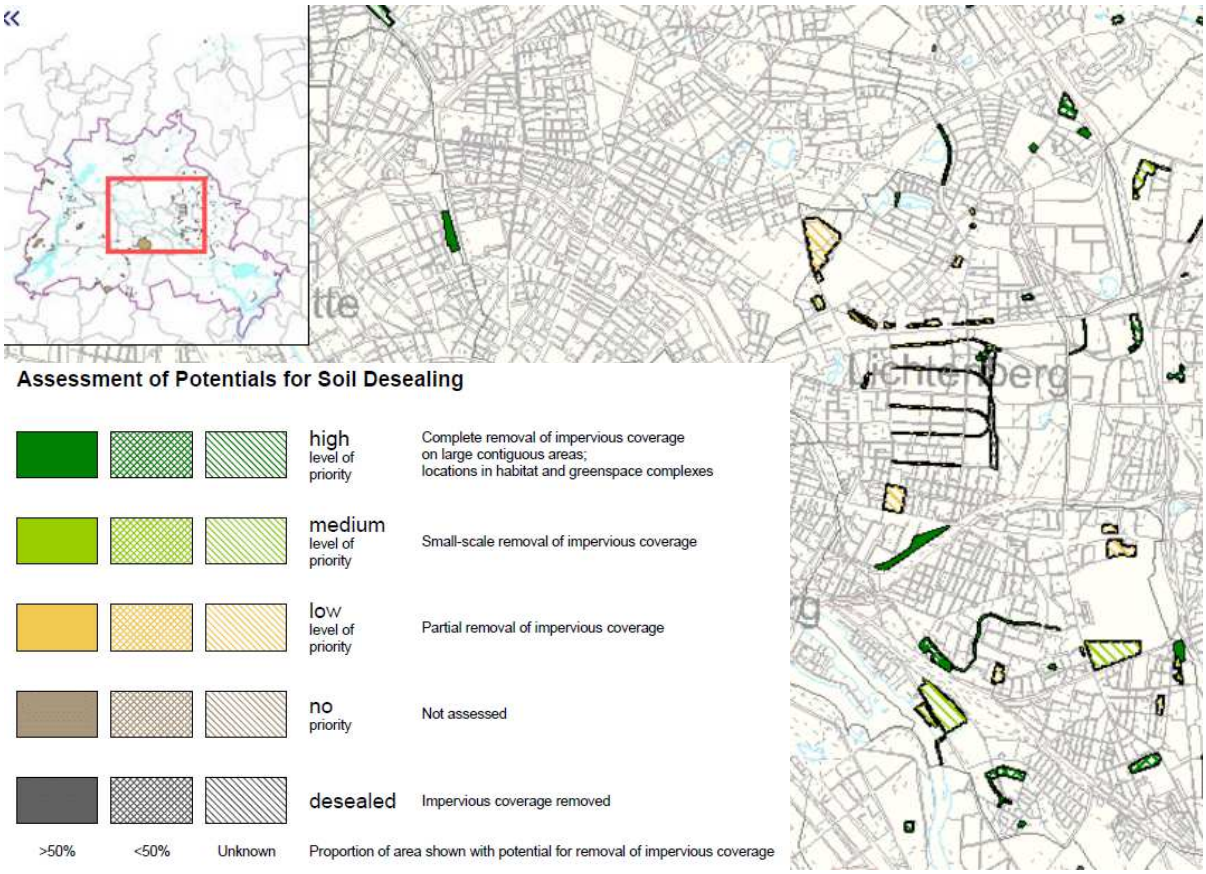
Nonetheless, finding areas for de-sealing is not easy in Berlin. Indeed, there is a shortage of these areas: any strategy involving compensation should foresee a survey on available areas suitable for de-sealing and the creation of a dedicated database.

In order to increase the number of areas for de-sealing, a project called “Potentials for Impervious Coverage Reduction" was started. The aim of the project is to identify and evaluate soils that might be de-sealed in the near future. Soil functions should be restored in these areas, so as to foster the development of important habitats for vegetation and soil organisms.

The project entails the setting up of a uniform system of classification and assessment of the said areas for the whole city. This system should be constantly updated.

During the period 2010-12, a survey was first carried out in the 12 boroughs of the city, at the four Forestry Agencies of Berlin and among private citizens. The most recent update was made between March 2015 and October 2015. The data gathered during the survey were entered in a database managed by the central government. In the future, public authorities can add further information and suggestions on other areas.

Landowners can use the database to get information on areas available for de-sealing, but they can also have their non-building land included in the database, after checking its eligibility.



Maps of areas eligible for de-sealing

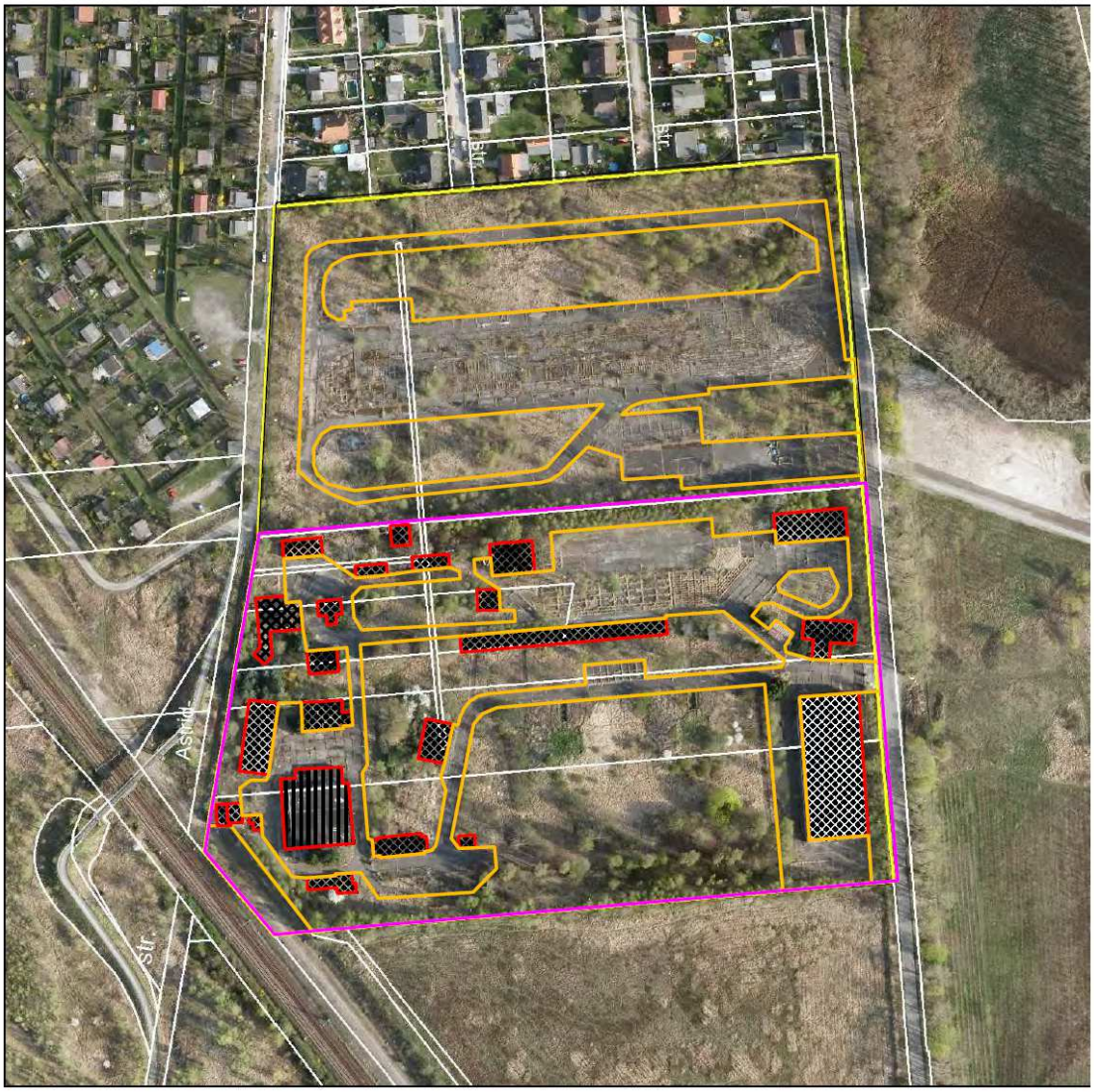
Source: http://fbinter.stadt-berlin.de/fb/index.jsp loginkey=showAreaSelection&mapId=ewmsk_entsiegelungspotenziale@esenstadt&areaSelection=map&Szenario=fb_en

To support de-sealing interventions, a specific tool was designed for an easy assessment of de-sealing costs. Moreover, based on the examples found in literature, an operational guide was prepared which contains a technical explanation on how to perform de-sealing and some indications on quality standards.

Sealed soils were identified and classified based on the impacts they have on the ecosystem.

The following data were collected for each area:

- location of the area (borough, neighbourhood, address, coordinates);
- ownership;
- use (current and future);
- pavement class and degree of permeability;
- extent of de-sealing;
- special issues, hurdles to planning, etc.



Legende	Flächen (digitalisiert)
Typ 1 - ungebundene Befestigungen	- 0 m² (nicht vorh.)
Typ 2 - Nebenflächen	- 29.500 m²
Typ 3 - Straßen	- 0 m² (nicht vorh.)
Typ 4 - Gleise	- 0 m² (nicht vorh.)
Typ 5 - Mauern, Einfassungen	- 2.184 m²
Typ 6 - Gräben	- 0 m² (nicht vorh.)
Typ 7 - Garagen	- 4.950 m²
Typ 8 - eingeschossige Gebäude	- 920 m²
Typ 9 - mehrgeschossige Gebäude	- 325 m²
Typ 10 - Sonderbauten	- 0 m² (nicht vorh.)

Example of area eligible for de-sealing

Source: http://www.stadtentwicklung.berlin.de/umwelt/bodenschutz/de/vorsorge/download/arbeitshilfe1-ostenansaetze.pdf

Then these data were connected to the geographical data from the spatial information system (master plan - FNP - protected areas based on right to conservation - Law on environment protection, Conservation law, Habitat directive - orthophotos, etc.) in order to create an easy to read map of areas available for de-sealing.

To do so, research was combined with information gathered by local experts and assessment based on geographical data provided by the State of Berlin.

De-sealing is prioritized according to the following data:

- right of ownership;
- expert's assessment;
- technical effort;
- time needed for implementation.

"High" priority areas are publicly owned or available for other reasons - for example, because an agreement was entered into with a private owner. "Medium" priority areas are owned by funds, institutes or federal agencies. Private areas are generally classified as "low" priority.

With respect to the expert's assessment, "high" priority areas are those that after de-sealing can be directly connected to green areas or public spaces - either existing or foreseen within the project. "Medium" priority areas, on a large scale, do not have direct connection with green areas but through further de-sealing. "Low" priority areas indicate those areas that remain isolated after de-sealing.

“Technical effort” refers to the degree of sealing, also taking into account the presence of structures onsite that would require an increased demolition effort.

In terms of time needed for implementing, areas are classified as short term (1 to 2 years), medium term (up to approx. 5 years) and long term (over 5 years).

The Municipality of Berlin also defined an urban development index aimed at ensuring minimum ecological standards for new developments or regeneration operations named BAF (Biotope Area Factor), which indicates the amount of permeable soil needed to respect the ecosystem, taking into account the following environmental quality goals:

- safeguarding and improving the microclimate and atmospheric hygiene;
- safeguarding and developing soil functions and water balance;
- creating and enhancing the quality of the plant and animal
- habitat;
- improving the residential environment.

$$BAF = \frac{\text{ecologically effective areas}}{\text{total land area}}$$

The BAF covers all urban uses - commercial, residential, craft-industrial, public facilities, technical infrastructure - and formulates minimum ecological standards for structural changes and new developments.

The individual parts of a plot of land are weighted according to their "ecological value".

Type of surface		Faktor
Impervious surfacesimpermeable to water and air, no plant establishment. (concrete, asphalt, impenetrable surface)		0,0
Partially impervious surface permeable to water and air, without plant establishment. (paving stones, sand, gravel)		0,3
Half open surfaces permeable to water and air, some plant establishment. (gravel with grass, wooden deck, grass reinforcement)		0,5
Plant surfaces without contact with the underlying groundupper decks (over underground cellars or garages) with less than an 80 cm earth layer		0,5
Plant surfaces without contact with the underlying ground no contact with the ground, more than 80 cm earth layer		0,7
Plant surfaces with ground contact vegetation with ground contact, accessible for development of flora and fauna		1,0
Rainwater infiltration per m^2 roof area precipitation that infiltrates and regenerates groundwater, infiltration over surfaces with existing vegetation		0,2
Vertical greenery up to 10 m high greenery that covers inner and outer walls without windows, the actual height, up to 10 m, is taken into consideration		0,5
Green roofs extensive and dense plant cover on a roof surface		0,7

Definition of surfaces and weighting factor according to the Berlin BAF

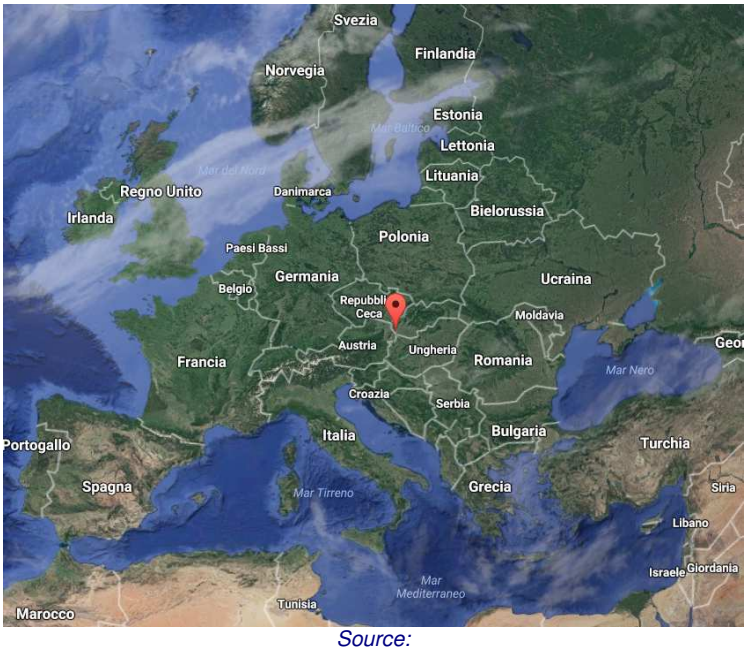
Source: Stadtentwicklung Berlin

3.2 SLOVAK REPUBLIC

In Slovakia, both national and municipal regulations set out compensation measures for the conversion of agricultural or forestry soil. Namely, the Decree of the Government of the Slovak Republic no. 376/2008 defines the fee to be paid depending on the class of affected soil.

This measure aims at discouraging the use of high quality agricultural land next to cities, in order to meet food demand through agriculture.

3.2.1 BRATISLAVA



Source: https://www.google.it/maps/place/Bratislava,+Slovacchia/@49.4524776,9.4039209,4339333m/data=!3m1!1e3!4m5!3m4!1s0x476c89360aca6197:0x631f9b82fd884368!8m2!3d48.1485965!4d17.1077477

Coordinates 48°08′00″N 17°06′00″E
Area 367,584 sq. km
Population 491,061 (2014)
Density 1335.92 people /sq. km

Regulation on urban planning and zoning no. 4/2007 of the city of Bratislava combines direct compensation with compensatory fees set at national level for agricultural soil consumption, except for:

- developments covering an area of less than 1,000 sq. m. or 500 sq. m. in the urban environment;
- access roads to fields;
- roads and motorways;
- military facilities;
- buildings of collective interest.

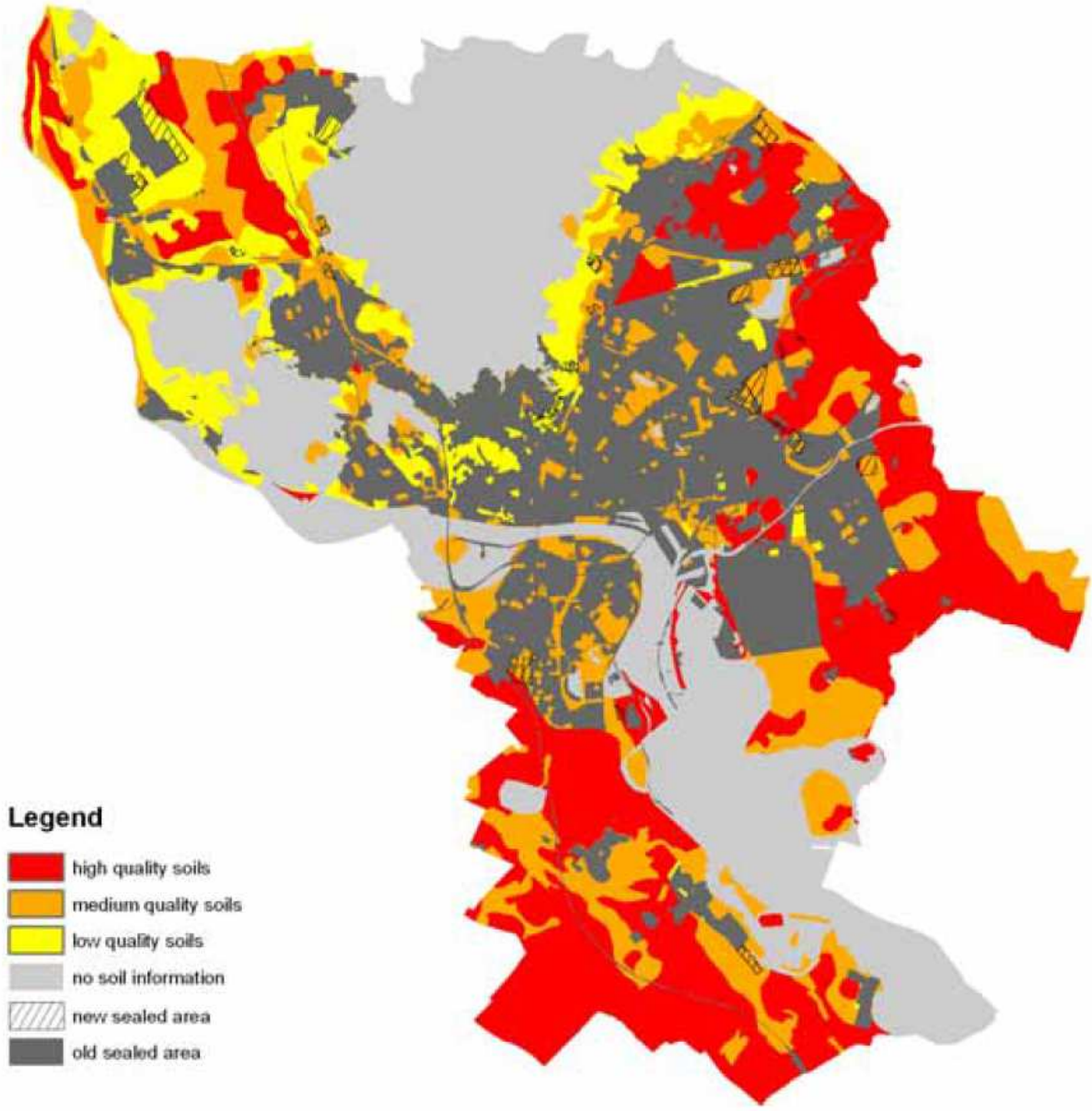
The city of Bratislava has implemented direct compensation: whenever agricultural soil is converted, green areas must be created equal to 10% of transformed land in the case of production units, and to 20-30% in the case of residential use or services. If no area is found for conversion into a green area, it is possible to partly achieve the "standard" by creating green roofs.

The soil quality map of Bratislava includes 9 soil quality classes based on the national evaluation

system.

Classes 1 to 4 includes the highest quality soils, classes 5 to 6 are medium quality soils, whereas classes 7 to 9 refer to low quality soils.

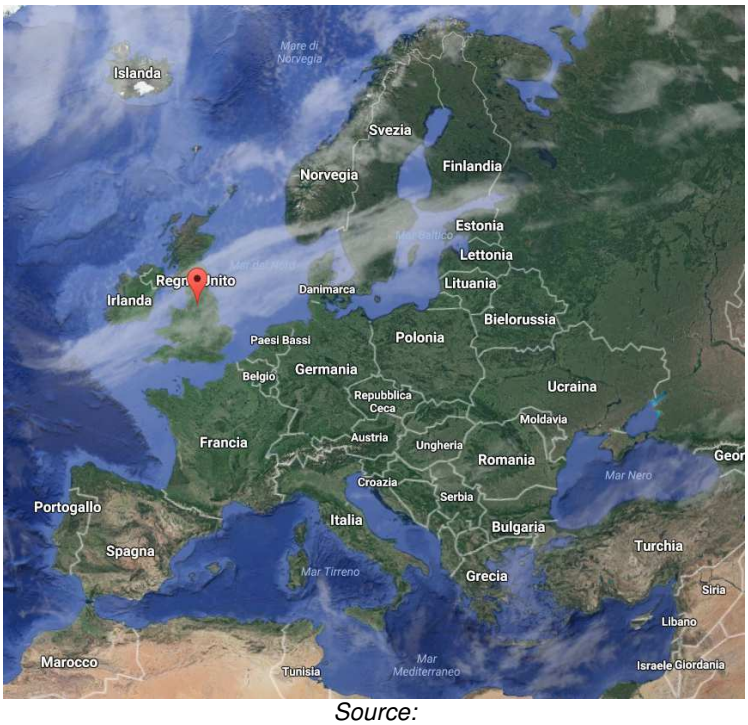
The fee established by the national regulation varies from 6 to 15 €/sq. m. depending on the class the soil being transformed belongs to.



Urban sprawl in Bratislava between 1992 - 2007 on soil quality map

Source: http://www.umweltbundesamt.at/fileadmin/inhalte/urbansms/pdf_files/final_results/18_Assessment_of_soil_protection_efficieny.pdf

3.3 UNITED KINGDOM



Source: https://www.google.it/maps/place/Gran+Bretagna/@51.2186513,14.2296486,4518125m/data=!3m1!1e3!4m5!3m4!1s0x48623f576e11cf01:0xb31929c178ebc05!8m2!3d53.7190281!4d-2.0727839

Coordinates 53°49′34″N 2°25′19″W
Area 229,850 sq. km
Population 62,035,570 (2012)
Density 259 people /sq. km

Great Britain introduced green belts to halt urban sprawl. The main purpose of the green belt policy is halting urban sprawl, preventing neighbouring towns from merging into one another, thus safeguarding the landscape, countryside and historic towns, assisting urban regeneration and encouraging the re-use of derelict urban land.

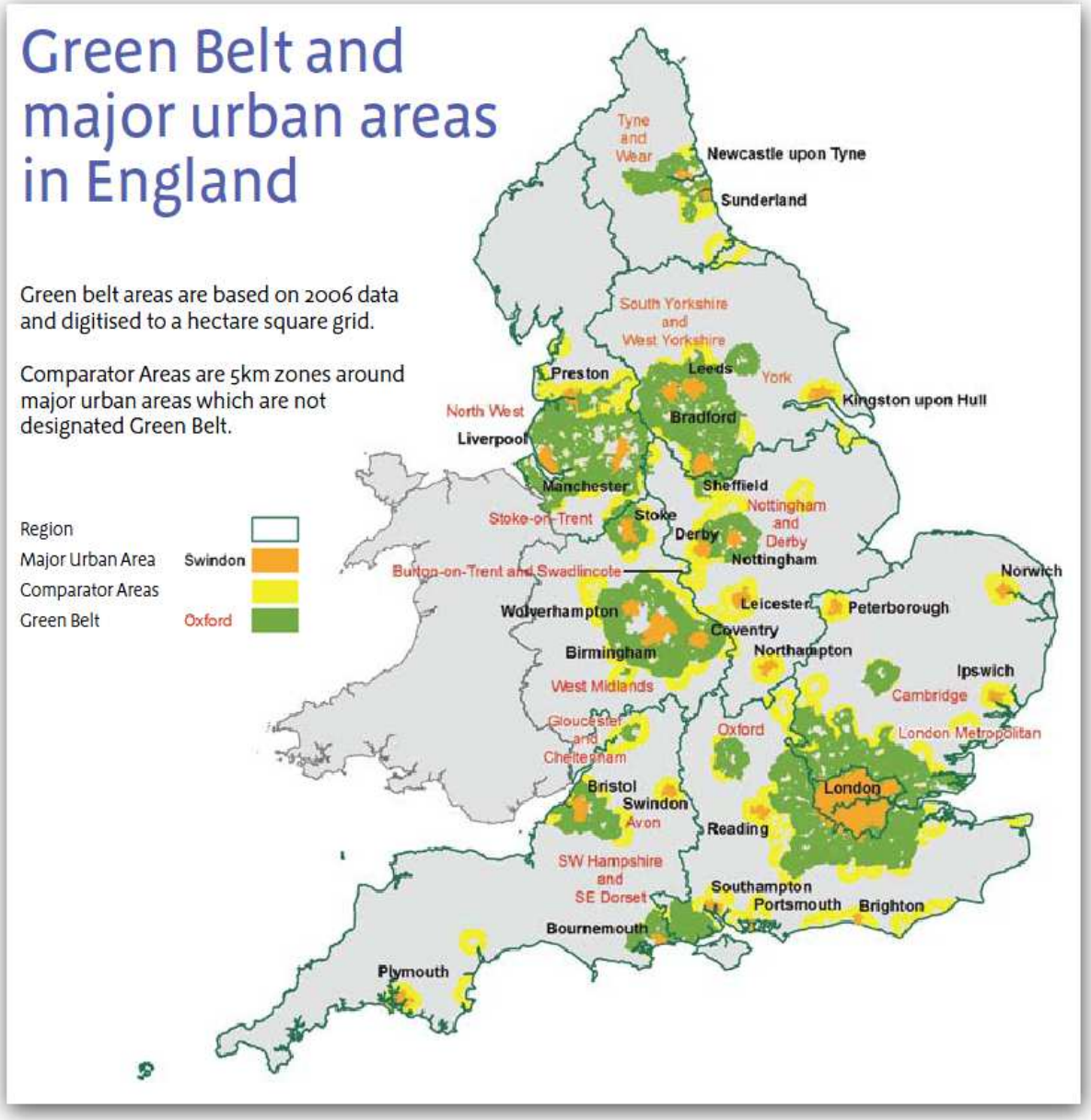
The first idea of a green belt in the UK was proposed by the Greater London Regional Planning Committee in 1935. Aimed at encouraging urban development close to existing urban areas and safeguarding agricultural land, the New Towns Act of 1946 and the Town and Country Planning Act of 1947 introduced new compensatory provisions and allowed local authorities to include green belts in their town plans and acquire areas for implementing them. The Green Belt Policy was codified in 1955.

Between 1998 and 2001 Great Britain adopted Planning Policy Guidance 2 based on the notion of green belts.

Green belts approved in England through structural plans covered 1,639,360 ha in 2010, accounting for 13% of the whole country. There are 14 separate green belts with the largest amounting to 513,300 hectares around London and the smallest (700 hectares) around Burton-on-Trent. Other green belts were approved in Wales, Scotland and Northern Ireland.

At present, the policy mainly aims at protecting the green belts which have been implemented and realised. New buildings cannot be constructed within the green belts. Infilling is highly restricted and any big projects are evaluated by a strict local planning authority. The construction of buildings is permitted for agriculture and forestry purposes only. The overall objective of the planning policy

is to define strategies aimed at enhancing the beneficial use of green belts, improving accessibility and providing facilities for outdoor sport and recreation, preserving and enhancing landscapes and biodiversity.



Source: https://www.quora.com/How-different-would-the-UK-have-been-without-the-Green-Belt

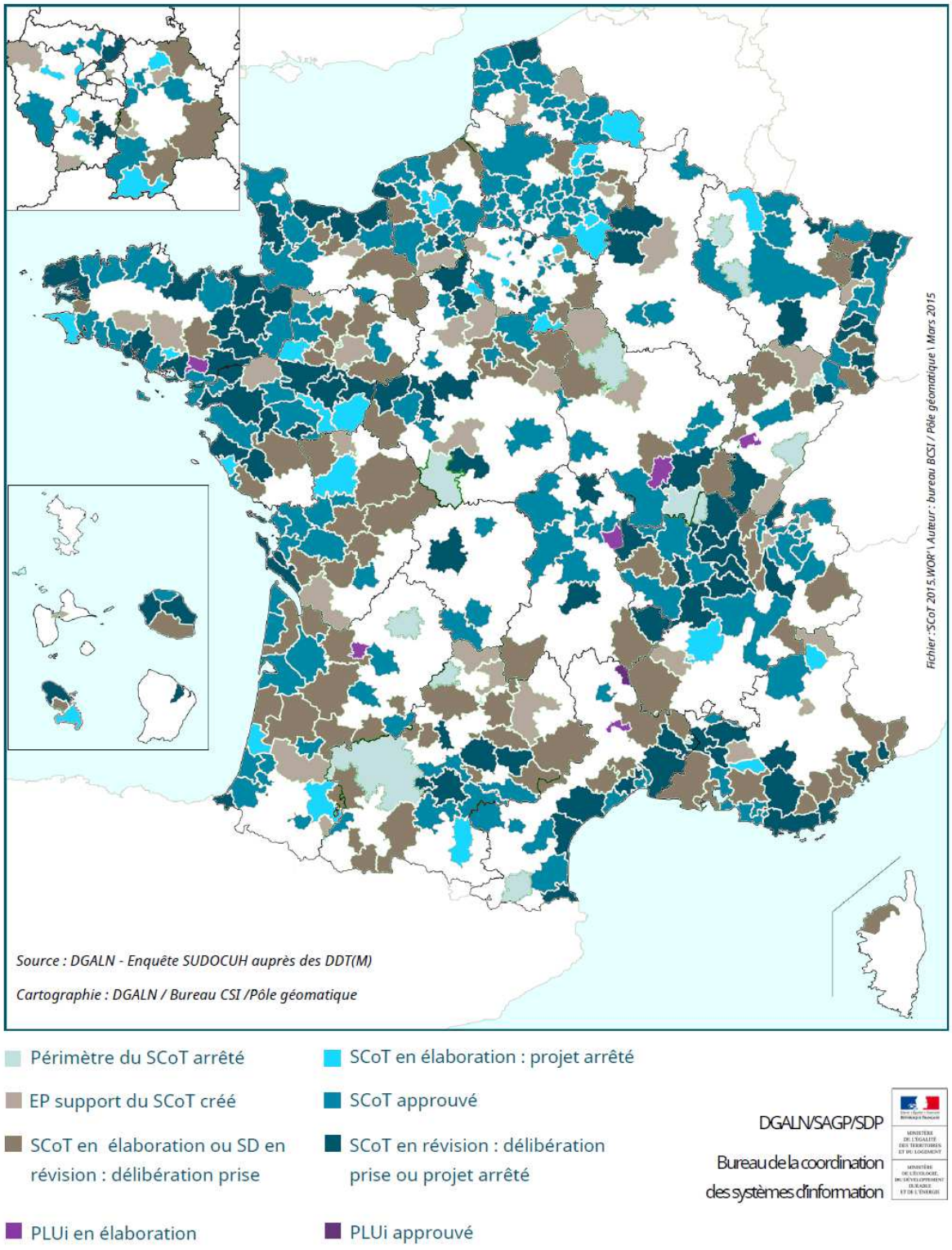
Planning Policy Guidance 3 issued in 2000 sets out thresholds for the development of housing to meet the need for new dwellings, adopting a sequential approach: absolute priority is given to brownfield sites (60% of new dwellings should be provided on previously-developed land). Housing development must be of at least 30 dwellings per hectare. As early as 2008, 60% of new dwellings were built on previously developed land and in London up to 94%.

3.4 FRANCE

The SCoT (*Schémas de la Cohérence Territoriale*) are Territorial Consistency Schemes implemented by Law "*Solidarité et renouvellement urbain"* (S.R.U. - *Solidarity and urban renovation*) enforced in December 2000. These prescriptive large-area reference plans are prepared by inter-municipal voluntary associations. They define the development of urban areas and priorities in terms of transportation and residential, productive and commercial development, by accurately delimiting the urbanised areas and protected green land.
The provisions contained in the SCoT are binding for urban planning tools at a lower level, like the *Plan Locale d'Urbanisme* (PLU) *[Local town planning scheme]* and the *Zone d'Aménagement Concerté* (ZAC) *[Designated development area]*.
If no SCoT has been approved, the principles of "*constructibilité limitée*" *[limited building]* or "*extension limitée de l'urbanisation*" *[limited developments]* are applied, according to which municipalities cannot use new land for development or building large commercial sites.
The goal of the said rule is to preserve the land and rationalise its use, as well as to guarantee the effective management of public resources. If permitted by previous surveys, the SCoT can authorise new developments on previously developed land, in order to limit land use and at the same time save money for public transportation. As to commercial site planning, a considerable decrease in parking areas is foreseen with the aim of halting the sprawl of shopping centres in peri-urban areas.
Similarly, the *Law on solidarity and urban regeneration* (S.R.U.) forbids the use of new land or the construction of large artificial surfaces in municipalities located within 15 km of big municipalities with more than 50,000 inhabitants. New areas can be developed only if public transportation is available or if located in previously developed land. As at 1 January 2015, in France there were 448 SCoT (77% of French population - 25,137 municipalities).

Mulhouse - Alsace
Source: http://www.mulhouse-alsace.fr/fr/schema-de-coherence-territoriale-scot

Carte des SCoT au 1er janvier 2015



Map representing SCoT evolution as at 1 January 2015
Source: www.fedescot.org

3.5 THE NETHERLANDS

Land take in the Netherlands is mainly associated with the construction of public works and halting rural sprawl.

In 1993, the principle of ecological compensation to be applied to agricultural areas in order to reduce the ecological losses of major infrastructure projects - roads built by public bodies - was introduced.

The Dutch compensatory approach relies on 2 principles:

- *no unless:* no new infrastructure can be built unless ecological compensation is carried out and unless an environmental impact-like assessment is performed beforehand;
- *no net loss of ecological values:* since any transformation inevitably causes irreparable environmental and ecological damage, specific measures to mitigate and compensate residual damages must be implemented.

For every sq. m. of land take, at least one sq. m. of renaturalised land must be realised to compensate for land transformation.

The compensation system has made it possible to realise ecological works, find financial resources to be allocated to ecological projects and re-use areas for ecological and environmental functions.

However, such a compensation system has had to face the problem of finding areas where to carry out compensations - due to the lack of areas and high land value. Moreover, the compensations carried out were not connected, thus preventing the creation of an ecological network.

In the Netherlands, there is a metropolitan agglomeration - the Randstad - consisting primarily of the city regions of Amsterdam, Rotterdam, The Hague and Utrecht and other 14 smaller cities. It includes an area of roughly 6,000 sq. km called "Groene Hart", the “green heart”, characterized by agricultural and natural areas. It equals almost 80% of the territory of the Randstad.

In order to safeguard this "green heart" that provides areas for agriculture, natural land and outdoor recreation to the surrounding cities, the national government has adopted a restrictive policy that limits the number of new residential and industrial sites and allows them to be constructed only in the proximity of existing city centres.

"In general, the national policy on land protection sets out that settlements must always be developed in major metropolitan agglomerations, adopting a sequential approach: making use of previously-developed land is a priority, while greenfield development is permitted only when there are no longer opportunities of re-use and completion. (ERVET Emilia-Romagna - Governance dei sistemi urbani e consumo di territorio: politiche, pratiche, lezioni apprese - 2012) [ERVET Emilia-Romagna - Governance of urban systems and land take: policies, practices, lessons learnt]

Since the 90s, the national policies have been countering land take on greenfield sites adjacent to city centres.

The VINEX programme is a clear example of such policies aimed at creating more compact cities.

It established the following three guiding principles that must be transposed and adjusted in regional, provincial and municipal planning:

- every region shall meet its housing requirements;
- new developments shall be steered to urban areas, while rural areas must be preserved through a restrictive development policy;
- the new residential, productive and recreational areas must be developed close to existing

cities and around public transport.

The government has supported this programme by allocating financial resources to local authorities for the purchase of soils, site remediation and extension of public transport infrastructure.

Following the VINEX programme, 39% of new dwellings were built in inner urban areas and 61% on the edge of existing urban areas.

However, 30% of all dwellings were social houses.

In the Netherlands, 25% to 40% of developments are on brownfield sites or underused areas, thanks also to the tax reductions granted and to the fact that if the new development is beyond a given distance from the city centre, developers must also provide infrastructure and services. Between 2001 and 2005, 35% of new developments were realised on previously developed areas.

The Netherlands

Source: https://it.pinterest.com/explore/olanda-950396809452/

Groene Hart - The "green heart"
Source: http://www.stichtingmilieunet.nl/andersbekekenblog/natuur/de-kwaliteitsatlas-groene-hart.html

4. PART THREE - UNITED STATES: THE STRATEGY AIMED AT INCREASING RAINWATER INFILTRATING INTO SOIL THROUGH DE-SEALING

A) Funding programme for interventions in privately-owned areas

Impervious surfaces are impermeable surfaces mainly covered by artificial materials, such as roads, sidewalks, driveways and parking lots, that are covered by impenetrable materials, such as asphalt, concrete, brick and stone. Soils compacted by urban development are also highly impervious.

Impervious Surface Removal is a **programme** launched by the **Washington administration** that provides rebates issued as reimbursement to homeowners who decide to improve the quantity and quality of permeable surfaces on their own property, so that water can naturally infiltrate into the ground.

Interventions eligible for reimbursement are the following:

- rain garden: designed to allow rainwater to soak into the ground without using sewage systems;
- removal of impermeable surfaces and replacement with soil for agriculture and vegetation;
- removal of impermeable surfaces and replacement with permeable pavements to be used as a parking area or appurtenant area.

Reimbursement amounts depend on the surface treated. A minimum surface for eligibility is applied.

B) Interventions in public spaces

In public spaces, the programme aims to increase permeable surfaces and mainly sidewalks and flowerbeds, through flowerbed enlargement, the creation of continuous permeable strips and large green areas.

Project	Square ft.	US$ spent	Cost/sq. ft.
Impervious Surface Reduction	80.3	$ 1,223,414.34	$15.23
Green Median Renovation	44.203	$ 636,386.37	$14.40
Total	124.51	$ 1,859,800.71	$14.94

Calvert Street, NW - Before

Calvert Street, NW - After

Old Morgan School Way, NW - Before

Old Morgan School Way, NW - After

P and North Capitol Streets, NE – Before

P and North Capitol Streets, NE – After

Source of images: https://ddotdish.com/2012/02/17/imperviousssurfaceremoval/

5. PART FOUR - BEST PRACTICES AND CASE STUDIES RELATED TO IMPROVING URBAN RESILIENCE

5.1 WORK METHOD

A number of projects were selected from the best practices of de-sealing and the most complex city transformations, through soil and function regeneration, that we analysed. Based on the said analysis, we created this path/interpretation to further prepare and draft the guidelines on resilience in urban regeneration.

The case studies were grouped into four types and for each of them we recorded the main data of the projects being analysed:

- project owner
- the city in which the project was carried out
- project type
- situation ex ante and ex post, the area size
- the interventions carried out
- de-sealing, with an indication of the permeable surfaces before and after the project is completed
- presence of SUDS - Sustainable Urban Drainage Systems - and any other ecological and environmental sustainability-related aspects
- participated processes implemented during the transformations
- urban, architectural and landscape planning
- timeline of the interventions
- project developers
- reference bibliography and/or website bibliography
- some graphical representations and pictures

A) Big urban projects

This category includes some of the most important urban regeneration experiences in some European cities (Paris, Berlin, Lyon, Grenoble, Aalborg, Angers, etc.). They are major interventions aimed at replacing specific functions - railway areas, industrial sites, barracks and airports - with new functions characterised by mixed uses.

These brownfield sites are quite large and the renovation plans and projects completely change the urban setup, the arrangement of public spaces, and public and private mobility. They are often conceived with the requirements of eco-districts, in which the green space project and management of rainwater meet the objectives of mitigation and adaptation to climate change. Buildings are high-efficiency, and in some cases the hydraulic project entails separate water collection networks - and water re-use for maintenance of the green areas - and possibly, onsite depuration.

B) District projects

These projects have a smaller scope and lower impact; they concern public spaces in districts where regeneration does not lead to the replacement of urban functions, but to improved quantity or urban and social quality of public spaces - although sometimes they also include property enhancement.

Squares, roads, small parks, gardens and community vegetable gardens, etc. In some cases, these permeable green areas, carefully designed from a hydraulic viewpoint, can both serve as public spaces for conventional urban functions, but also for mitigation and adaptation to climate change.

C) Small gardens

These projects are carried out at a smaller scale. They are mainly total or partial 'selective' de-sealing, sometimes 'artistic' de-sealing, with interesting solutions in terms of low execution and maintenance costs.

These projects may include squares, public or appurtenant parking areas, residual spaces, small urban voids, derelict sites, etc. They are promoted and carried out by public administrations or by citizens' associations who sometimes participate in their realisation.

De-sealing or gardens - even temporary ones before subsequent transformations - are often realised in underused, abandoned areas or sites that were unnecessarily sealed. The goal is to improve use of the public space or a site used by the public, by enhancing multifunctionality, accessibility, liveability and landscape quality.

D) Bottom-up projects

This last category refers to some spontaneous practices which are developing everywhere in Europe, inspired by previous experiences carried out in the United States, Canada and the United Kingdom.

Citizens want to recover, even temporarily, marginal, abandoned and derelict places, for socially-oriented purposes, to share experiences and organise workshops, and at the same time satisfy urban biodiversity.

The most common social, participated and ecological experiences are those carried out by "movements" and associations promoting practices for the creation and management of shared gardens and vegetable gardens (Community gardens/*Jardins partagés*) or urban de-sealing - like the "*Jardin de Trottoir*" in France or the American association "Depave" from Portland or the "Depave Paradise" of the Canadian Green Communities. These communities intend to promote the transformation of 'over-paved' areas in order to overcome the social and environmental impacts of paving. They wish to reconnect urban landscape to nature, through projects based on action, education, protection and management of spaces and soils after removing layers of concrete and asphalt.

5.1.A.1 - GODSBANEAREALET - AALBORG, DENMARK

From former railway yard to resilient district for adaptation to climate change

Client: DSB Ejendomsudvikling
Location: Aalborg, Denmark
Population: 200,000
Project type: eco-district
Situation ex ante: railway yard
Situation ex post: complex urban regeneration area
Size: 30 ha in total
Work: dwellings, tertiary, commercial facilities and student residence, city park
De-sealing: Permeable surface before the project: approx. 7 ha | Permeable surface after the project: approx.15 ha
SUDS: central city park as flood water retention and natural purification area | rain gardens in built-up areas and parking spaces | Water regulation channels within built-up areas directed toward the gardens and the park | Green roofs
Participation: participated process aimed at sharing urban quality guidelines for the preparation of the master plan
Planning tools: Urban quality guidelines | Master plan | Urban and architectural project | Landscape project | Hydraulic project
Timeline: 2009-2010 (Design and Participation) 2011-2014 (Work)
Developers: Urban and landscape project by Polyform Arkitekter (Architect WERK Arkitekter - Thomas Kock | Sangberg Architects - Jonas Sangberg) | Hydraulic project (SUDS): Niras | Masterplan: Cenergia

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DRAWINGS AND FLOOR PLANS Polyform Arkitekter, Cenergia, Niras
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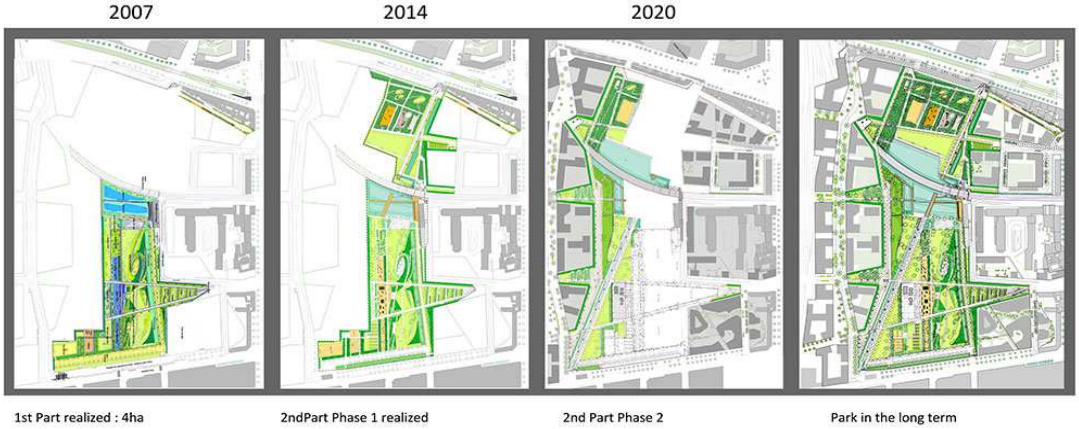
2007
2014
2020
1st Part realized : 4ha
2ndPart Phase 1 realized
2nd Part Phase 2
Park in the long term

5.1.A.2 - MARTIN LUTER KING PARK AND CLICHY-BATIGNOLLES ECO-DISTRICT - PARIS, FRANCE

From former railway yard to resilient district for adaptation to climate change

Client: DEVE (Direction des Espaces Verts et de l'Environnement)
Location: Clichy-Batignolles (Paris), France
Population: 2,230,000
Project type: eco-district
Situation ex ante: railway yard, area crossed by three railway tracks and major mobility infrastructure - bypass road, roads
Situation ex post: complex urban regeneration area
Size: 50 ha
Work: functional mix, residential, tertiary, services, commercial facilities, large city park (10 ha)
De-sealing: Permeable surface before the project: approx. 0.5 ha | Permeable surface after the project: approx. 12 ha
SUDS: The core area of urban regeneration is Martin Luther King park, which unfolds around a wet ditch and a pond (biotope) into which rainwater flows. Soils are shaped through channels and ditches built to harvest and re-use rainfall water (water storage for the irrigation of green areas and the park); connection to the sewer system is envisaged only in some cases. The harvested water ensures 50% of the water needs. The park is integrated in an urban green infrastructure made of continuous and adjacent green spaces and connections, which contributes to climate mitigation and the conservation of urban biodiversity.
Other environmental sustainability aspects: solar panels on new buildings; energy from wind turbine that ensures water recirculation in the park channels.
Timeline: From the beginning of 2000: urban recovery and conversion project carried out in collaboration with SNCF (France's national state-owned railway company) and RFF (state-owned company responsible for operating the rail network). During the first phase, almost half of the park was realised (4.3 ha) | 2005-2006 phase 1 | 2008-2011 phase 2 and phase 3 | Date of construction: 2007 phase 1; 2012-2014 phase 2; 2017-2020 phase 3 | Construction work is still ongoing and will be completed by 2020.
Developers: urban project by François Grether, with Concepto and Ogi Ingegneria | Landscape project by Atelier Jacqueline Osty Landscape

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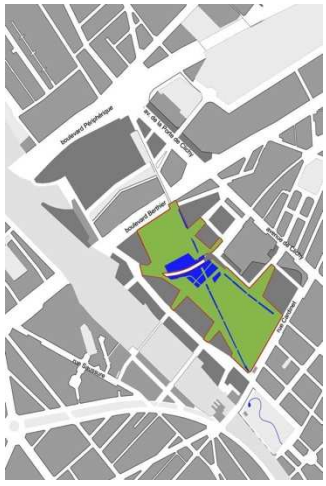

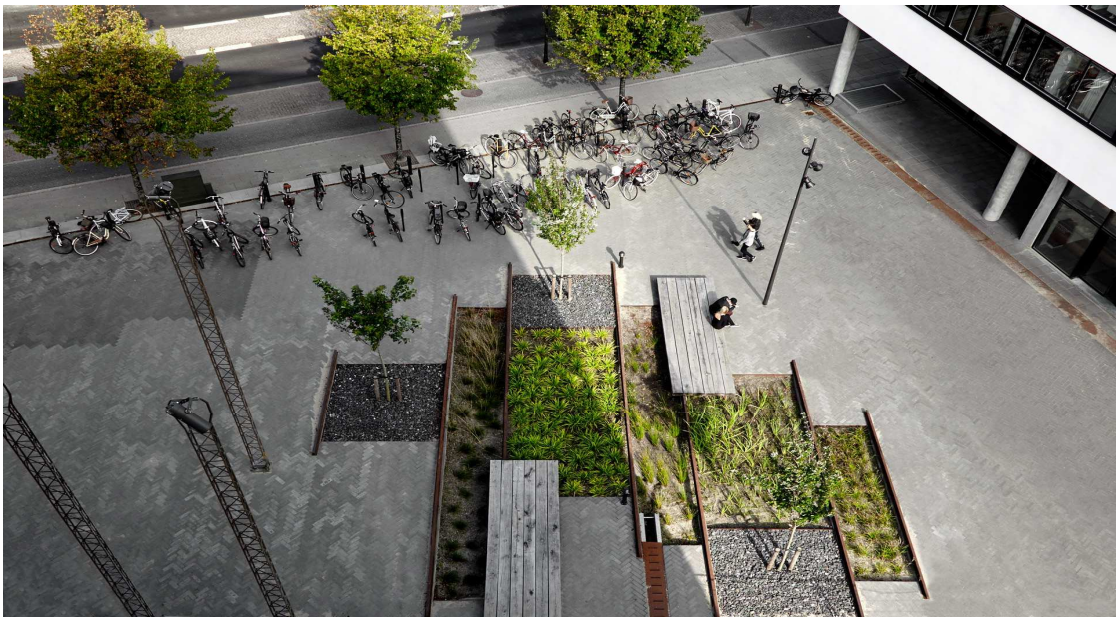

5.1.A.3 - CASERNE DES JARDINES ECO-DISTRICT - ANGERS, FRANCE

From former military barracks to eco-district

Client: The Municipality of Angers through SARA (Societé d'Aménagement de la Région d'Angers)
Location: Angers, France
Population: 147,500
Project type: eco-district
Situation ex ante: military area
Situation ex post: urban regeneration area with a functional, social (25% social housing) and generational mix; mix of urban and architectural shape and mixed use of public spaces
Size: 7 ha
Work: dwellings, tertiary, services, commercial facilities, city park, class A buildings
De-sealing: permeable surface before the project: approx. 0.2 ha | Permeable surface after the project: approx. 3 ha
SUDS: central city park that can serve as partial and a temporary flood water retention area in case of extreme weather; rain gardens in private green areas, buffer areas and semi-private green spaces and green roofs: they slow down rainwater entering the drainage network
Participation: participated process with the people living in the neighbourhood to share a common space management regulation; identifying the needs of the citizens and neighbourhood associations; defining three spaces that qualify the central park: the garden of meeting, the evolutive garden and the educational garden.
Urban planning and design tools: urban project of the mixed development area ZAC (*Zone d'aménagement concerté*), Guidelines for architecture, town planning, landscape and environment.
Timeline: the area was abandoned in 1998; 2000 Contest; 2002-2005 Participation and design; 2006-2012 work completion
Developers: Urban project by Enet-Dolowy; Landscape project by Phytolab; Boplan structures
Awards: Gold medal "Victoires du paysage 2010"

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5.1.A.4 - CASERNE DE BONNE ECO-DISTRICT - GRENOBLE, FRANCE

From former military barracks to eco-district

Client: SAGES Société Publique Locale d'Aménagement (SPLA) from Grenoble
Location: Grenoble
Population: 150,600
Project type: eco-district
Situation ex ante: military area
Situation ex post: urban regeneration area with functional and social mix, city park
Size: 15 ha
Work: dwellings (35% social housing for rent), half were obtained by refurbishing existing buildings and the remainder are new buildings, hotels, service facilities - nursery school, swimming-pool, rest home; parks and public gardens of approx. 5 ha (1/3 of the area); 15,000 ha for entertainment activities and retail shops.
De-sealing: permeable surface before the project: approx. 6 ha | Permeable surface after the project: approx. 8.2 ha
SUDS: natural management of rainwater through retention by vegetated ditches and rain gardens; limiting run-off by creating permeable and semi-permeable soils; limiting water consumption in the dwelling by adopting technical solutions; green roofs.
Other environmental sustainability aspects: sustainable waste management; biodiversity; creation of green areas connected to the green belt of the city; buildings' energy efficiency; use of renewable energy sources and bio-construction.
Participation: 2005-2006 the participated process involved the citizens through public consultation and workshops aimed at designing the main transformations.
Urban planning and design tools: ZAC De Bonne - Detailed urban plan
Timeline: the area was abandoned in 1994; 2000-2001 Planning phase; 2004 pre-operational phase; creation of the ZAC and signing of public planning agreement SEM SAGES; 2005/2006 Consultancy phase; 2006 selection of promoters and developers through a contest and commercialisation phase.
Developers: Detailed urban plan: Agence DEVILLERS. Architectural project: AKTIS Architecture. Landscape and urban greenery: Atelier Jacqueline OSTY

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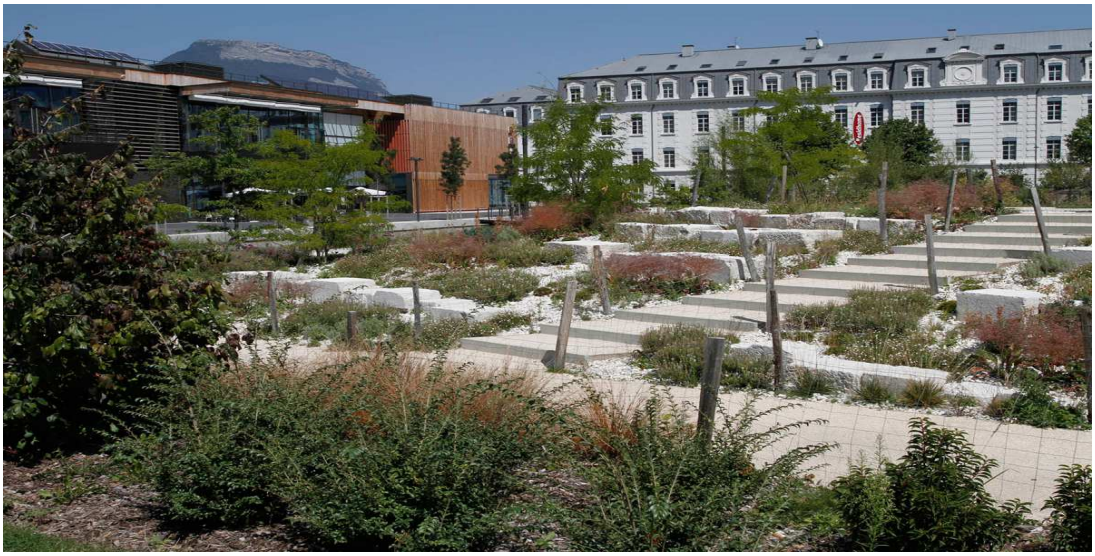

5.1.A.5 - LA CONFLUENCE ECO-DISTRICT - LYON, FRANCE

From former industrial-harbour area to eco-district

Client: Grand Lyon
Location: La Confluence, Lyon
Population: 485,000
Project type: eco-district
Situation ex ante: industrial area (18th century) abandoned in the 1990s, previously occupied by factories, harbour and railway facilities.
Situation ex post: complex urban regeneration area with functional and social mix, after major remediation and infrastructural interventions, mainly with respect to mobility.
Size: 150 ha in total, of which 41 ha ZAC 1 (2003-2018) and 35 ha ZAC 2 (2012-2025) *(ZAC = mixed development area)*
Work: redevelopment of industrial infrastructure and realisation of a green system - rather than one large park - consisting of both permanent and temporary gardens right from the beginning, completing public spaces before the other construction interventions.
Luxury dwellings 44%, social housing 23%, public facilities 33%, tertiary, services, shops, museum, university.
De-sealing: ZAC 1 Permeable surface before the project: 0.0 ha | Permeable surface after the project: approx. 17 ha
SUDS: collection of rainwater for the supply of drinking water. Conveying excess rainwater to the river. Collection of grey water and purification for the supply of drinking water. System of green areas - over 30 ha of parks and gardens - specially designed also for water collection, infiltration, storage and for slow conveyance to the river.
Other environmental sustainability aspects: high energy efficient buildings; mix of renewable energy sources; waste recycling up to 70%; sustainable mobility / increased access to local public transport; 50% reduction in water consumption; collection in separate networks, local treatment and re-use; rainwater harvesting.
Participation: public consultation: 24,000 locals visited the exhibition of the winning project of the international contest and sent 1,000 written comments to the municipality. The first master plan was reviewed.
Urban and design planning: ZAC Lyon Confluence; Master plan ZAC1; Master plan ZAC2; Urban project; Landscape project; hydraulic project
Timeline: 1998 Preliminary study, the implementation of which is still underway. The public-private company SEM Lyon Confluence was established in 1999 to coordinate the regeneration project from acquisition and reclamation of soils to allocation or resale to private operators. In 2000, SEM entrusted the task of preparing a plan for the first ZAC1 (41 ha) along the Saône (22.5 ha of public spaces, 400,000 m² of useful floor area). In 2009, the master plan was drafted for the second phase, ZAC2, 35 ha of territorial space (420,000 m² of useful floor area). In 2010, the museum of La Confluence was created; area surrounding the Perrache train station (including the old jail): 5 ha of useful floor area, 126,000 m² useful floor area. About 1,000,000 m² of built-up areas complete the project.
Developers: ZAC 1 Master plan François Grether urban planner, Michel Desvigne Landscape ZAC 2 Master plan Herzog & de Meuron architecture, Michel Desvigne landscape architect.

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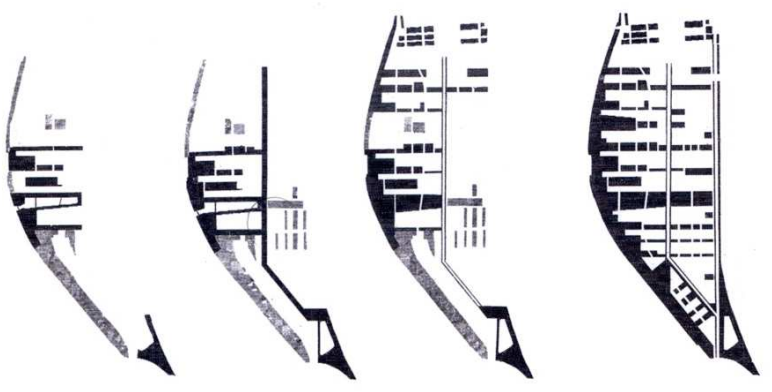
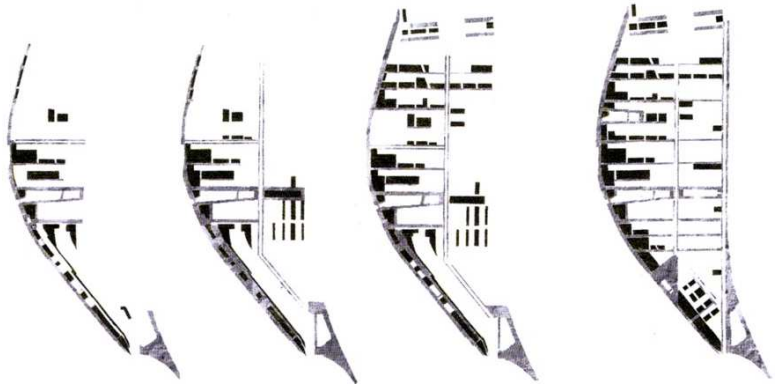


5.1.A.6 - ECO-DISTRICT AND CITY PARK OF BUILLANCOURT (PARC DU TRAPEZE) - BOULOGNE-BUILLANCOURT, ÎLE-DE-FRANCE, FRANCE

From former industrial car making area to eco-district

Client: SAEM Val de Seine (company promoting urban redevelopment)
Location: Boulogne-Billancourt
Population: 117,100
Project type: eco-district
Situation ex ante: productive/car making area (RENAULT) established at the end of 1800 and abandoned after 1992.
Situation ex post: residential district with courtyard district, functional and social mix. Dwellings (1/3 social housing for rent), offices, public structures, culture facilities, schools, service facilities, shops, park.
Size: 74 ha of which 37.5 ha ZAC 1, 11.5 ha ZAC 2, 25 ha ZAC 3 *(ZAC - mixed development zone)*
Work: redevelopment of the **Parc du Trapeze** area (ZAC 1: 37.5 ha) with mixed functions - dwellings, social housing, public structures, offices, shops, park, science and biodiversity experimental school. Redevelopment of the **Île Seguin-Rives de Seine** area (ZAC 2 11.5 ha) - international innovation centre with facilities for cultural activities (opened to the public in 2010); the construction of the city of music is underway. Redevelopment of the **Pont de Sèvres residential area** (ZAC3: 25 ha) built in the 1970s, through urban renovation aimed at regenerating all outdoor public spaces by envisaging new functions and services for the district. 5,800 dwellings (1/3 being social housing); 25,000 sq. m. of shops and 36,400 sq. m. of neighbouring public services.
De-sealing: Permeable surface before the project ZAC 1: approx. 0.0 ha | Permeable surface after the project: approx. 12 ha | Permeable surface before the project ZAC 2: approx. 0.0 ha | Permeable surface after the project: approx. 3.5 ha
SUDS: The district has been designed to adapt to climate change through permeable wooded public spaces and a large flood garden. The 7 ha-park is an extended equipped area connected to the new built-up area through sloping lines and progressive heights into which the rainwater of the whole district flows. Water is the element that characterises the landscape: wet spaces, rural grassland and flood ditches, small woods, large meadows. Under normal weather conditions, the park is an accessible green area with playgrounds and equipped spaces; in case of intense rain, it becomes a progressive filling basin. The pathways at height ensure safe access. The system of open spaces along the roads are intended as an extension to the park: along the streets and pedestrian areas there are rain gardens; in public and semi-private courtyards, the gardens and permeable spaces collect rainwater and gradually convey it to the rain gardens.
Other environmental sustainability aspects: high energy efficiency buildings; water management through a separate triple network; geothermal energy; sustainable mobility, creation of areas for biodiversity.
Urban and design tools: PLU *[Local Urban Plan]*; ZAC Zone d'aménagement concerté *[Mixed development area]*. This is a 74-ha area that includes the Parc du Trapeze and the Pont de Sèvres junction district; Modification to the PLU; Design contest.
Timeline: The Renault factory was shut down in 1992-95 | 2001 Agreement for the sale of the areas used by Renault to DBS promoters (Hines, Icade, Nexity Vinci) | 2001-2002 Urban studies on the Trapèze area and the Pont de Sèvres borough | 2002 Plan adoption | 2002 Renault/town of Boulogne-Billancourt protocol | 2003 Creation of ZAC Seguin-Rives de Seine; Creation of SAEM | 2004 approval of local urban plan PLU; Approval of the implementation project of the ZAC; signature of the area redevelopment public agreement; operational agreement SAEM/Renault/DBS and design contests for these areas | Since 2005 to date: the second phase of jobsites is being completed.
Developers: General urban and landscape planning project: AGENCY AAUPC Chavannes &

associés architecture urbanisme et paysage | A number of architecture and landscape studios for the various blocks | Park project: AGENCE TER.

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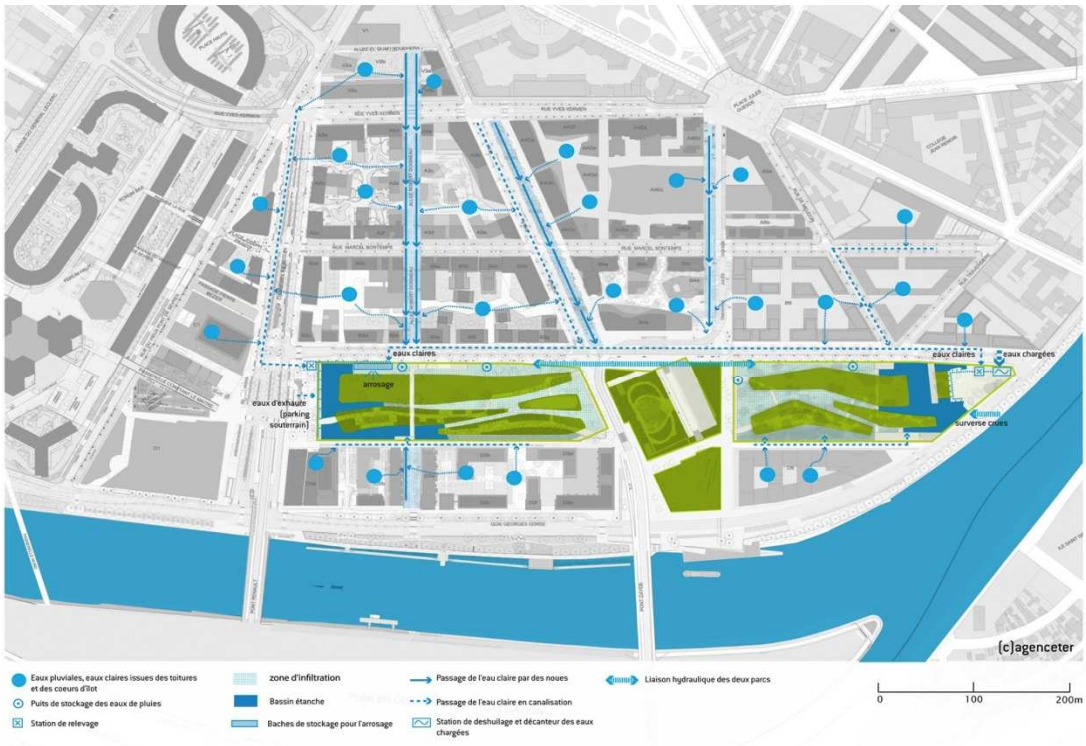

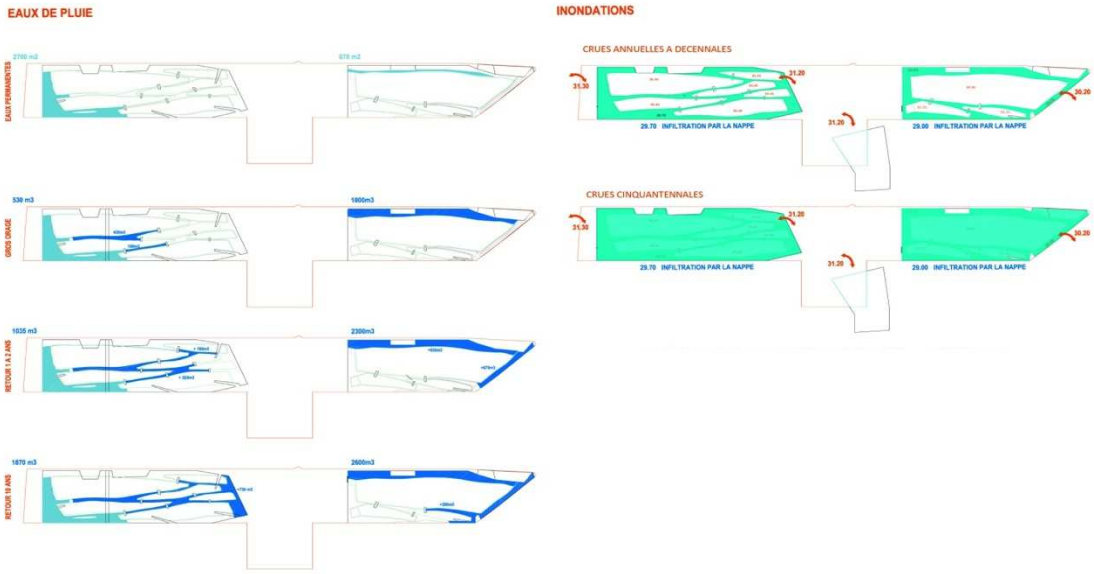

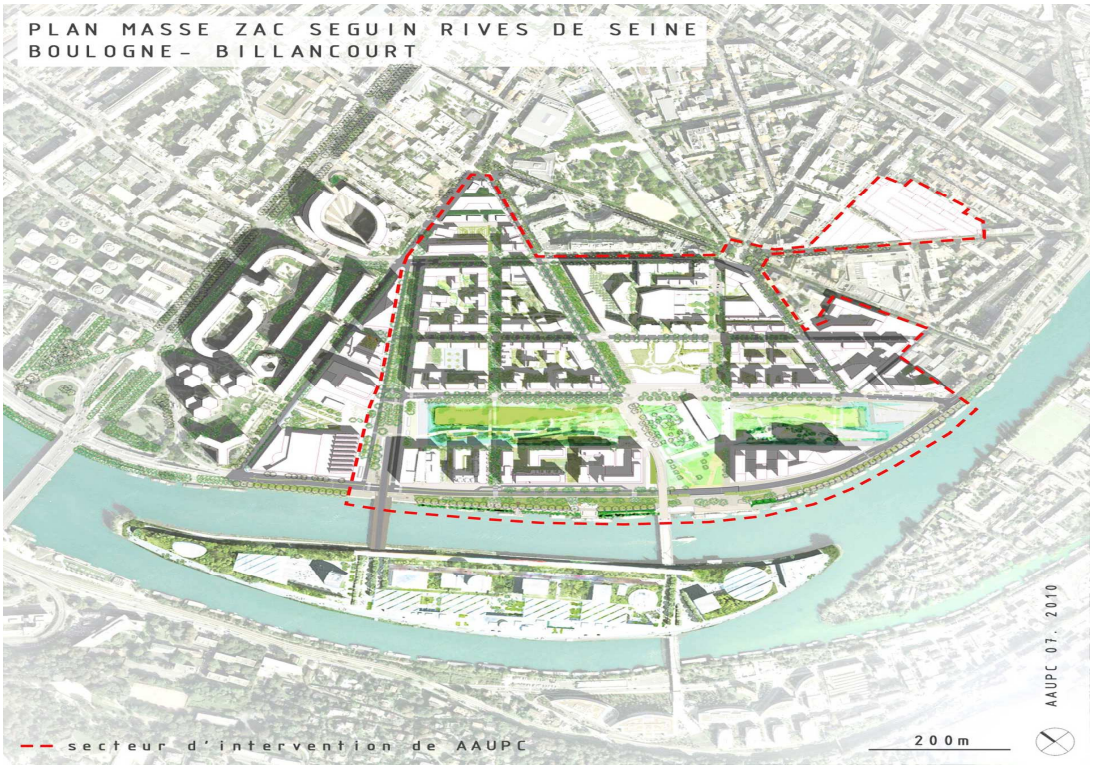
PLAN MASSE ZAC SEGUIN RIVES DE SEINE
BOULOGNE- BILLANCOURT
secteur d'intervention de AAUPC
200m
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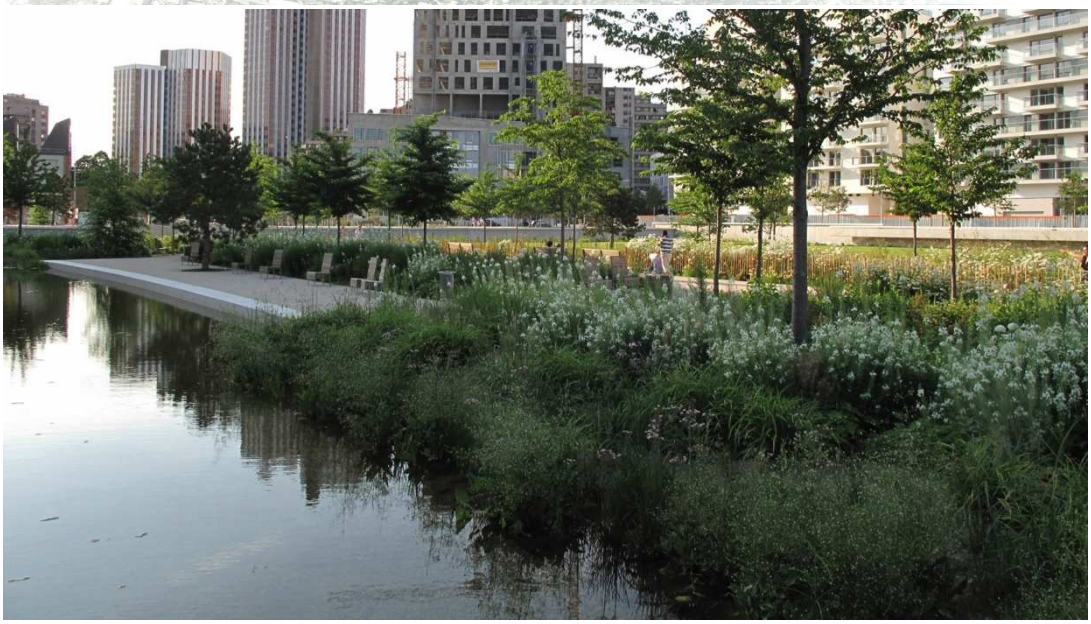

5.1.A.7 - PROMENADE DU PAILLON, LA COULEE VERT - NICE, FRANCE

From former buried river transformed into parking area and bus station to linear city park

Client: Nice Métropole, Côte d'Azur
Location: Nice
Population: 343,000
Project type: Linear city park
Situation ex ante: Between the 1970s and 1990s, the following structures were built on the riverbed: the old bus station, a large parking area, Leclerc Square, Massena area, Jacques Medecin Forum and Albert I Gardens.
Situation ex post: city park with parking areas, play areas and sports facilities. The park extends over an area that is 1.5 km long and approx. 100 m wide.
Size: 8 ha
Work: the site was obtained by demolishing some buildings and recovering a number of spaces. Reorganisation of urban mobility.
De-sealing: permeable surface before the project: approx. 2.5 ha | Permeable surface after the project: approx. 6 ha
SUDS: rainwater management: use of absorbed rainwater, which is filtered and partly stored for the park's water needs. Limiting impermeable areas, maximum exploitation of permeable surfaces such as grass, obtained by de-sealing as natural filter for rainfall water; sloping pathways in the park to favour drainage toward vegetated areas and dramatically reducing flow to the sewage system.
Other environmental aspects: the complex system of fountains with continuous jets and mist, which also create the impressive water blade in the middle of the park, plays an important climate mitigation role in summer.
Participation: at the end of 2009, public consultation and information sharing before the contest.
Urban and design tools: Preliminary study; Landscape and agronomic project; Hydraulic project; Fountain system project; Lighting project
Timeline: 2010 Contest and design; 2012-2013 Jobsites and inauguration
Developers: Landscape and agronomic project: ATELIER PÉNA PAYSAGES | Hydraulic project: ZEKTON HYDRAUDESIGN | Lighting project: ATELIER COUP D'ECLAT

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5.1.A.8 - GLEISDREIECK PARK - BERLIN, GERMANY

From former derelict railway yard to city park

Client: Grün Berlin GmbH
Location: Berlin
Population: 3.5 million
Project type: city park
Situation ex ante: railway area enclosed by the abandoned tracks of a goods yard
Situation ex post: park
Size: 29 ha
Work: The park is divided into three macro-areas connected by new pathways that run for the whole length of the old railway tracks. Eastern and central area (17 ha): sport facilities, playground, basketball courts, parkour and freestyle paths, platforms, five-a-side football pitches, relaxation areas. Southern area (2 ha): large lawn area for relaxation, walks, resting, picnic. Western area (10 ha): wooded area with a more rural/wild look.
De-sealing: Permeable surface in the 50s: approx. 0 ha | Permeable surface in 2000 as the area was abandoned and spontaneously re-naturalised by wood and pioneer species: approx. 19 ha | Permeable surface after the project and creation of the park: 25 ha
SUDS: the area first underwent re-naturalisation when the site was abandoned, then depaving and soil restoration were carried out, by demolishing the railway tracks and warehouses.
Permeable surfaces of wood and meadows cover 25 ha in the park.
Participation: In the 70s, the citizens living in the area asked the Berlin administration to transform the derelict area into a city park. They come up with the first ideas of re-use and accessibility based on the principle of preserving it as a “wild” area.
Urban planning and design tools: Landscape project divided into functional portions
Timeline: In the 60s, the area was abandoned; in the 90s, an agreement was signed to reuse and transform the derelict area into a city park. 2006: contest and design phase. 2011: Eastern and central areas completed. 2013: Southern area completed. 2014: Western area completed.
Developers: Urban and landscape project: ATELIER LOIDL, BREIMANN BRUUN SIMONS LANDSCAPE ENGINEERING

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5.1.A.9 - ADLERSHOF PARK - BERLIN, GERMANY

From former derelict airport to city park and scientific-technological district

Client: WISTA-MANAGEMENT GMBH development agency
Location: Berlin
Population: 3.5 million
Project type: City park on the outskirts of the city through urban regeneration/scientific-technological district.
Situation ex ante: Adlershof airport was one of the first airfields in Germany (1909) and, over time, the district saw the construction of aerospace research institutes, clusters and centres.
Situation ex post: Large city park obtained from the abandoned airport. The area was transformed by preserving the specialist function, while at the same also ensuring a mix of functions and improving services and facilities. Buildings and research clusters for science, biotechnologies and cinema; campus residences.
Size: 70 ha
Work: Central area (26ha):the pavement has not been removed, but it has been cut to start depaving and re-naturalisation with pioneer species; over time, it has transformed into a special biotope (protected area). On the edges there are equipped areas, pathways, recreational equipment and services connected to the campus, businesses and residences. Park (70 ha); Campus (20 ha); Scientific park (85 ha); Multimedia centre (25 ha); Tertiary (15 ha); University (15 ha); Commercial/industrial areas (155 ha); Residences (30 ha)
De-sealing: Impermeable surface in the 30s: n.a. / Current impermeable surface: 69 ha
SUDS: the central area in the park underwent re-naturalisation as the site was abandoned, and the asphalt cut. 25 ha in the park are covered by permeable meadows.
Urban planning and design tools: Development and transformation plan; contests
Timeline: Plot development and transformation plan: since 1993 to date, ongoing work; Park: 1997 - 2005
Developers: Urban planning project by development agency WISTA-MANAGEMENT GMBH | Park landscape project: BÜRO KIEFER - GABI KIEFER, RALPH HAASE, LUC MONSIGNY, ERIK OTT | Architectural projects and projects for the outdoor spaces in the district.

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area in corso
di rinaturalizzazione
con specie pioniere
nuovi impianti arborei
aree gioco
percorsi
siepi e arbusti

5.1.A.10 - PARK KILLSBERG - STUTTGART, GERMANY
From former quarry-landfill and exhibition centre to connection city park

Client: City of Stuttgart
Location: Stuttgart, Germany
Population: 598,000
Project type: city park connecting with the green infrastructure named *green joint.*
Situation ex ante: quarry, then landfill and an exhibition centre (the halls were located on the old filled quarries), parking areas.
Situation ex post: city park, dwellings, service centre
Size: 10 ha (the park)
Work: the old exhibition centre was demolished (17.8 ha, including the parking areas) and the filled quarries it was built on were reclaimed. The city park was realised, connecting the parks and gardens of Killesberg (missing piece for the creation of the so-called “green U” unfolding from Schlossgarten to the parks of Villa Berg, Rosenstein Park, Wilhelma, Leibfridscher Garten, Wartberg and Killesberg to the Feuerbacher Heide). Dwellings (200 flats), offices, a service centre (extension of the Academy of Fine Arts), a community centre and a museum were constructed.
De-sealing: Permeable surface before the project: approx. 6.5 ha | Permeable surface after the project: approx. 10.5 ha
SUDS: Rainwater collection system: water is collected in a storage tank underground and conveyed to a new pond and into the natural cycle | the lawn areas in the park are biotopes with flora and fauna determined by microclimate conditions.
Participation: the project is the result of collaboration between the local authority, citizens and residents.
Design tools: Reclamation project | Urban and architectural project | Landscape project | Hydraulic project
Timeline: 2004-2005 historical survey of contaminated areas (85% of filled quarries) and general study aimed at assessing any infiltrations | 2007 the Exhibition Centre moved to another location and the soil was reclaimed - 315,000 tonnes of contaminated soil were extracted | 2008-2013 the park was completed.
Developers: Landscape project | Rainer Schmidt Landschaftsarchitekten GmbH Landscape, Associate architect: Pfrommer + Roeder Landschaftsarchitekten | Renderings: ARGE Zukunft Killesberg | Awards: European Garden Award, 1.Prize, Category “Innovative Contemporary Concept or Design of a Park or Garden”, 2014 | RTF-Award, 1.Prize, Category Landscape Design ‘Built’, 2014 WAN Landscape Award 2015, 1.Prize, 2015

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[Photos from Google earth: right: KILLSBERG PARK area, year 2000; left - year 2016]

5.1.B.1 - JARDIN ROSA LUXEMBURG - PARIS, FRANCE

From railway area to indoor and outdoor garden

Client: City of Paris;
Location: Paris, France;
Population: Paris: 2,230,000; 18th Arrondissement: 184,000
Project type: public community garden
Situation ex ante: railway area along the tracks of the "Gare de l'Est"; sheltered structure of the "Halle Pajol" and masonry building of the post office warehouse and customs.
Situation ex post: community garden with playground, garden and small vegetable gardens; housing and facilities in the old market structures. Special attention was paid to renewable energy (the roof of the structure features 3,500 sq. m. of solar panels, thus accounting for the largest French photovoltaic plant in an urban setting.
Size: 3.50 ha area, of which 9,000 sq. m. garden
Work: recovery of the railway area, post office (former building for mail storage and sorting) and customs, and the old Halle Pajol market. Depaving along the border with the tracks, and creation of a transition strip with community vegetable gardens and gardens; the metal structure of the old market and post office dating back to 1926 was recovered in order to realise a boarding school for 20 classes (600 students), a university institute (IUT), a 4,000 sq. m. sports centre including a gym, martial arts room and fitness area and a 5,200 sq. m. shopping mall called Green Uno, with a shopping area on the ground floor, public spaces, 4,000 sq. m. esplanade, 9,000 sq. m. green indoor and outdoor areas.
Depaving: Permeable surface before the project 0 sq. m. | Permeable surface after the project 0.7 ha
SUDS: rainwater collection system for the irrigation of gardens and vegetable gardens; 1,740 sq. m. of green roofs; flood yard in the post office building transformed into boarding school.
Participation: after the area was abandoned and until the new project jobsite was started in the mid-90s, artists, socio-cultural associations and citizens occupied both the outdoor spaces and abandoned buildings temporarily to create theatre spaces and to carry out artistic activities, also creating shared gardens. Such temporary uses made it possible to promote and test the use of public spaces for social purposes. In 1994, the mixed development zone ZAC Pajol was established. The City of Paris intended to acquire the areas and buildings, demolish the old building of the Halle Pajol and the post office, so as to divide the plot into over 600 housing units. In 1999, the residents and associations complained about the already high density and lack of green areas and services and the project was interrupted. It was resumed in 2000, based on a different programme meeting the expectations of the citizens. In 2002, with the support of a team of volunteering professionals (urban planners, architects and sociologists), the citizens and local associations set up the CEPA (Coordination Espace Pajol) with the main purpose of regenerating the Halle Pajol. From 2002 to 2013 an unprecedented consultation process among institutional players (politicians, officers, architects, landscape planners, etc.) and the civil society (residents, associations, CEPA, neighbourhood committee) led to the definition of a new project for the regeneration and recovery of the two buildings - Halle Pajol and Bâtiment des Messageries et Douane - the garden and other public spaces.
Urban planning and design tools: 1994: the mixed development zone ZAC Pajol was approved. 1999: the project (ZAC) was interrupted. 2000-2002 a new programme was prepared by the residents supported by CEPA association. From 2002 to 2013 a long consultation process led to the definition of a new project for the regeneration and recovery of the two buildings Halle Pajol and Bâtiment des Messageries et Douane.
Timeline: 2004: the new ZAC Pajol (DU - Department of town planning - 2003-0156) was created; in 2006, the deconstruction of the Halle began; in 2010, construction of the sports centre began

and the boarding school was inaugurated. Work at the Halle started in 2011. In 2012, the sports centre and gymnasium were completed. In 2013, the Halle Pajol was completed and the photovoltaic plant activated. The Pajol esplanade and public garden were realised. The construction work was completed in 2014 as the IUT was terminated and the community garden opened.
Developers: Landscape In Situ Architectes Paysagistes; ZAC coordination and definition of public spaces, Agence Galiano-Simon; Halle project, Jourda Architectes; Boarding school project, Ateliers 2,3,4 - Bolze et Rodriguez-Pages; Sports centre project, Brisac - Gonzalez Architects; I.U.T. project Brossy et Associés

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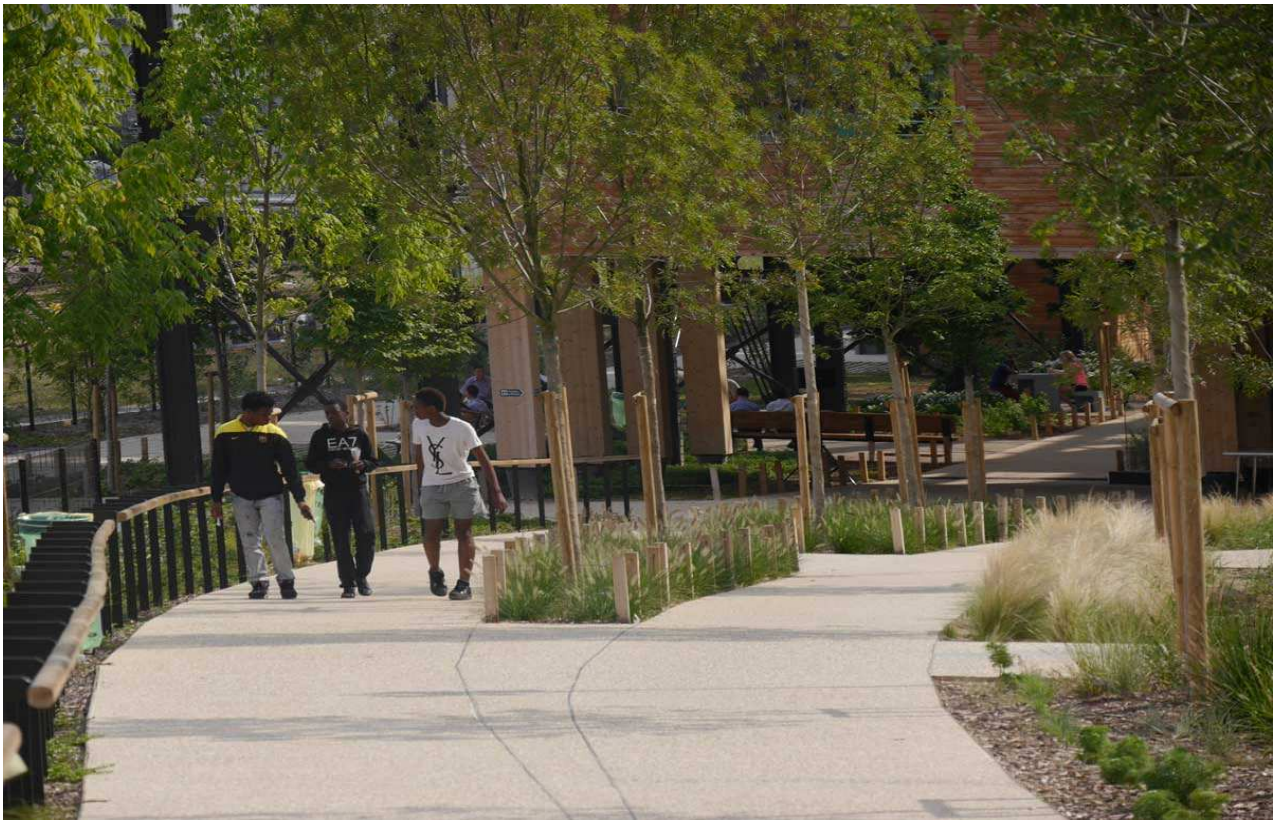

5.1.B.2 - ZOLLHALLEN PLAZA - FREIBURG IM BREISGAU, GERMANY

From car park to rain square

Client: City of Freiburg im Breisgau;
Location: Freiburg, Germany;
Population: 230,000
Project type: urban regeneration
Situation ex ante: car park
Situation ex post: rain square and multifunction public space
Size: 5,600 sq. m
Work: The project for the square envisages the re-use of the mineral and ferrous materials of the railway station; management of rainfall water with no connection to the sewage system; the flowerpots are the infiltration points (*permeable planter*) of water which is harvested and purified through the vegetation, and then filtered by means of an innovative in-built filtering means that slowly conveys it to the aquifer and partly stores it, thus considerably reducing overflow to the sewage system; the depressed areas in the square can work as temporary flood areas, when needed.
Depaving: Permeable surface before the project 700 sq. m | Permeable surface after the project 1,500 sq. m
SUDS: the draining, filtering and storage system of the square has been designed for the following return times:

- with regular rain, water feeds the aquifer *(Infiltration city)*
- weather events with a return time of 10 years imply storage *(Storage city)*
- weather events with a return time of 10 years imply temporary flooding*(Flood city)*

Urban planning and design tools: architectural, landscape and hydraulic project
Timeline: 2009-2010 project design; 2011 project realisation
Developers: Landscape Architecture Ramboll Studio Dreiseitl
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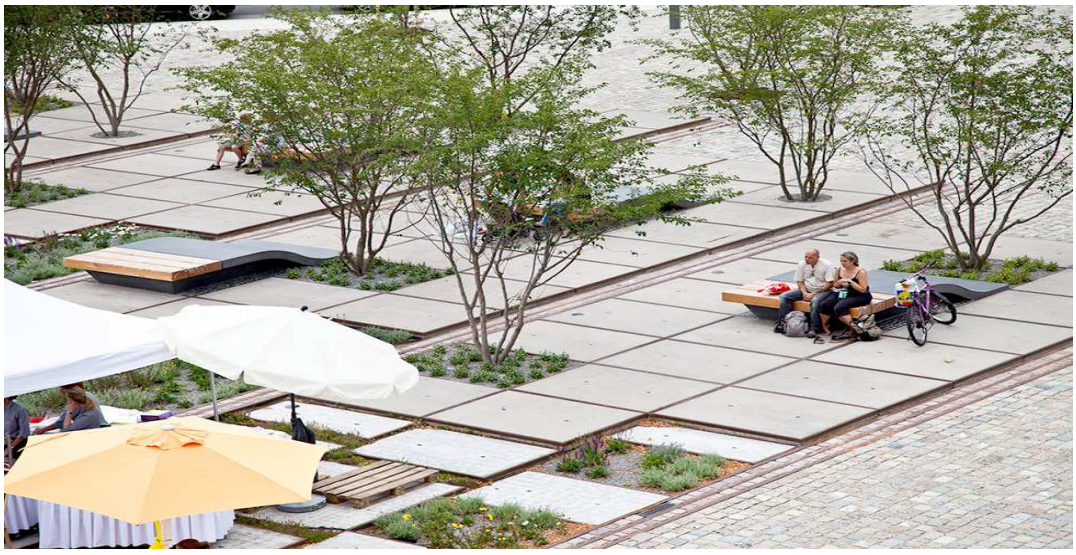

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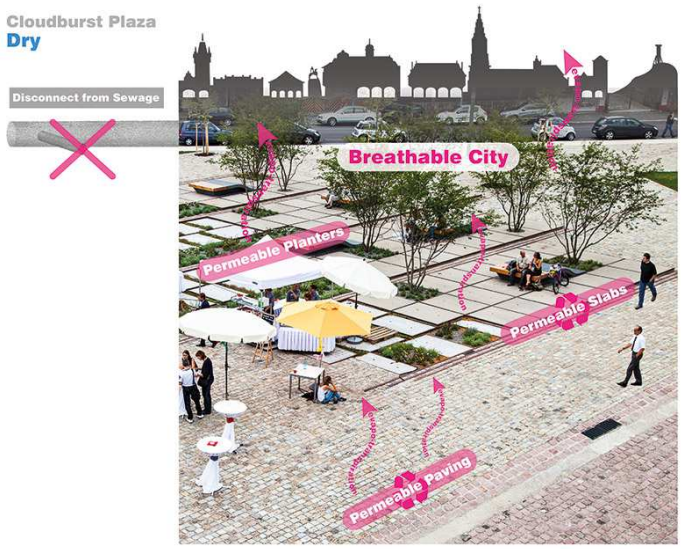

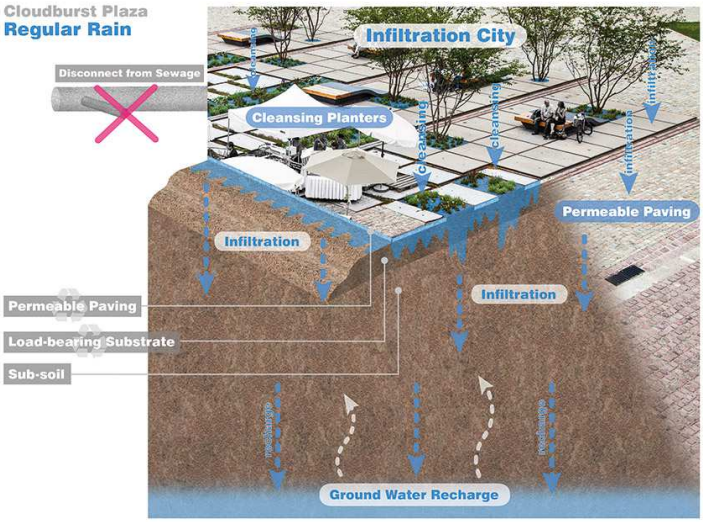

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5.1.B.3 - JARDINS D'AMARANTHES AND ÎLOT MAZAGRAN - LYON, FRANCE

From car park to art garden and later on community garden

Client: City of Lyon and Grand Lyon
Location: Lyon, France; La Guillotière neighbourhood, sensitive urban area (ZUS), defined by the French public administration as a priority area for urban policies (1996-2014)
Population: Lyon, 483,000 inhabitants / La Guillotière neighbourhood, 18,000
Project type: neighbouring urban spaces; restoration of small public spaces following urban regeneration with functional and social mix (25% social housing) and increased public spaces.
Situation ex ante: urban void *(délaissé urbain)* used as parking area in a 19th century residential neighbourhood (prevalence of immigrants). La Guillotière neighbourhood, where the art garden project is implemented, is still being regenerated by the Grand Lyon through demolition/ reconstruction.
Situation ex post: artistic community garden managed by the residents through associations; over time, the garden was transformed into garden and community vegetable gardens; the private and public buildings surrounding the garden were allocated to social housing.
Size: 4,500 sq.m. block, of which 650 sq.m. is the D'Amaranthes garden
Work: demolition of pre-existing buildings and removal of asphalt in the parking area; artists' works - design of the metal greenhouse, garden and murals; creation of other mall public spaces within the widest Îlot Mazagran; greenhouse and main garden; community vegetable gardens of Amaranthes; area planted with Robinia.
Depaving: Permeable surface before the project: 0 sq.m. (in 2000) | Permeable surface after the project: 2,500 sq.m. (in 2012)
SUDS: n.a.
Participation: the garden is a bottom-up experience; the main protagonists are the artists and locals though their associations; the final project will extend from the Îlot des Amaranthes to inside the Îlot Mazagran is supported by a "spontaneous" participated process. Later the locals established the Brin d'Guill association.
Urban planning and design tools: in 2011, a number of meetings were organised by Le Grand Lyon with the purpose of defining some general goals which were later translated into a contest for the re-design of the block with the d'Amaranthes garden, the Îlot Mazagran and other neighbouring spaces.
Timeline: 2003: construction of the metal greenhouse in the Jardins d'Amaranthes and the ephemeral artistic garden (realized with the contribution of public funds); 2004: extension of the greenhouse and creation of a community garden; 2005-2007: extension following further demolitions; with the agreement of the Galerie d'art Roger Tator and the District Council, the 'Brin d'Guill' association transforms the demolished site into a community garden.
Developers: Emmanuel Louisgrand from Galerie d'art Roger Tator for the green house and ephemeral artistic garden

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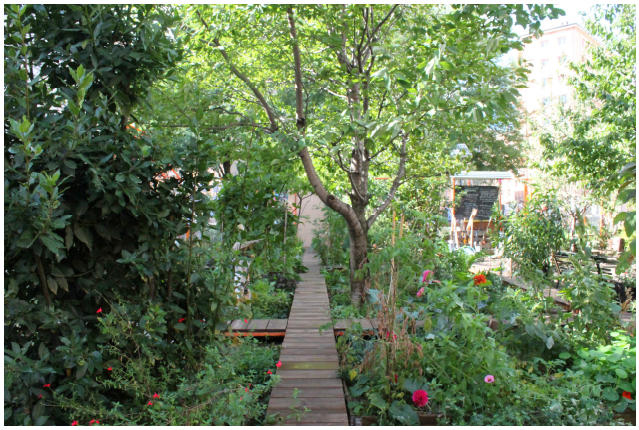



AMARANTO

5.1.C.1 - BOERENHOL' [PARK]ING, COURTRAI - BELGIUM

From car park to temporary public area with re-use of materials *in situ*

Client: Town of Courtrai (Secret Garden Festival)
Location: Courtrai, Belgium
Population: 75,000
Project type: temporary experimental garden realised during a gardening festival and based on recycling materials and re-using soil.
Situation ex ante: fully impermeable (asphalted) car park
Situation ex post: permeable and vegetated public space
Size: 2.000 sq. m
Work: partial de-sealing of the area and increased biodiversity through vegetation. De-sealing is designed based on modular parking bays: surface materials and soils are recycled, and their shape re-designed. The water channel is preserved to maintain and plant various plant species.
De-sealing: permeable surface before the project: approx. 0 sq. m | Permeable surface after the project: approx. 200 sq. m
Design tools: preliminary project defined during the execution phase
Timeline: realised in 2009
Developers: Wagon Landscaping

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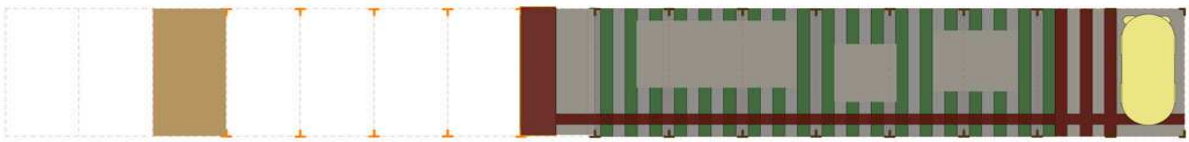

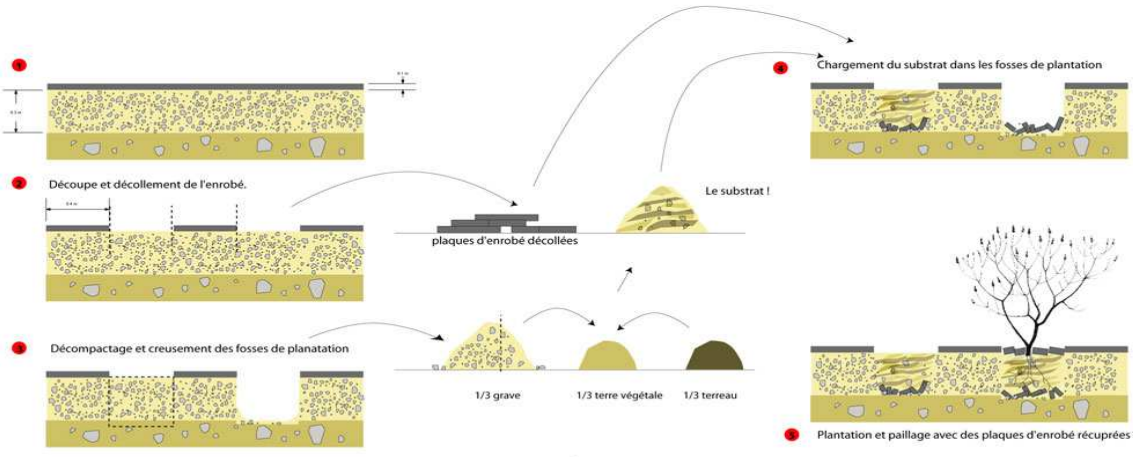

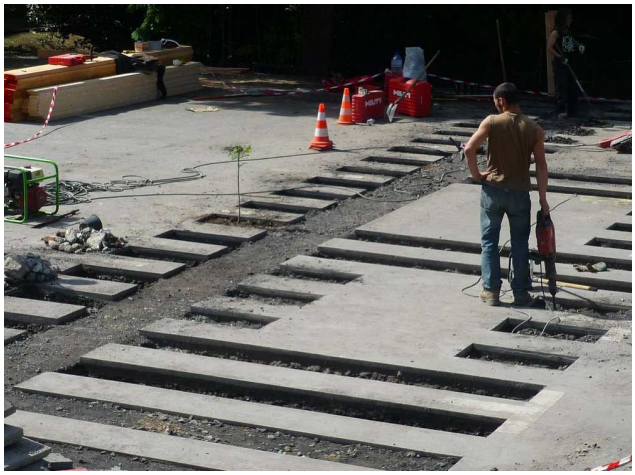

5.1.C.2 - QUE DALLE ! ÎLE JEANTY - DUNKERQUE, FRANCE

From harbour quay to rural garden

Client: Town of Dunkerque
Location: Dunkerque, France
Population: 372,000
Project type: experimental garden aimed at transforming the pavement of an old quay of a loading dock and recovering a green space
Situation ex ante: quay of a loading dock
Situation ex post: more permeable and greener public space
Size: 600 sq. m
Work: partial de-sealing of the quay; addition of clay-rich soil for improved water retention (originally the soil was very permeable); planting leguminous crops for their ability to enrich the soil, as well as shrubs and pioneer species that easily adapt to poor soils; mulching by means of asphalt blocks and gravel. The project foresees the re-use onsite of all materials obtained from de-sealing, in order to minimize treatment and landfilling.
De-sealing: Permeable surface before the project: approx. 0 sq. m | Permeable surface after the project: approx. 600 sq. m
Design tools: preliminary project defined during the execution phase
Timeline: realised in 2009
Developers: Wagon Landscaping and Atelier 710
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5.1.C.3 - TEXTURE / FLASH CODE GARDEN - COURTRAI, BELGIUM

From car park to temporary rural garden

Client: Town of Courtrai / Kortrijk, Belgium
Location: Courtrai
Population: 75,000
Project type: de-paving for temporary square
Situation ex ante: impermeable car park
Situation ex post: partially permeable artistic garden based on QR-code of Texture-museum
Size: the whole parking area of 1,550 sq. m | area of intervention 710 sq. m
Work: partial removal of the car park pavement and creation of a labyrinth garden through small green areas featuring hardy species.
De-sealing: Permeable surface before the project: 0 sq. m | Permeable surface after the project: 500 sq. m
Design tools: Landscape project
Timeline: realised in spring 2014 in 5 months , including the design phase, ,with the contribution of citizens
Developers: Studio Basta and Wagon-landscaping

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5.1.D.1 - JARDIN JOYEUX – AUBERVILLE, FRANCE

From car park to rocky garden

Client: OPH Office Public de l'habitat d'Auberville
Location: AUBERVILLE, northern suburbs of Paris
Population: 80,000
Project type: temporary garden before a new project is carried out
Situation ex ante: car park
Situation ex post: garden realised as a rocky garden
Size: 1,000 sq. m
Work: de-sealing with conservation of the removed material (asphalt) onsite and creation of a garden on existing subsoil; 45 cu. m of earth; 15 cu. M of gravel; 1,000 perennial plants; 2,000 sedum; 1 kg of special seeding; 100 trees and shrubs; over 150 plant species.
De-sealing: Permeable surface before the project: approx. 0 sq. m | Permeable surface after the project: approx. 1,000 sq. m
Design tools: landscape and artistic project
Timeline: realised in 2015 in 5 days, with the contribution of local artist Sylvie Da Costa, who lived in the area and 7 gardeners
Developers: Wagon Landscaping

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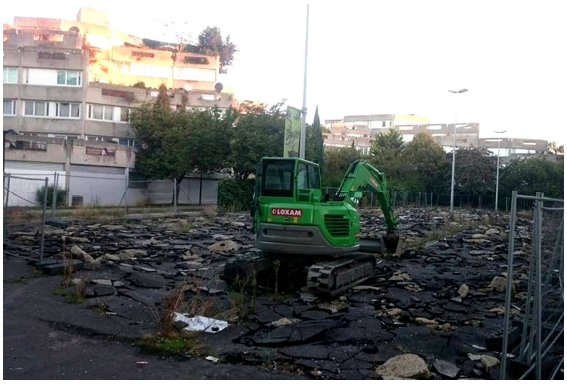

5.1.D.2 - RUELLE DU TROTTEUR - MONTREAL, CANADA

From service road to permeable garden

Client: initiative of the citizens living in Ruelle du Trotteur, supported by RBC Water Project and the Administration
Location: Montreal, Le Plateau borough
Population: 1,650,000
Project type: de-paving
Situation ex ante: asphalted service road
Situation ex post: permeable garden
Size: 450 sq. m
Work: partial removal of asphalt layer and creation of a garden at the roadside.
De-sealing: Permeable surface before the project: approx. 0 sq. m | Permeable surface after the project: approx. 138 sq. m
Design tools:
Timeline: realised in 2015 by volunteer citizens
Developers: Depave Paradise

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http://www.depaveparadise.ca/gallery.html (images before and after the work)
http://histoireplateau.org/toponymie/la-ruelle-du-trotteur/

5.1.D.3 - ASTOR ELEMENTARY SCHOOL - PORTLAND, USA

From asphalted yard to play area and garden

Client: initiative carried out by citizens, volunteer associations, parents and school pupils
Location: Portland, OR, USA
Population:584,000
Project type: de-paving
Situation ex ante: yard / asphalted car park
Situation ex post: permeable garden, play area and playgrounds
Size: 5,000 sq. m
Work: removal of asphalt and creation of a garden with furniture and playgrounds
De-sealing:Permeable surface before the project: approx. 0 sq. m | Permeable surface after the project: approx. 5,000 sq. m
Design tools: depave.org association
Timeline: realised in 2016 in collaboration with **ASCE Oregon, YMF**,**GreenWorks**, the students and teams of the University of Portland
Developers: Depave.org

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IMAGES (all) Depave Paradise
DRAWINGS AND PLANS /
WEBSITES http://www.depave.org
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