



01.16 Potential for the Removal of Impervious Soil Coverage (Soil De-Sealing)

Overview

The consumption of land by construction leads to a loss of soil functions with permanently negative effects on the efficacy of the natural balance. Soils have a large variety of functions which need to be protected: they provide habitats for plants and animals, they store and filter the groundwater, they act as buffers against pollutants, they are the foundation for agriculture and for healthy living, and they are an archive of natural and cultural history. These fundamental functions of the soil must be secured by adequately taking the needs of soil protection into account when planning for the future.

Soil is increasingly gaining importance in societal and ecopolitical matters, especially in view of climate change and biodiversity. As a result, national measures and regulations have been implemented to **reduce land consumption**, and to provide sustainable land management in cities and municipalities.

In 2002, the Federal Government already formulated the goal of reducing new land consumption to 30 ha per day by 2020 (BMU 2016). Based on current reports, this goal will not be reached. The daily consumption currently (2014-2017) amounts to 58 ha per day (UBA 2019). With the German Sustainable Development Strategy 2016, the Federal Government has postponed the 2020 goal of 30 hectares to “below 30 hectares per day” by 2030 (indicator of the Sustainable Development Goal 11.1a, Statistisches Bundesamt 2018). Sustainable Development Goal 15 addresses the protection and the sustainable use of the resource soil and indicates degradation neutrality by 2050 as its top priority. Impervious soil coverage (“sealing”) is one of the 16 core indicators by which sustainable development in the State of Berlin is measured (Amt für Statistik Berlin-Brandenburg 2014). These actions have initiated a process in the State of Berlin with the goal of permanently taking the limited resource soil into account in the contentious area of construction and planning processes, on the basis of legally established regulation options.

The goal of the Senate Department for the Environment, Transport and Climate Protection (SenUVK) and the Senate Department for Urban Development and Housing (SenSW) is therefore to provide instruments for an active, practice-oriented **land management system**. This will particularly facilitate soil protection authorities in carrying out their duties as the representatives of the public interest, e.g. in the context of urban development planning, and of competently integrating aspects of soil-protection in the environmental impact assessment process.

One problem that appears regularly in planning practice is that it is hardly possible to materially compensate for the imperviousness of an area that necessarily results from construction activity. In principle, the best compensation would involve the removal of impervious coverage (de-sealing) of another area. However, due to the restrictions of availability of most land for such measures, it is difficult to find areas in Berlin where the impervious coverage may actually be removed. It is then not possible, using the Environmental Impact Assessment, to effect the realization of such measures, due to the lack of any adequate available land. **Proposals for removing impervious coverage** usually have a chance to be realized if areas available for having their impervious coverage removed are already known, have been checked for suitability, and are listed in a register.

An initial step was the compilation of [Environmental Atlas Map 01.13 Planning Advice for Soil Protection](#), an important planning instrument for soil protection assessment. The weighing of the various functions and sensitivities of the Berlin soils permitted a differentiated evaluation of urban development planning. For example, in the case of soils which, from a soil protection viewpoint, were classed as particularly valuable, the search for alternative sites for relevant development planning projects was recommended.

The project [“Potential for the Removal of Impervious Coverage in Berlin”](#) (only available in German) was initiated to improve the availability of areas for impervious coverage removal as a second step. The goal of the project is the ascertainment and evaluation of land which could potentially have its impervious coverage permanently removed in the foreseeable future. To the extent possible, the efficacy of the soil

is to be restored, and habitats valuable from a conservationist point of view are to be developed for plants and animals. Moreover, the goal is to support a spatial linkage between the places of impact and the places of upgrade by means of a **uniform system for the citywide recording and evaluation of areas**. For this purpose, particularly the instrument of [impact mitigation regulation](#) (only available in German) is an obvious option – both with respect to construction law and with respect to conservation law.

In the context of the project phases since 2010, a survey was carried out in all Berlin boroughs, all four Berlin forestry agencies, and among private owners. The most recent update was carried out between July 2020 and December 2020. The data obtained during this survey process were compiled in a centrally administrated database, into which further information and suggestions for areas can in future continually be introduced by the various actors in the public administration.

Moreover, private landowners are to be able to not only obtain information on potential areas for the removal of impervious coverage, but also, if they wish, to propose their own areas which cannot be used for construction purposes and which, after examination for suitability, can be incorporated into the portfolio.

In order to continue to support the implementation of impervious coverage removal, a [tool](#) to derive simplified cost approaches for the expected dismantling costs has been prepared (an [Excel input file](#) simplifies the cost estimate for an impervious coverage removal measure). Based on the [review of the literature](#), proposals for a [guide to action](#) regarding technical and qualitative standards for the regeneration of soil functions after the removal of impervious coverage have been developed (all documents only available in German).

Statistical Base

Surveying staff members of the borough administrations and the Berlin forestry agencies familiar with the material and with the areas involved, was used to investigate specific information on areas, with respect to:

- the location of areas (borough, neighborhood, address/location description, coordinates)
- the property situation, and contact data if appropriate
- existing (or former) and planned land use
- type of impervious coverage, and extent of its possible removal, and
- outstanding issues to be solved, obstacles to the planning process, etc.

On this basis, an initial compilation of potential areas for the removal of impervious coverage was obtained. This newly gathered area data was linked to other relevant information by merger with various geo-data existing in the State of Berlin, so that this information is available at a glance. In addition, the following available digital information was used:

- plots of land as per the Official Property Cadastre Information System (ALKIS), as of 2020
- plots of land owned by the State of Berlin as per the Official Property Cadastre Information System (ALKIS), as of 2020
- block geometries of the City and Environment Information System (ISU 5), as of 2015
- Planning Advice for Soil Protection, as of 2017
- areas of application of current and concluded development planning procedures, as of 2020
- the Land-Use Plan (FNP), work map as of 2020
- the landscape plan procedure, as of 2013
- protected areas under conservation law (Landscape Protection Law (LSG), Conservation Law (NSG), Habitat Directive (FFH), large-scale natural monuments) as of 2019
- neighbourhoods, as of 2018
- standard land values (“Bodenrichtwerte”), as of 2020.

Areas were visually examined, and, where those limits did not coincide with lot boundaries, potential areas for the removal of impervious coverage were delimited, primarily on the basis of

- digital ortho-photos, aerial photography flights 2004 through 2020, and
- the Map of Berlin, scale 1 : 5,000 (K5), as of 2020.

In particular cases an on-site inspection was carried out.

Methodology

The procedure was structured as a multistage concept, including a combination of survey and compilation of information of local and other experts, and an evaluation based on available geo-data of the State of Berlin.

In the context of the pilot phase of the project “Potential for the Removal of Impervious Coverage in Berlin”, the question as to the extent to which a purely automated area search based on the extensive geo-data of the State of Berlin could yield usable results by merging said data and applying filters was explored by way of example. Despite of great efforts, the generated results were unsuitable for further use. It was decided to continue with the survey process using local experts, and to refine the process.

Investigation of Areas

The survey was conducted during the years 2010 and 2020, in the **borough offices** of the 12 Berlin boroughs. Whenever possible, representatives of the borough offices responsible for urban planning, landscape planning and environment and conservation were included in the process. First, those boroughs with a high proportion of sites characteristic of the outskirts of the city were investigated. The survey confirmed the assumption that these boroughs would contain the greatest potential for the removal of impervious coverage.

Moreover, the survey was carried out at the four **Berlin forestry agencies** (Grünwald, Köpenick, Pankow, and Tegel). During this inquiry a total of 40 areas were recorded, which are located outside Berlin borders.

Also, public and **private land owners** of large properties which, from their portfolios, seemed to be likely to have suitable properties in their inventories, were contacted in writing.

The aim of the survey was to identify such areas which are permanently no longer required for construction use and for which the planned urban development does not prevent the permanent removal of impervious coverage in the foreseeable future. The requisite local, planning and other information could primarily be obtained from the interview partners in the urban and/or landscape planning authorities in the boroughs. A conclusive planning policy preparation of measures for the removal of impervious coverage, however, was not purpose of the investigation. The remaining needs for clarification or agreement were incorporated into the data compiled on the areas.

Ascertainment of Factual Data

For particular potential areas for the removal of impervious coverage, a variety of information was compiled which is to aid in the evaluation of the suitability of these potential areas, and for the further planning (cf. Tab. 1). This involves primarily information on:

- the location of areas (borough, neighborhood, address/location description, coordinates),
- the property situation, and contact data if appropriate,
- existing (or former) use,
- planned use or changes in use, and
- type of impervious coverage, and extent of its possible removal.

Moreover, there is a space for comments, where unspecified information can be entered.

In order to permit a more precise assessment of the extent and cost of possible impervious coverage removal measures, about two thirds of the areas contained in the database have additionally been photographically documented to date. A selection of these **photos** is contained in the factual data on the respective areas, as a link.

Soil pollution of the ascertained areas is possible in general. With regard to further handling, a case-by-case decision is made by the responsible soil protection authority. For this purpose, data is compared with the soil pollution record. The removal of impervious coverage of parts of an area may potentially be possible.

Merger with Land Referenced Data

By **merger with** the extensive available **digital land referenced data** existing in the State of Berlin, information on current or concluded development planning and landscape planning procedures, the Land-Use Plan, as well as information from the maps, and the map “Planning Advice for Soil Protection” were linked to the potential areas for the removal of impervious coverage to make this information available at a glance (cf. Tab. 2).

Prioritization

Moreover, there are four criteria which are meant to **guide the prioritization** of potential areas for the removal of impervious coverage:

- property rights,
- expert assessment,
- technical effort, and
- time required for implementation.

This prioritization is to be carried out according to a three-point scale in each case. In cases in which an evaluation is not possible, a "n. a." is entered; if appropriate, remarks can be entered into the comments associated with the evaluation (cf. Tab. 3).

In the evaluation of property rights/ area availability, areas, which are the property of the State of Berlin, or which can generally be considered available for other reasons (e.g. if an agreement with the private owner has already been reached) are classified as "**high**". Areas which are predominantly the property of the Berlin Properties Fund (LSF), or, to the extent that is known, can be attributed to the Institute for Federal Real Estate (BIMA), or some other federal agency (e.g. the Federal Waterways) fall into the "**medium**" category. Areas with an unknown property situation, i.e. generally areas either in private ownership or federal assets, are classified as "**low**".

With respect to expert assessment, areas where the impervious coverage can be completely removed, and where the resulting pervious surface will be connected with already existing or planned green and open-space are classified as "**high**". Cases without large and connected potential areas for the removal of impervious coverage, but rather with comprehensive partial removal measures or scattered potential areas for the removal of impervious coverage fall into the "**medium**" category. Finally, areas which have a potential for small-scale isolated measures, or where only a very limited partial removal is possible, are classified as "**low**". Additional information on expert assessment is provided by the so-called *hydraulic removal of impervious coverage*. This refers to areas mainly characterized by a change in coverage from areas with (fully) impervious coverage towards a type of coverage pervious to water and air, as these areas often still serve a development function (paths, courtyards, parking spaces, etc.). Essentially this is about increasing the infiltration of precipitation water. It is usually not possible to specify the removal of impervious coverage accurately in sq m.

The ascertainment of technical effort is oriented toward the type of impervious coverage, or the degree of construction on the area concerned. A high degree of building demolition or a high degree of multistory buildings possibly including basements accordingly implies a **high** level of effort, while a simple removal of impervious coverage, such as that of pathway or roadways, constitutes a **low** level of effort. Between the two lie demolition measures of a **medium** level of effort, involving the removal not only of the coverage itself, but also of small structures, such as cottages, garages or special structural facilities, such as greenhouses.

With regard to evaluating the time required for implementation, a rough assessment of the necessary planning effort/preliminary work was undertaken, and the implementability classed as **short-term** (1 to 2 years), **medium term** (up to approx. 5 years), and **long-term** (more than 5 years).

Implementation

After the process of the removal of impervious coverage has been completed, the areas are retained in the register, and marked on the map with a using a distinct type of hatching. The same process is applied to areas, where the impervious coverage has been partially removed. Moreover, information on the measures carried out, on the contact person, etc. are entered into the data table (cf. Tab. 4).

Tabular Overview of the Data

The following table lists each field in the data table with a brief description, distinguishing the following categories:

- newly gathered data
- data obtained by merger or manual comparison with geo-data existing in the State of Berlin
- data fields containing evaluations of the areas, and
- data fields containing information on the completed implementation of measures for removing impervious coverage.

The data on each field can be accessed via the map in the Geoportal/ FIS-Broker, or as a separate data table. Moreover, one can use particular data fields to filter the datasets in order to obtain an

individualized selection of areas. In the following tables, data fields which support the **filter function** are marked by an “x” highlighted in green.

Tab. 1: Data on cases of impervious coverage removal - newly gathered data		
Content	Comments/ description	Filters
Sequential number	Unique numbering, sorted by borough / state	x
Information source	Usually, a section of the borough office, forestry agency, or owner	x
Address / location description		
Type of impervious coverage	Info on impervious coverage, impervious, buildings etc.	
Type of impervious coverage – detailed	Detailed info on impervious coverage	
Use/existing structure	Info on current and/or historic use	
Planning/development goal	Info on possible future use, depending on the concretization of planning	
Hydraulic removal of impervious coverage	Mainly potential for change in coverage (yes, no)	x
Need for further clarification	Indications of the need for clarification or agreement	
Comments	Other comments, e.g., on required authorizations/exemptions, currently valid lease contracts, existing concepts, etc.	

Total area (digitalized, in sq m)	Digitalized area; query of characteristics of property	x
Removable built-up impervious coverage in sq m	Estimate of built-up areas where impervious coverage can be removed; precision in accordance with degree of concretization of planning; the value "-1" is used if no estimate is possible	x
Share of removable built-up impervious coverage in %	Calculation of built-up impervious removal area divided by the total area; the value "-1" is used if no estimate is possible	
Removable non-built-up impervious coverage in sq m	Estimate of non-built-up areas where impervious coverage can be removed; precision in accordance with degree of concretization of planning; the value "-1" is used if no estimate is possible	x
Share of removable non-built-up impervious coverage in %	Calculation of non-built-up impervious removal area divided by the total area; the value "-1" is used if no estimate is possible	
Total share of removable built-up and non-built-up impervious coverage in %	Calculation of total areas share: impervious coverage removal, built-up, and impervious coverage removal, non-built-up; the value "-1" is used if no estimate is possible	
Removed impervious coverage in sq m	Estimate of the total area where impervious coverage was removed without distinguishing between built-up and non-built-up areas	

First entry	Entry date	x
Last entry / last check	Date of the last modification / check	x

Coordinates, geographic WGS84		
Coordinates, ETRS89 33N, EPSG:25833		

Profile		
Photo1	Only if photos are available of the object from which the impervious coverage is to be removed	
Photo2	Only if photos are available of the object from which the impervious coverage is to be removed	

Photo3	Only if photos are available of the object from which the impervious coverage is to be removed	
Photo4	Only if photos are available of the object from which the impervious coverage is to be removed	
Photo5	Only if photos are available of the object from which the impervious coverage is to be removed	
Photo6	Only if photos are available of the object from which the impervious coverage is to be removed	
Photo7	Only if photos are available of the object from which the impervious coverage is to be removed	

Tab. 1: Data on cases of impervious coverage removal - newly gathered data

Tab. 2: Data on cases of impervious coverage removal - using secondary data		
Content	Comments / description	Filters
Borough / state	Name of borough / state, (selection: 12 boroughs, 1 state)	x
Neighbourhood / community	Name of neighbourhood, (selection: 100 neighbourhoods / communities); merged with RBS	x
Number of lots	Number of lots which this area partially covers	
Compatibility with Land Use Plan	Comparison with Land Use Plan (FNP): potential for development, some potential for development, check potential for development, n.a.	x
Planning goal of the Land-Use Plan	Planning goal of the Land-Use Plan (FNP); green space, general residential building area, etc.	
Development plan numbers	Merged with the map "Development plans; project-referenced development plans", from the Geodata Catalogue of the State of Berlin; if several development plans are affected, all descriptions are to be provided	
Development plan in place	Development plan in place: yes, no if several development plans are affected, all descriptions are to be provided	
Development plan establishment	Development plan established 10 years ago or more: yes, no if several development plans are affected, all descriptions are to be provided	
Landscape plan	Merged with the map "Landscape plan procedure", from the Geodata Catalogue of the State of Berlin; if several landscape plans are affected, all descriptions are to be provided. the current phase of the landscape plan is appended to the plan name (e.g. "_FBB", "_in place")	
Eco account	The area lies within the Berlin eco account area (yes / no)	
Planning advice for soil protection	Merged with the map "Planning Advice for Soil Protection ", from the Environmental Atlas Berlin (01.13); if several values are affected, the highest assessment is to be used.	x

Tab. 2: Data on cases of impervious coverage removal - using secondary data

Tab. 3: Data on cases of impervious coverage removal - prioritization of potential areas for the removal of impervious coverage		
Content	Comments / description	Filters
Prioritization Property rights / Area availability	Assessment: High (availability certain, property of the State of Berlin); Medium (property primarily of LSF or BIMA); Low (private property with use intent); n. a. (not assessed)	x

Prioritization Expert assessment	Assessment: High (complete impervious coverage removal of a large contiguous area; location in biotope or green space complex); Medium (Small-scale impervious coverage removal); Low (Partial removal); n. a. (not assessed)	x
Prioritization Technical effort	Assessment: Low (minor effort, e.g. removal only of surface coverage); Medium (medium-level effort, e.g. minor structures, sheds etc.); High (major effort, e.g. large buildings/basements); n. a. (not assessed)	x
Prioritization Time required for implementation	Assessment: Short (implementation within 1-2 years); Medium (up to approx. 5 years); Long (more than 5 years); Accomplished part. rem. (impervious cover partially removed) n.a. (not assessed)	x
Prioritization Comments	Comments on four assessments, if necessary	

Tab. 3: Data on cases of impervious coverage removal – prioritizing potential areas for the removal of impervious coverage

Tab. 4: Data on cases of impervious coverage removal – implementing the impervious coverage removal		
Content	Comments / description	Filters
Implementation of impervious coverage removal	Has the impervious coverage been removed completely or partially from the area already? (yes, no, partially)	x
Implementation of impervious coverage removal – comments	e.g., which procedure applied; ordered by whom; contact, etc.	

Tab. 4: Data on cases of impervious coverage removal - implementing the impervious coverage removal

Map Description

Currently, 224 areas are listed in the Register of Potential Areas for the Removal of Impervious Coverage. The impervious coverage has been partially removed for 31 and fully removed for 14 of these areas.

Fig. 1 shows how many areas have been added to the list in each of the boroughs of the State of Berlin and areas of the Berlin forests in the State of Brandenburg, together with their sizes in hectares. Fig. 2, however, displays the size of the potential areas from which the impervious coverage may be removed, as well as that of the areas where the impervious coverage has already been removed.

The vast majority of the areas is in the category “diffusely impervious”. These are areas in which the area size of the impervious coverage removal could not be quantified with sufficient precision. This has generally been the case wherever such potential areas were identified as located diffusely scattered across a larger area. In other cases, the reason that such potential areas could not be qualified was that they could neither be precisely identified by administrative officials nor concretely delimited using aerial photography (e.g. bunker facilities). Since in these areas the proportions of the total area that are available vary, the concrete size of the potential impervious coverage removal area cannot be estimated.

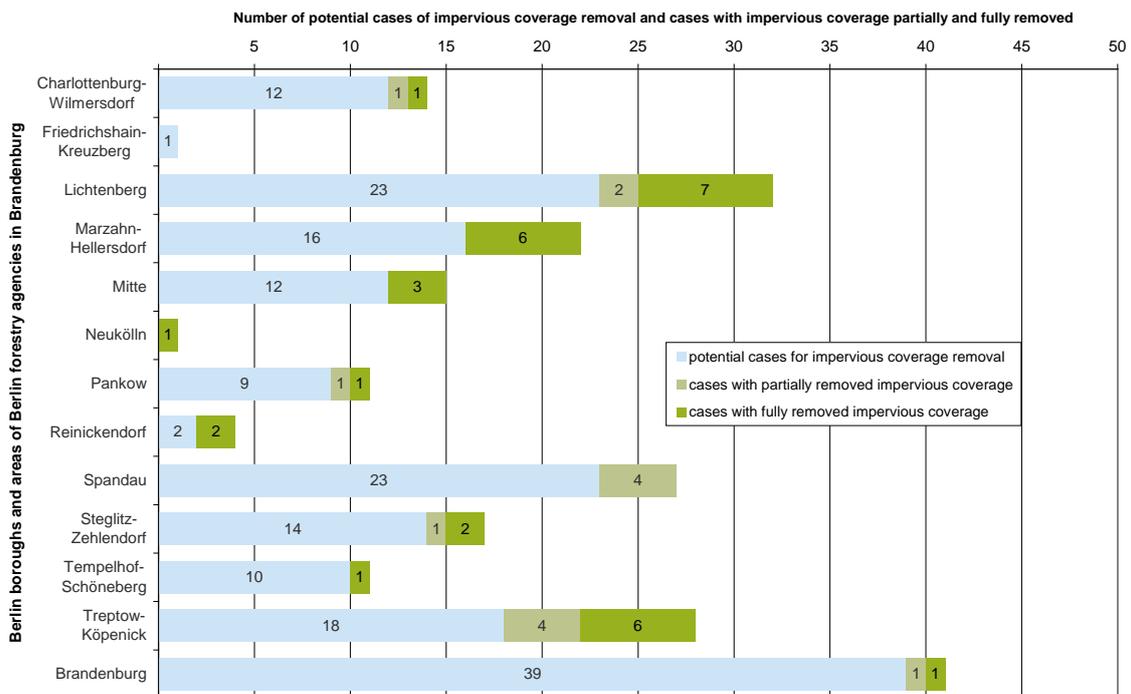


Fig. 1: Number of potential cases for impervious coverage removal and cases of the 12 Berlin boroughs and areas of Berlin forestry agencies in Brandenburg where the impervious coverage has either been fully or partially removed

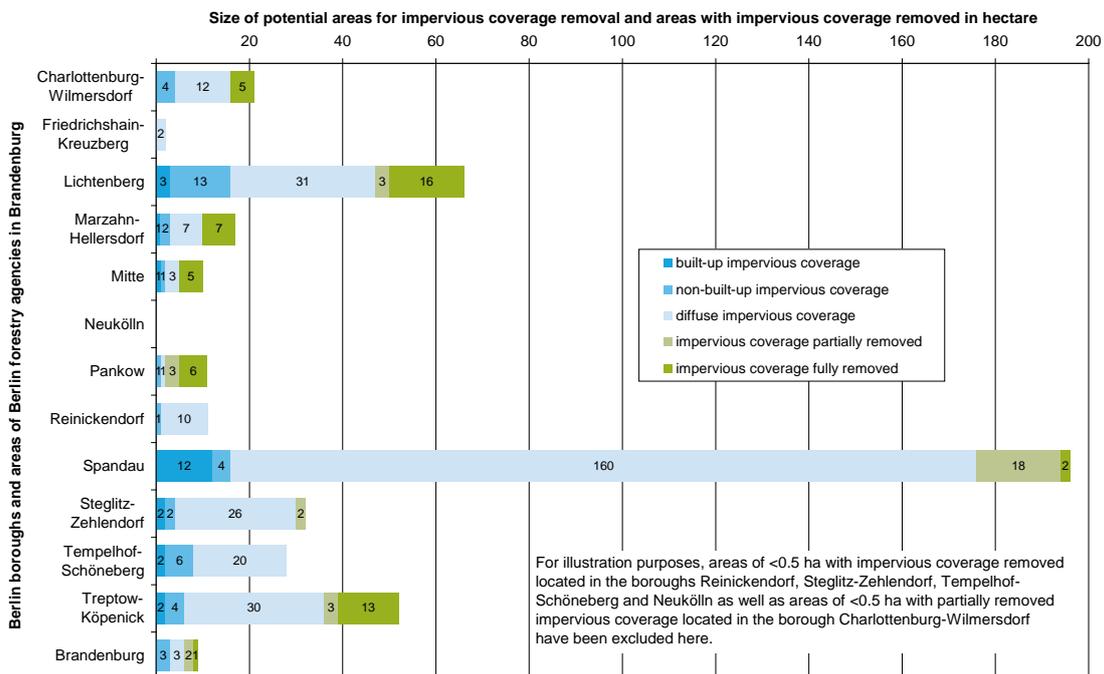


Fig. 2: Size of potential areas for impervious coverage removal and areas of the 12 Berlin boroughs and areas of Berlin forestry agencies in Brandenburg where the impervious coverage has been removed already

In the Environmental Atlas, these areas are differentiated and presented in varying colour shades, based on the expert evaluation of the potential for impervious coverage removal (cf. chapter on Methodology, section on Prioritization). In addition, areas, which had their impervious coverage removed partially or fully already, are mapped.

Only those locations are shown in the respective **solid colour** if the actual potential for having their impervious coverage removed is estimated at more than 50 % of the digitalized area. Areas in which said potential is estimated at less than 50 % of the digitalized area are shown with **cross-hatching**.

Cases in which the potential for the removal of impervious coverage cannot be precisely quantified in terms of total area (see above “diffusely impervious areas”) are shown with **simple hatching**.

The impervious coverage removal areas are shown in the map with various hatching. Menu item “Map structure” has the option of switching off the layer with the solid colour or hatching, and to reduce the identification of potential areas for impervious coverage removal to the border around the respective areas. Using menu item “Map overlay”, various maps can be switched on to provide background information. In this mode, the added background maps are readable. The map background can be selected via a menu item in the map window (digital topographic map / aerial photograph).

Moreover, the Geoportal/ FIS Broker has the option to view figures or photos linked to the particular impervious coverage removal areas under menu item “Select for factual data retrieval”.

Furthermore, each of these potential areas is linked to a **profile** (in A4 format), which contains a picture including a section from aerial photography, the delimitation of the potential area for the removal of impervious coverage, and the lot boundaries in the ALKIS, as well as a table with all relevant factual data. This uniform method of recording and presenting data facilitates and simplifies the selection of potential areas for the removal of impervious coverage (cf. Fig. 3).



Auszug aus Entsiegelungsdatenbank Flächennummer: 10003

Bezirk / Ortsteil	Adresse, Lagebezeichnung (informell)	Koordinaten (WGS84)	
Mitte / Wedding	Allee du Stade, 13405 Berlin	52.54870185, 13.31243300	
Nutzung / Versiegelungsart	Planung, Entwicklungsziele (informell)	Klärungsbedarf / Kommentar	
ungenutzter Kiesverladeplatz / versiegelt / Beton	Freilegung des Gewässers, öffentliche Grünfläche, Ergänzung Berlin-Kopenhagen-Radweg	- / Berliner Flächen sind externe Ausgleichsflächen B-Plan III-231(Festplatz, festgesetzt), nicht vollständig versiegelt, stark verdichtet, die Fläche wird wahrscheinlich 2021 als A & E-Maßnahme vom SGA umgesetzt.	
digitalisierte Fläche in m ²	Entsiegelung, bebaut in m ²	Entsiegelung, unbebaut in m ²	Entsiegelungsanteil gesamt in %
11.645	0	-1	-1
Bebauungsplan	Landschaftsplan	FNP-Darstellung	Planungshinw. Bodenschutz
ohne	ohne	Grünfläche	geringe
Priorisierung, Eigentum	Priorisierung, fachlich	Priorisierung, techn. Aufwand	Priorisierung, zeitlich
mittel	hoch	gering	n. a.

letzter Eintrag / letzte Prüfung: 04.12.2020

Maßstab 1 : 2.500

Fig. 3: Sample of a profile (only available in German)

Literature

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