Senate Department for Urban Development, Building and Housing





01.16 Potential for the Removal of Impervious Soil Coverage (Soil De-Sealing) 2023

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 its adaptation triggered by climate change, the carbon and water storage capacity of the soil and biodiversity. This has led to the introduction of measures and regulations at national level to **reduce new land consumption and impervious soil coverage** as well as a need for 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 (BMUV 2021). This goal was not met, however.

With the German Sustainable Development Strategy 2016, the Federal Government postponed the 2020 goal of 30 hectares to "under 30 hectares per day" by the year 2030 (indicator of sustainability target 11.1a, Federal Statistical Office 2018). In the updated Federal Government's Sustainable Development Strategy 2021, the aim is to establish a closed-loop land-use regime by 2050, meaning that, in net terms, no additional land shall be developed for the purposes of settlement or transport (Federal Government (ed.) 2020; Federal Statistical Office (Destatis) (ed.) 2021a).

"Germany's mean, measured across the four years between 2018 and 2021, indicates that the settlement and traffic area increased by an average of about 55 hectares per day. The indicator has thus slightly risen compared to that of the preceding years (54 hectares per day between 2017 and 2020)." (translated from Federal Statistical Office (Destatis) (ed.) 2023a, 2023b, 2023c). Efforts to address this trend shall involve setting ambitious targets and implementing measures on both international and national scales. The global Sustainable Development Goal 15 by the United Nations, along with Germany's corresponding Sustainability Strategy, emphasise the crucial role of protecting and sustainably utilising soil resources, with degradation neutrality as a central objective (United Nations, 2015; Federal Government (ed.), 2021).

The difference between new land consumption (or land consumption) and impervious soil coverage: the term 'new land consumption' refers to the net increase in settlement and traffic areas. The indicator 'increase in settlement and traffic area' applies to natural areas that have been converted into settlement or traffic areas. It may therefore also include pervious spaces, such as urban parks, courtyards, greenery along roads, cemeteries, and allotment gardens. Particularly in urban areas this indicator is often not enough to determine the actual condition of the soil and assess the sustainable management of this resource. The impervious area of a city may increase even if land consumption remains the same, such as through inner development and structural redensification. Therefore, information on impervious soil coverage generally offers a more detailed insight into the condition of the soil across the city (LABO, 2020).

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 2021). This indicator sparked a process in the State of Berlin, aiming to sustainably integrate soil, a limited resource, into the complex interplay of construction and planning processes, based on regulatory options. This process further seeks to strengthen the protection and restoration of valuable soil functions. The goal of the Senate Department for Urban Mobility, Transport, Climate Action and the Environment and the Senate Department for Urban Development, Building and Housing is therefore to provide instruments for an active, practice-oriented **land management system**. These make it easier, in particular, for the soil protection authorities to perform their tasks as public authorities, 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 the impervious covers required for developing an area can hardly be offset in material terms. In principle, the best compensation would involve the removal of the impervious cover (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 cover may actually be removed. It is then not possible, using the Environmental Impact Assessment, to implement such measures, due to the lack of any adequate available land. **Proposals for the removal of impervious coverage** usually have a chance to be realised if areas with the potential of having their impervious cover removed are already known, have been checked for suitability, and are listed in the register.

An initial step was the compilation of <u>Environmental Atlas Map "Planning Advice for Soil Protection"</u>, 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 to identify and evaluate land which could potentially have its impervious cover 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. In addition, the aim is to support a geographical decoupling of the sites of impairment and those of restoration by means of a city-wide survey and a uniform system for the evaluation of the recorded areas. In individual cases, the instrument of impact mitigation regulation (according to construction law and conservation law) may be considered an option here. The recorded areas generally represent available land that may be used to offset human intervention in the soil or the permanent loss of soil functions. They also indicate land suitable for impervious coverage removal measures within the framework of funding measures.

In the context of the project phases since 2010, a survey has been conducted in all Berlin boroughs, all four Berlin forestry agencies, and among private owners. The most recent update was carried out between October 2023 and November 2023. The data obtained during this survey process has been compiled in a centrally managed database. In the continuous progress of the Berlin programme dedicated to removing impervious covers, the upcoming goal is to consolidate existing records regarding areas potentially suitable for this purpose. This includes exploring participatory approaches to uncover previously unrecognised potential, engaging various stakeholders within the city.

In order to continue to support the implementation of removal measures, a <u>tool</u> to derive simplified cost approaches for the expected dismantling costs has been prepared (an <u>Excel input file</u> simplifies the cost estimate for an impervious coverage removal measure). Based on the <u>review of the literature</u>, proposals for a <u>guide to action</u> have been developed. They address technical and qualitative standards for the regeneration of soil functions following the process of removing impervious covers (all documents only available in German). Additionally, regular newsletters provide updates on current events concerning the removal of impervious soil coverage. In 2021, documentation on successful removal measures was released, outlining the project process, financing and the involvement of the Spandau borough office (SenUVK 2021; please refer to <u>Potential for the Removal of Impervious Soil Coverage (Soil De-Sealing) - Berlin.de</u> (available only in German) for access to the newsletter and documentation). Another report on a current project is scheduled for publication in 2024, documenting the removal measures undertaken at the former Marienfelde borough nursery site.

Statistical Base

By surveying staff members of the borough administrations and the Berlin forestry agencies familiar with the material and with the areas involved, it was possible to obtain specific information on areas, with respect to:

- the location of areas (borough, neighbourhood, address/location description, coordinates),
- the property situation, and contact data if appropriate,
- existing (or former) and planned land use,
- type of impervious cover, and extent of its possible removal, and
- any need for coordination, obstacles to the planning process, etc.

On this basis, an initial compilation of potential areas for the removal of impervious coverage was developed. Further relevant information was linked to this area-related primary data by intersecting it with other geo-data available in the State of Berlin, in order to make this information easily accessible. In addition, the following available digital information was used:

- plots of land as per the Official Property Cadastre Information System (ALKIS), as of October 6, 2023,
- plots of land owned by the State of Berlin as per the Official Property Cadastre Information System (ALKIS), as of October 6, 2023,
- block map 1 : 5,000 (ISU5) of the Urban and Environmental Information System (ISU) of the Senate Department for Urban Development, Building and Housing, III D, as of 2020,
- Planning Advice for Soil Protection, as of August 13, 2018,
- areas of application of current and concluded development planning procedures, as of October 19, 2023,
- the Land-Use Plan (FNP), working map, as of May 11, 2023,
- the landscape planning 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 May 11, 2023
- neighbourhoods as per the Official Property Cadastre Information System (ALKIS), as of October 6, 2023, and
- standard land values ("Bodenrichtwerte"), as of January 1, 2023.

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 orthophotos, aerial photography flights from 2002 to 2023,
- aerial photos, recorded between 1953 and 1999, and
- the Map of Berlin, scale 1: 5,000 (K5), versions of 2008 to 2023.

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

Methodology

The procedure was based on a multistage concept, including a combination of research and compilation of information from local 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", an example was examined. The aim was to determine the extent to which a purely automated area search, based on the extensive geo-data of the State of Berlin, could yield suitable results by intersecting the data and applying filters. Despite extensive trials, 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

Since 2010, the **borough offices** of the Berlin boroughs have been conducting reserach. Whenever possible, representatives of the borough offices responsible for urban planning, landscape planning, green spaces 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 contained the greatest potential for the removal of impervious coverage.

Moreover, the survey was carried out at the four **Berlin forestry agencies** (Grunewald, Köpenick, Pankow, and Tegel). During this investigation 41 areas were recorded that 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.

It should be noted here that it is optional for borough authorities, Berlin forestry agencies etc. to record and share information on potential areas that may have their impervious cover removed. The reports are based on expert assessments, nonbinding and may also be withdrawn if changes in spatial or sectoral planning occur.

The aim of the survey was to identify such areas which are <u>permanently</u> no longer required for construction use and for which the planned urban development does not prevent the permanent removal of their impervious covers in the foreseeable future. The local, planning and other information needed for this could primarily be obtained from the interviewees in the urban and/ or landscape planning authorities in the boroughs. The aim of this investigation did not include, however, the preparation of finalised plans for impervious coverage removal measures. Any remaining need for clarification or agreement was noted in the data compiled on the areas.

Ascertainment of Factual Data

A variety of information was compiled for each potential area that may have its impervious cover removed. This information was used to help assess the suitability for such removal measures as well as for further planning purposes (cf. Tab. 1). This involved primarily information on:

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

Additional, non-specific information could also be entered in the comment box.

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 linked in the factual data on the respective areas.

It is generally possible that **soil pollution** is an issue in the areas that have been identified. 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 (BKK) of the State of Berlin. If necessary, the partial removal of an impervious cover is also an option.

Intersection with Land Referenced Data

The data obtained was **intersected with** the extensive available **digital land referenced data** available 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 therefore linked to potential areas suitable for the removal of their impervious cover. As a result, this information is available at a glance (cf. Tab. 2).

Prioritisation

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

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

For each case, this prioritisation is carried out using a three-point scale. If a case cannot be evaluated, "n. a." is entered. Additional comments may be entered in the comment box linked to the evaluation as needed (cf. Tab. 3).

In the evaluation of <u>property rights/ area availability</u>, 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 unkown property situation, i.e. generally areas either in private ownership or federal assets, are classified as "low".

Areas are classified as "high" in the expert assessment, if their impervious covers may be removed completely, and if the resulting open space connects to other green and open spaces that are already in place or being planned. Areas receive a "medium" rating if they do not contain large, contiguous areas suitable for removal measures. They are rather characterised by large areas suitable for partial removal measures or scattered areas suitable for a complete removal. Finally, areas suitable for small-scale isolated measures, or a very limited partial removal only, are classified as "low". The expert assessment also considers information on the hydraulic removal of impervious coverage. It refers to previously (fully) impervious areas that have received a new type of cover that is permeable to water and air, as these areas often still play a role in development (paths, courtyards, parking spaces, etc.). The idea here is to improve the infiltration of precipitation. The size of the area suitable for removal measures cannot usually be precisely quantified in square metres. It must be determined on site on a case by case basis. The possibility of changing the type of cover for partial areas may also be explored here.

The ascertainment of the <u>technical effort</u> depends on the type of impervious cover, or the degree of development of the area. A large need for building demolition or a large proportion of multistorey buildings, which may have basements, thus implies a **high** level of effort. A simple removal of impervious covers, such as that of pathway or roadways, constitutes a **low** level of effort. Between the two are demolition measures of a **medium** level of effort, involving the removal not only of the cover itself, but also of small structures, such as cottages, garages or other special structural facilities, such as greenhouses.

In order to assess the <u>implementation timeframe</u>, a rough estimate of the necessary planning effort/ preliminary work was carried out. The implementation timeframe was then categorised as **short-term** (1 to 2 years), **medium-term** (up to approx. 5 years), or **long-term** (more than 5 years).

Implementation

After the removal of an impervious cover has been completed, the area is retained in the register, and marked on the map using a distinct type of hatching. The same process is applied to areas after a partial removal. Moreover, information on the measures carried out, the contact persons, etc. may be recorded in the data table (cf. Tab. 4).

Tabular Overview of the Data

The following overview presents each field of the data table with a brief description, distinguishing the following categories:

- primary data,
- data obtained by intersection 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 covers.

The data may be accessed via the map in the Geoportal/ FIS-Broker for each individual area, or may be displayed as a separate data table. It is also possible to filter the data records by some of the data fields to display a customised selection of areas. The following tables therefore also indicate (green, x) whether a data field supports the **filter function**.

Tab. 1: Data on cases of impervious coverage removal – primary data		
Content	Comments/ description	Filter
Sequential number	Unique numbering, sorted by borough / state	Х
Information source	Usually a section of the borough office, forestry agency, or owner	Х
Address / location description		
Type of impervious cover	Info on impervious cover, impervious, buildings etc.	

details	Detailed info on impervious cover	
Use/ existing structure	Info on current and/ or historic use	
Planning/ development goal	Info on possible future use, depending on the concretisation of planning	
Hydraulic removal of impervious cover	Mainly potential for change in coverage (yes, no)	Х
Need for further clarification	Indications of the need for clarification or agreement	
Comments	Other comments, e.g., on required authorisations/ exemptions, currently valid lease contracts, existing concepts, etc.	
Total area (digitalised, in m²)	Digitalised area; query of characteristics of property	Х
Built-up impervious area with removable impervious cover in m ²	Estimate of built-up areas with removable impervious cover; precision depends on planning stage; the value "-1" is used if no estimate is possible	х
Share of built-up area with removable impervious cover in %	Calculation of built-up impervious area divided by the total area; the value "-1" is used if no estimate is possible	
Non-built-up area with removable impervious cover in m ²	Estimate of non-built-up areas with removable impervious cover; accuracy depends on planning stage; the value "-1" is used if no estimate is possible	Х
Share of non-built-up area with removable impervious cover in %	Calculation of non-built-up impervious area divided by the total area; the value "-1" is used if no estimate is possible	
Share of built-up and non-built- up areas with removable impervious cover in %	Calculation of the sum of built-up and non-built-up area shares with removable impervious cover; the value "-1" is used if no estimate is possible	
Area with impervious cover removed in m ²	Estimate of the total area where impervious cover was removed without distinguishing between built-up and non-built-up areas	
First entry	Entry date	Х
Last entry / last check	Date of the last modification / check	X
Coordinates, geographic		
WGS84 Coordinates, ETRS89 33N,		
EPSG:25833		
Profile		
Photo1	Only if photos of the object with removable impervious cover are available	
Photo2	Only if photos of the object with removable impervious cover are available	
Photo3	Only if photos of the object with removable impervious cover are available	
Photo4	Only if photos of the object with removable impervious cover are available	
	Only if photos of the chiest with removable impensious	

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

cover are available

Photo5

Photo6

Photo7

Only if photos of the object with removable impervious cover are available

Only if photos of the object with removable impervious cover are available

Only if photos of the object with removable impervious

Tab. 2: Data on cases	of impervious coverage removal – using secondary data	
Content	Comments / description	Filter
Borough / state	Name of borough / state, (selection: 12 boroughs, 1 state)	Х
Neighbourhood / community	Name of neighbourhood, (selection: 100 neighbourhoods / communities); intersected with RBS	Х
Number of lots	Number of lots which this area partially covers	
Compatibility with the Land-Use Plan	Comparison with Land-Use Plan (FNP): potential for development, some potential for development, check potential for development, n.a.	Х
Planning goal of the Land-Use Plan	Planning goal of the Land-Use Plan (FNP); green space, general residential building area, etc.	Х
Development plan numbers	Intersected 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	
Compatibility with the development plan	Compatible: yes, no, partially (only parts of the area suitable for removal measures) "-" (the development plan does not detail relevant information or is adjacent to the area suitable for removal measures) If multiple development plans are intersected, all descriptions shall be included.	Х
Landscape plan	Intersected 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	Intersected 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.	Х

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

Tab. 3: Data on cases of impervious coverage removal $-$ prioritisation of potential areas for the removal of impervious coverage		
Content	Comments / description	Filter
Prioritisation 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
Prioritisation Expert assessment	Assessment: High (complete removal of impervious cover of a large contiguous area; location in biotope or green space complex); Medium (Small-scale removal of impervious cover); Low (Partial removal); n. a. (not assessed)	x
Prioritisation Technical effort	Assessment: Low (minor effort, e.g. removal only of surface cover); Medium (medium-level effort, e.g. minor structures, sheds etc.);	х

	High (major effort, e.g. large buildings/basements);	
	n. a. (not assessed)	
	Assessment:	
	Short (implementation within 1-2 years);	
Prioritisation	Medium (up to approx. 5 years);	
Time required for	Long (more than 5 years);	Х
implementation	Completed;	
	part. rem. (impervious cover partially removed);	
	n.a. (not assessed)	
Prioritisation	Ontional comments on four accomments	
Comments	Optional comments on four assessments	

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

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

Tab. 4: Data on cases of impervious coverage removal – implementing removal measures

Map Description

Currently, 222 areas are listed in the Register of Potential Areas for the Removal of Impervious Coverage. The impervious cover has been fully removed for 33 and partially removed for 14 of these areas.

Fig. 1 shows how many areas have been recorded in each of the boroughs of the State of Berlin and in areas of the Berlin forests in the State of Brandenburg. Fig. 2, however, displays the size of the potential areas suitable for removal measures, as well as that of the areas where the impervious cover has already been removed fully or in part.

The vast majority of the areas falls into the category of "diffusely impervious". These are areas for which the size of the removable impervious cover could not be quantified with sufficient precision. This has generally been the case wherever such potential areas were identified as diffusely scattered across a larger area. In other cases, the reason that such potential areas could not be determined was that they could neither be precisely identified by administrative officials nor delimited accurately using aerial photography (e.g. bunker facilities). It is impossible to gauge the size of the actual removal potential of these areas, as the available porportion of the total area varies.

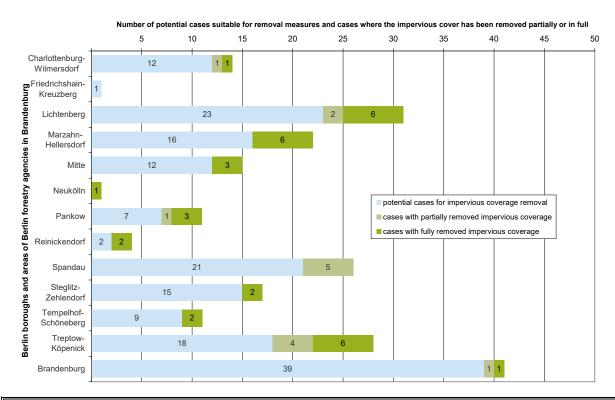


Fig. 1: Number of potential cases suitable for removal measures and cases where the impervious cover has been removed partially or in full (in the 12 Berlin boroughs and areas of Berlin forestry agencies in Brandenburg)

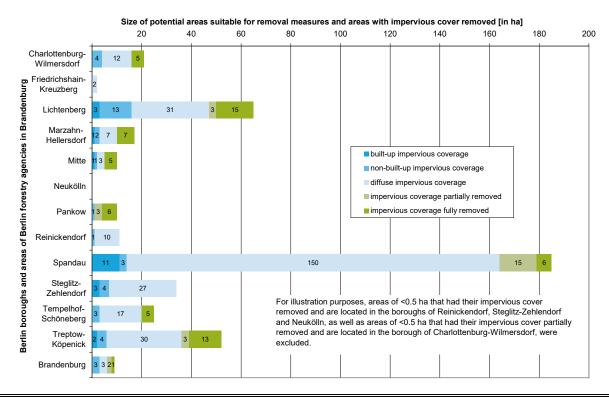


Fig. 2: Size of potential areas suitable for removal measures and areas with impervious cover removed [in ha] (in the 12 Berlin boroughs and areas of Berlin forestry agencies in Brandenburg)

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

Locations have a <u>solid colour</u> if more than 50 % of the digitalised area is estimated to be suitable for removal measures. Areas with an estimated potential of less than 50 % are <u>cross-hatched</u>.

Cases for which the potential for removal measures cannot be precisely quantified in terms of the total area (see above "diffusely impervious areas") are <u>hatched</u> (parallel lines).

Various types of hatching are used to present the impervious coverage removal areas on the map. The "Map structure" menu item offers the possibility to switch off the solid colour or hatching layer, and to only display the borders to identify potential areas suitable for removal measures. The "Map overlay" menu item allows various maps to be added as background information. In this case, it is possible to read the added background maps. The map background may 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 each impervious coverage removal area under the menu item "Select for factual data retrieval".

Furthermore, each of these potential areas is linked to a **profile** (A4 format), which contains a picture including a section of an aerial photograph, the delineation of the potential area for the removal of impervious coverage, and the lot boundaries in ALKIS, as well as a table with all relevant 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).

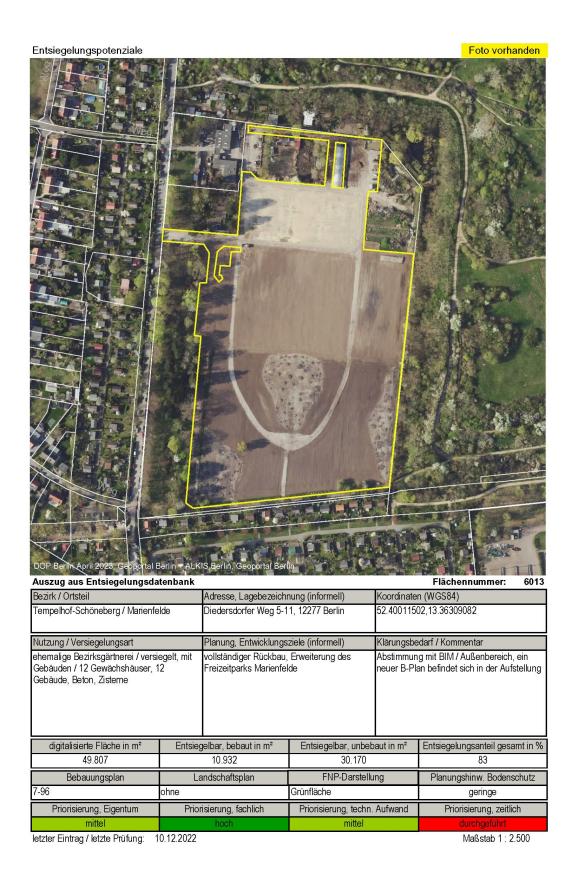


Fig. 3: Sample of a profile (only available in German)

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