



06.03 Open-Space Development 2020

Introduction

Green and open spaces are defined as non- or minimally built-up areas, such as woods, fields, allotment gardens, sports areas, parks, cemeteries and fallow areas. They are of great importance for the **quality of life** within a city. The existence of a variety of open spaces, from near-residential parks up to farmland and wooded areas, is a key prerequisite for the fulfilment of the needs of residents for relaxation.

Green and open spaces enrich the urban features by their contribution to the residential structure of a city. They serve as habitats and retreats for plants and animals, and fulfil important **compensatory functions for the urban ecosystem**. They improve the urban climate by promoting air circulation and air exchange, and moderating warming. They relieve surface waters by retaining and permitting the evaporation of rainwater.

As areas that are largely pervious, they enable undisturbed soil life, with all the ensuing effects for the ecological balance. The soil is a decomposition, compensation, and construction medium for processes of material transformation; its filtration, buffering, and metabolic qualities also serve, particularly, the protection of the groundwater. Increased impervious soil coverage and substance input into the soil may destroy its functions permanently or even irreversibly.

The consumption of green and open spaces for construction use is a key environmental policy issue, which is also discussed and referred to as land use, land consumption or new land consumption.

In the context of the environmental discourse, there is a great need for a basis to assess the extent of land consumption, and its developments during recent decades. Balances regarding land consumption are needed both to define quality goals for soil protection, and as indicators for the discourse on sustainability. In particular, the aim is to reduce land consumption and to monitor the development over time. Its continuous observation also serves as an indicator with regard to sustainable development at federal, state or municipal level.

According to the Federal Statistical Office, which uses the only figures available for a nationwide comparison from the statistical offices of the German states, a continuous **increase in residential and traffic areas** to 130 hectares per day could be observed in **Germany** up to the turn of the millennium. It is important to note that the residential area category does not only include impervious but also pervious open and green spaces in the city, such as parks, campsites, cemeteries and playgrounds, and even gardens and front yards, which are categorised as buildings. Land consumption, primarily at the expense of farmland and forest, dropped to 99 hectares per day in 2003, only to increase to 131 hectares per day again in 2004. Since then, land consumption decreased to 77 ha per day in 2010 and to 45 ha in 2019 (German Environment Agency (UBA) 2020). The Federal Government's goal in the German Sustainable Development Strategy is to limit the average increase to under 30 ha per day by the year 2030. By 2050, the aim is to establish a closed-loop land-use regime, which means that the total land consumption is reduced to net zero by land recycling and by reducing new land consumption (cf. Federal Statistical Office 2021).

Figures on the development of residential and traffic areas are also available for **Berlin**. The Statistical Office for Berlin-Brandenburg (AfS) regularly publishes figures on the municipal area, broken down by borough and type of use, and compiles them together with information on the residential and traffic areas. The figures are based on the evaluation of the real estate cadastres in the borough land survey offices. Up until 2015 (inclusive), the data was supplied based on the AdV (Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany) - land use directory. Since 2016, the data is generated by evaluating the Official Real Estate Cadastre Information System (ALKIS) (Amt für Statistik Berlin-Brandenburg 2020b).

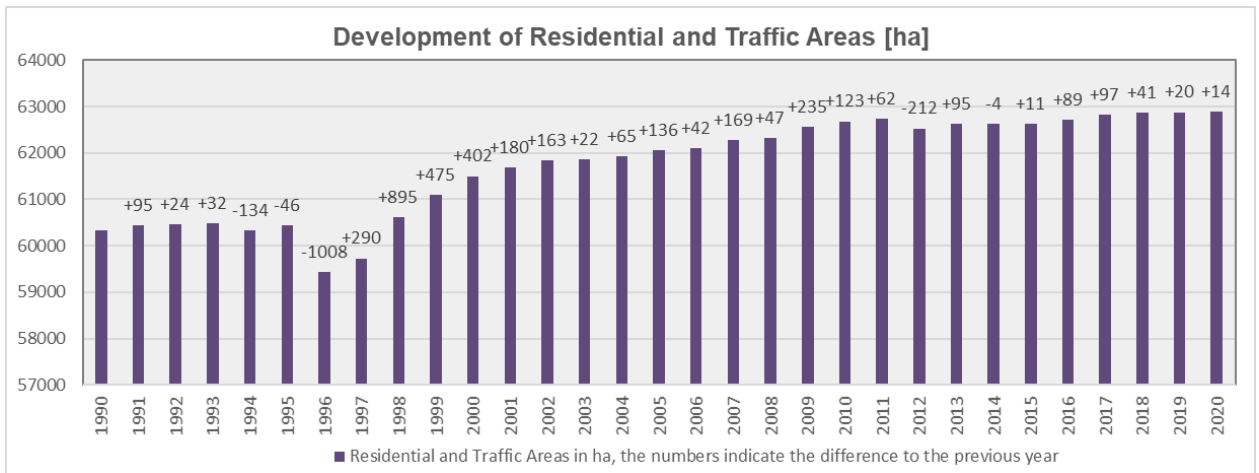


Fig. 1: Development of residential and traffic areas in Berlin, 1990 – 2020 (Statistical Yearbooks Berlin; until 1998 editions (hard copy) of the State Statistical Office, since 1999 digitally available via the Statistical Office for Berlin-Brandenburg, 2020a). Due to changes in the survey methodology, the figures from 2016 and later cannot be directly compared with earlier periods.

As described above, urban green uses may also fall into the categories of residential and traffic areas. The figures of the official statistics on residential and traffic areas are therefore only suitable for providing insight into the development of land used for residential purposes and its associated green uses. Regarding the development of residential and traffic areas, the analysis of the official land use statistics only quantifies the consumption of forest areas and farmland, although detailed figures are also available for inner-city green uses and calculations would be possible. For non-city states or for Germany as a whole, such figures may be suitable for describing the land consumption of these use categories. Since successfully and permanently harmonising the methodology throughout Germany based on ALKIS data, the foundations for appropriate monitoring have been created.

For the State of Berlin, reducing the open space uses to “Forest” and “Farmland” is not a suitable solution to representing the use of green and open spaces. Since forest areas are largely protected, land consumption would thus be limited to decreases in farmland. With regard to the above-mentioned important functions of all green and open spaces, it is necessary to monitor any loss of green and open spaces as well as any gains in their entire range, i.e. including allotment gardens, fallow areas, greenery along roads, cemeteries and parks as well as larger contiguous green spaces on areas associated with construction use. For this reason, a comprehensive basis for monitoring the entire green and open space inventory, consisting of the open-space development map data, has been developed and published as part of the Environmental Atlas for more than three decades.

The two approaches to ascertaining land consumption differ greatly in their objectives and their methodologies. This becomes apparent in a comparison of the land use categories they employ. Table 1 presents the land use categories of the Environmental Atlas’ open-space development map on the one hand and the data on the development of residential and traffic areas according to the Statistical Offices of the Federation and the Länder (Statistical Office for Berlin-Brandenburg) on the other. The table lists land-use categories that are grouped as construction use or residential areas on the one hand and green or open-space use on the other. It only includes categories for which statistical evaluations are also available.

	Environmental Atlas	AfS / AdV use catalogue
Residential areas		
	Residential use	Residential area
	Mixed use	Mixed use area
	Core area use	Trade and services
	Commercial and industrial area, large-scale retail	Industrial and commercial area
	Public and special use	Special functional area
	Utility area	Utility facility
		Waste disposal
	Weekend-cottage and allotment garden-type use	Sports, leisure and recreational area (incl. park, allotment garden, sports field)

	Sports facility, covered (partially)*	
		Cemetery
	Traffic area	Traffic
	Constructions site	
Open spaces		
	Farmland	Farmland
	Forest	Forest
		Woods
	Tree nursery/ horticulture	Tree nursery
	Allotment garden	
	Park	
	Sports facility, covered (partially)*	
	Sports facility, covered (partially)*	
	Cemetery	
	Fallow area	Wasteland, area without vegetation
	Urban square/ promenade	
		Heath
		Peatland
		Swamp

Tab. 1: Classification of the Environmental Atlas' and the Statistical Office's use categories into "residential areas" and "open spaces" to ascertain land consumption (according to the Statistical Office for Berlin-Brandenburg 2020b, Environmental Atlas)

The table illustrates the fundamentally different classifications of the two approaches, especially with regard to the open space categories.

According to the Environmental Atlas approach, all areas, which have been assigned to an "open space" use category listed in Table 1, are regarded as open spaces. This applies regardless of whether dual use applies for the area according to the use mapping of the Urban and Environment Information System (ISU), i.e. simultaneous construction use and green use or not (cf. [Environmental Atlas maps "Actual Use of Built-up Areas" \(06.01\) and "Inventory of Green and Open Spaces" \(06.02\)](#)).

In a metropolitan area like Berlin, the increase in residential and traffic areas according to Federal and State statistics is therefore not a suitable indicator for the consumption of open space. For this reason, the indicator "soil imperviousness" was defined as part of 40 core indicators for Berlin, for the purpose of sustainability monitoring. It aims at documenting the economical use of the resource soil in the context of sustainability. Data from the Environmental Atlas (Statistical Office for Berlin-Brandenburg 2021) is also used to illustrate how the degree of imperviousness develops over time.

The indicator of soil imperviousness, however, is equally unsuitable for drawing direct conclusions about the development of green and open spaces in Berlin. Thus, the Environmental Atlas provides the only continuously updated basis for such monitoring, its open-space development map, which has been published since the mid-1980s.

To grasp the methodological approach that is outlined later, it is crucial to understand **the definition** that the **term "open space"** is based on here and its limits in terms of representation.

Green and open spaces may be assigned to economic use (e.g. agriculture), horticulturally designed as recreational areas (e.g. parks) or largely unused (fallow areas with or without spontaneous vegetation). Typical green and open space uses include forests, farmland, meadows and pastures, but also urban open spaces such as parks, allotment gardens, cemeteries or sports facilities as well as fallow areas. Urban open space uses are thus also classified as open spaces rather than residential and traffic areas, which differs from the use system employed by the Statistical Office for Berlin-Brandenburg.

The green and open space inventory as a whole includes larger contiguous areas of the city's green potential, which do or may potentially serve as unique habitats for animals and plants and fulfil recreational, landscape and abiotic functions in the ecosystem.

The level of detail of the areas presented in the open-space development map is based on the level of blocks and block segment-areas of the Environmental Atlas' use maps. The specification of a minimum area size of about 1 ha leads to a generalised representation, which always allows the key areas of

urban development to be located and interpreted. The Environmental Atlas provides additional datasets (“Urban structure - Area Types Differentiated” (06.08), “Impervious Soil Coverage” (01.02), “Vegetation Heights” (06.10.2) and “Green Volume” (05.09)) that provide insight even on a smaller scale, i.e. below the 1 ha limit. This includes insight into the green structure within residential and commercial areas or into the parts of construction use/ green and open space use areas that are actually impervious.

The reason for presenting open space losses at longer time intervals, i.e. every decade for periods since 1970, is that more frequent presentations – e.g. on an annual basis – would require a disproportionate amount of effort.

Statistical Base

The last open-space development map, published in 2013, serves as the statistical base for the present map with regard to open space losses and gains. This map already covers the areas ‘gained’ between 1945 and 2010 and the areas ‘lost’ for the periods from 1945-1970, 1970-1980, 1980-1990, 1990-2000 and 2000-2010. These areas have been transferred to the new map.

The mapping of open space losses in the first versions of this map prior to 1990 primarily involved the use of non-digital sources. The Environmental Atlas Map 06.03 **Open-Space Development since 1950** from the year 1985, which served as the main data base, presents open space losses for **West Berlin** for the periods from 1950-1970, 1970-1980 and 1980-1984. It indicates open space gains based on the open-space inventory of 1984 (scale 1 : 50,000). This map in turn was based on historical city maps. The city atlas used, Berlin in der Tasche (Berlin in your pocket) around 1950 and 1970 (scale 1 : 20,000 - 25,000), the 1975 Berlin City Atlas (scale 1 : 8,000) and the 1980 Buchplan Berlin Hauptstadt der DDR (Atlas of Berlin, Capital of the GDR) (scale 1 : 25,000), formed the basis for ascertaining the open-space inventory in **1950, 1970 and 1980 in East Berlin**. The open-space inventory for both East and West Berlin for the year 1990 was extracted from the Euro-Großraumstadtatlas Berlin 1990 (Euro City Atlas of Greater Berlin) (scale: 1 : 20,000) and the Berlin Stadtplan 1991 (Berlin city map) (scale 1 : 20,000 and 1 : 25,000 - 35,000 respectively).

In addition, the Environmental Atlas Maps [“Actual Use of Built-Up Areas” \(06.01\)](#) and [“Inventory of Green and Open Spaces” \(06.02\)](#), which were developed based on the actual use mapping of the Urban and Environment Information System (ISU) parallel to each version of the open-space development map, were used to define and delimit the inventory of open spaces as well as the losses and gains of open space.

For the current version of the map, a new decade of open space losses (2010-2020) was added to the data and the information on open space gains was updated. The actual-use mappings of the ISU as of 2010 and 2020 formed the primary data base for this purpose.

Aerial photographs and orthophotos from the years 1928, 1953, 1990, 1998, 2002, 2004, 2010 and 2020 (all years are available in the [Geoportal](#) of the State of Berlin (SenStadtWohn 2020)) were used to verify individual areas throughout the phases of the map update.

Methodology

In accordance with the mapping units of the two actual-use maps of the Environmental Atlas, in particular the map “Inventory of Green and Open Spaces” (06.02), the open spaces that existed at the end of the Second World War were determined for the 1984/1985 version of this map, which was also its first version. The map covered the area of West Berlin and open spaces were determined based on old city plans, other maps and aerial photographs. Areas that were destroyed during the war and cleared later were not considered green and open spaces but rather built-up areas based on the historical context. **This timeframe is referred to as “before 1945” in the present document.** Open spaces that lay fallow for decades, for example at Potsdamer Platz, which were only developed again after the reunification of the city, were considered open space losses at the time they were built-up again.

Actual-use maps were superimposed on these green and open space maps in 1970 and 1980. The open space losses and gains were then copied out onto additional maps. Then, a balance was struck of the respective losses and gains, based on the area sizes. At that time, this was largely done on paper, at a scale of 1 : 50,000. The results were converted into digital form only later and were then based on the Environmental Atlas maps of actual land use, which have been continuously updated since 1985.

From then on, a change in land use was considered a **loss of open space** if the use changed from a category of the “Inventory of Green and Open Spaces” map to a use category included in the “Actual use of built-up areas” map. Green and open spaces are represented by the land use categories “Forest”, “Meadow and Pasture”, “Farmland”, “Park/ green space”, “City square/ promenade”, “Cemetery”, “Allotment garden”, “Fallow area”, “Sports use” and “Tree nursery/ horticulture” as defined in the

[“Inventory of Green and Open Spaces” \(06.02\) map of the Environmental Atlas](#). Areas assigned to construction use, e.g. public use areas, have also been categorised as open space, if they contain large contiguous and vegetated pervious areas (dual use, see SenStadtWohn 2021a). This has allowed the change in use since 1945 to be quantified for the periods indicated. It is important to note here that the open spaces presented in the “Inventory of Green and Open Spaces” Map (06.02) reflect *all* undeveloped land, as long as an area exceeds the 1-ha threshold and may therefore be recorded. The map thus shows land covered by vegetation rather than land use in terms of urban planning categories.

The **open space losses** refer to the time intervals specified above, while the open space gains refer to the entire period between 1945 and today. Areas that were built up within a certain time period (including road land) accompanied by a use change from a category of open space use to a category of construction use are presented as open space losses. This applies regardless of whether they were built up “before 1945”. This means that even areas that had been indicated as open space gains in previous versions of the map are later presented as losses, if they were built on again. Examples of this are the previously mentioned open spaces at Potsdamer Platz, which lay fallow for decades due to war and the Wall, as well as industrial sites that had been cleared and were then built on again after a few years, i.e. in a later decade. Gradual developments, such as the increasing development and densification of allotment gardens, accompanied by being recategorised as “Weekend cottage area”, are also recorded as open space losses, as the land use changed from a green and open space category to a construction use category here (cf. SenStadtWohn 2021a).

Areas that were developed before 1945 (without being destroyed during the war) and that were assigned to one of the above-mentioned open space categories in 2020 were recorded as **open space gains**. Demolition and the discontinuation of use (e.g. large railway facilities) due to the Second World War created open spaces, some of which were never built up again. They either still lie fallow and are often covered in vegetation or have been converted into public green and open spaces (e.g. parks at Gleisdreieck). In the end, only those areas that were developed “before 1945” were included as open space gains in the map.

In the early 2010s, the content of the map was already transferred from the digital block map 1 : 50,000 (ISU50, spatial reference Environmental Atlas 2005), which featured overdrawn roads for illustration purposes and which was not true to location, to **the geometry of the block map 1 : 5,000** (ISU5, spatial reference Environmental Atlas 2010), **which is true to location**. This improved the usability of the map greatly and allowed for balances to be drawn up for the areas. At this time, the development process of the map also became more automated. The open space losses and gains were identified in a largely automated manner, now drawing exclusively on data from the actual use survey of the Urban and Environment Information System (ISU). Only a few manual checks were carried out based on aerial photographs or orthophotos. Areas with recorded open space losses and gains in the decades up until 2010 were adopted from the existing data base. For the current map, the open spaces losses and gains of the last decade, 2010-2020, were added to these. In this context, a first clear **set of rules** for generating the inventory of green and open spaces from the use categories of the ISU block (segment) area map was developed (cf. SenStadtWohn 2021). This makes it possible to create the inventory of green and open spaces largely automatically and based exclusively on the use data of the ISU block (segment) area map using straightforward criteria. This set of rules may be used for all future updates of the “open-space development” map. Accordingly, the definition of “open space” is now even more clear-cut than before, including all uses listed in Table 1 in the “Environmental Atlas” column under “open space”.

As part of developing the 2020 open-space development map update, the map was also divided into two different layers for the first time. This is the case as the geometry of the ISU5 block (segment) area map changed due to continuous geometric adjustments to the map as part of updates to the geometries of the loss/ gain areas and does no longer match that of previous periods. By dividing the map into two layers, it was possible to preserve both geometries, the current and the historical one, with their respective properties, and, to display them simultaneously by superimposing them on the open-space development map.

The two layers contain the following content:

- Layer 1: current inventory of green and open spaces and ISU block (segment) areas in the current geometry incl. attributes for each open space loss and gain time period. The attributes contain the area shares (percentages) of the respective period in the current ISU block (segment) area.
- Layer 2: original area geometries of the open space loss and gain areas from the each time period. An area can only ever be assigned to one category. Accordingly, ‘loss’ time periods may not overlap with one another within Layer 2.

With the map display, it is therefore possible, on the one hand, to identify the exact geometric boundaries of each loss and gain area (Layer 2). On the other hand, the attributes may be used to identify what percentages of an area are part of which loss and gain period for each current ISU block (segment) area. The workflow for creating the Open-Space Development Map 2020 was the following (cf. SenStadtWohn 2021):

1. Generating the 2010 and 2020 inventories of green and open spaces based on the categories presented in Table 1.
2. Merging the 2010 and 2020 inventories of green and open spaces to identify area differences between the two datasets, which represent the potential losses and gains of open space.
3. Manually checking the potential areas of open space loss using the aerial photograph focussing on actual open space losses as compared to the previous time period.
4. Manually checking the potential areas of open space gain using the aerial photograph focussing on actual open space gains as compared to “before 1945”.
5. Creating Layer 2: merging the new loss and gain areas with the open space losses and gains from the previous time periods.
6. Creating Layer 1: merging the gain and loss areas from all time periods with the current ISU block (segment) area geometry and calculating the percentages of the different categories for each ISU block (segment) area.

Generally, when considering an area at block (segment) level, **small-scale open space losses** that may occur within a block (e.g. due to retrospective densification) may not be recorded by the selected method. Areas measuring below 1 ha or the minimum width of 20 m were generally not recorded.

Map Description

A clear trend emerges, when looking at the open-space development over the whole period that has been studied thus far, from “before 1945” (i.e. with all built-up areas of the city as a reference point prior to the war-related destruction) to 2020 (cf. Tab. 2). Between 1945 and 2020, 12 % of the green and open spaces within the municipal area (10,645 hectares) were consumed for construction purposes in Berlin. Comparably very few formerly built-up areas or traffic areas were converted into open space, however, during the same period (0.7 % of the municipal area, 660 hectares). The open-space losses predominately affected areas outside the City Rail Circle Line of the city, and were frequently achieved at the expense of farmland, allotment gardens and fallow areas.

Tab. 2: Open-space losses and gains in Berlin since 1945, according to the Environmental Atlas, Population Statistical Yearbooks, Statistical Office for Berlin-Brandenburg

Class	Area [ha]	Avg. population *	Year	ha/year	m ² /inh./year**
Open-space loss 1945-1970	4,035	3,240,470	25	161.4	0.50
Open-space loss 1970-1980	1,626	3,095,728	10	162.6	0.53
Open-space loss 1980-1990	2,870	3,170,182	10	287.0	0.91
Open-space loss 1990-2000	512	3,441,556	10	51.2	0.15
Open-space loss 2000-2010	672	3,405,999	10	67.2	0.20
Open-space loss 2010-2020	936	3,508,409	10	93.6	0.27
Open-space loss 1945-1970	10,651	3,302,165	75	142.0	0.43
Open-space gain 1945-2020	660	3,302,165	75	8.8	0.03
Inventory of open spaces 2020	35,717	3,664,088	1	35,717	97.5
Average population (as of December 31 of each year): Statistical Office for Berlin-Brandenburg 2020a					
*Average population of the periods calculated in each case starting with the first year, e.g. 1971-1980					
**The open spaces included in the calculation here should not be confused with the framework used for calculating the number of inhabitants with near-residential green spaces based on the guidelines for Berlin (green supply analysis)					

Tab. 2: Open space losses and gains in Berlin since 1945 (as of December 31 of each year) according to Environmental Atlas 06.03, Statistical Office for Berlin-Brandenburg 2020a

Individual gains in open space, mostly due to the impacts of war and the subsequent and division-related decommissioning of large railway facilities, are predominantly found in the inner city. Some of these

areas, which initially lay fallow for decades, were later converted into parks, such as the Görlitzer Park, the parks at Gleisdreieck or the Mauerpark.

The extensive consumption of hitherto non-built-up areas in East Berlin after World War II began approx. twenty years later than in West Berlin. In West Berlin, most open spaces were built up between 1950 and 1970, while in East Berlin, this occurred during the 1970s and 1980s. These differences in urban development reflected the political division of the city after World War II (cf. also Environmental Atlas Map "Building Age in Residential Development" (06.12) SenStadtWohn 2018).

At the end of the war, approx. 30 % of all buildings had been totally destroyed or seriously damaged. The districts of Mitte and Tiergarten were the most strongly affected; there, this concerned more than 50 % of all buildings; in Friedrichshain, it was 45 %. Initially, the economic situation in both the Soviet and the western sectors restricted building activity largely to repair. After the end of the blockade in 1949, West Berlin was able to profit from US economic aid under the Berlin construction programme. By contrast, East Germany and East Berlin were additionally burdened by reparation confiscations and dismantling.

During the 1950s and 1960s, the urban-development strategy of the **West Berlin (re-)construction programme** consisted in the separation of municipal functions and the relief of urban centres from dense construction. In the inner city, either areas cleared of rubble were rebuilt, sometimes with generously spaced buildings (for example, in the Otto-Suhr-Siedlung west of Moritzplatz), or open spaces that had previously been used as allotments or for other purposes were built on for housing development projects (Schillerhöhe in Wedding). In terms of existing housing, many blocks were extensively de-cored, demolished and rebuilt. New housing estates were also built, however, on formerly built-up areas destroyed during the war, e.g. the Hansaviertel in Tiergarten as part of the International Building Exhibition (IBA) in 1957.

On the outskirts of the city, meanwhile, the construction of the first larger housing estates (e.g. on former farmland and allotment garden areas at Falkenhagener Feld) and new commercial districts had begun on former open spaces.

From the mid-1960s to the mid-1970s, the well-known large housing estates were built on the outskirts of Berlin. Examples were the satellite towns Gropiusstadt in Neukölln and Märkisches Viertel in Reinickendorf.

During the 1970s, construction activity was concentrated on the revitalisation of the inner city.

During the 1980s, when the demand for living space had essentially been met, construction activity was in general confined to small fallow areas which were, for instance, built up in the context of the International Building Exhibition in 1984-87. Only rarely did any major consumption of open space occur. New industrial and commercial areas were established in Ruhleben, Marienfelde, and west of Neuköllnische Allee.

The few areas built up after 1990 involved compact residential areas on former ruderal and allotment-garden areas in Spandau, Steglitz, Rudow and Reinickendorf, as well as the buildings around Potsdamer Platz.

As a reaction to an increasing apartment vacancy rate, construction of multi-storey residential buildings declined sharply after 2000; in many plans for urban expansion and utilisation-change of areas, plans for such buildings were cancelled. A few new apartment buildings can be found in Frohnau, Buckow, Dahlem, Lichterfelde West and Altglienicke. Single-family housing moved into the foreground. The Regierungsviertel (government quarter) was completed. In line with the requirements of the Planwerk Innenstadt (inner city plan) and its updated version Planwerk Innere Stadt (interior city plan, SenStadt 1011), the development of the inner city was a clear priority. Less than 10 % of land consumption was allotted to urban expansion (e. g. in the former Diplomatenviertel (Diplomats' quarter), the new building of the Foreign Intelligence Service of Germany (BND) at Chausseestraße between Potsdamer Platz and Pariser Platz). Since its low in 2006, residential construction has been on the rise again (SenStadtUm 2011).

Increased land consumption also occurred for reasons other than the construction of housing, for large-scale retail and traffic projects, such as the A 100 motorway in the extension from Gradestraße in Neukölln.

In **East Berlin**, the reconstruction of the city proceeded only slowly. During the 1950s, the most important industrial plants and utilities were brought back into operation, and residential buildings that could be fixed were provisionally restored, but there was hardly any concerted construction of new residential buildings. The only important project was the construction of the buildings on Stalin-Allee

(today Karl-Marx-Allee) at the beginning of the 1950s in the context of the National Construction Programme, the counterpart to the West Berlin construction programme.

Only during the 1960s, after the construction of the Wall and the industrialisation of the East Berlin construction industry, did the reconstruction of the city centre begin. The goal was the fundamental restructuring of the city centre. The old tenement apartments were to give way to new buildings. The extensive demolition plans failed however, because of the difficult economic conditions and because of the existing housing shortage. At first, the areas along Unter den Linden and Karl-Liebknecht-Straße, around Alexanderplatz, and along Karl-Marx-Allee up to Frankfurter Allee, heavily destroyed during the war, were rebuilt. New construction then continued in the Fischerkiez (the southern part of the main Spree Island), and along Leipziger Straße.

The reconstruction of the city centre during the 1960s did not lead to any major loss of open space. However, the concentration on restructuring the city centre led to the neglect of new housing construction. Discontent with the living situation increased among the East Berlin population. As a result, the housing programme was proclaimed as the main emphasis of the social program in 1971. The goal was the elimination of the housing shortage through the construction of new apartment buildings and through the rehabilitation of the old buildings in the city centre, which had until then been neglected. During the 1970s and 1980s, large satellite towns were built on formerly open space by means of industrial prefabricated construction, with an immense mobilisation of labour from all over East Germany. New boroughs were established: Marzahn in 1976, Hohenschönhausen in 1979 and Hellersdorf in 1980. Other, albeit considerably smaller, residential estates were built along the entire periphery of East Berlin through 1990.

The large development areas of Marzahn, Hohenschönhausen and Hellersdorf arose to a large extent on the former sewage fields of Malchow and Hellersdorf which were closed down in 1968-1969. Near-natural areas along streams such as the Wuhle or Nordgraben were not built up, since the underground was not suitable for construction. However, smaller near-natural areas, such as pools, were often filled in and built upon.

In new residential areas or large housing estates on large contiguous open spaces, some small, isolated green spaces of no recreational or free-time value were sometimes left behind. One example is the construction carried out during the 1970s and 1980s in Lichtenberg, between Rummelsburger Straße and Saganer Straße. All that remained here of this large, formerly horticulturally or agriculturally used area was a narrow strip of parkland and a little green space.

The expansion of **industrial and commercial areas** also contributed to loss of open space. The losses in the Rhinstraße/ Gehrenseestraße/ Hohenschönhauser Straße area, along Märkische Allee, and along the motorway in Pankow were particularly high.

For the **development of the city as a whole**, post reunification, the following picture emerges:

After 1990, a few concrete-plate blocks which had already been planned or started were completed in Hohenschönhausen and Marzahn. The largest residential areas were built in the urban-expansion areas certified under the 1994 Land-Use Plan (FNP 94) in Buchholz and Karow-Nord.

In the decade 2000-2010, new **residential areas** were built primarily in Falkenberg, Biesdorf-Süd, Buchholz, Wartenberg and in Adlershof.

Overall, during the first two decades after reunification, 85 % of urban development in Berlin took place within the body of the city, while only 15 % extended beyond it (SenStadtUm 2011).

Areas that have been newly developed since 2010 are distributed across the entire urban area, although they tend to be more located on the outskirts and in the East of the city. New development is now no longer represented by large new housing estates, as was the case in the 1970s and 1980s, which is also evident from the average size of open space loss. New development now involves smaller, scattered areas. Up until 1990, the average size of newly built-up areas was about 7 ha. It has since dropped to a value of 1.9 ha in the decade between 2010 and 2020.

Larger construction projects from the decade between 2010 and 2020 include the residential and commercial buildings in Adlershof, the Europacity development project and new commercial buildings around Berlin Central Station and the extensions of single-family housing estates, e.g. in Gatow, along the Oberhavel river, in Biesdorf and Haselhorst. A residential project is currently under construction in Rummelsburger Bucht (bay on the Spree).

Comparing the totals of the last three decades (from 1990) reveals a clear increase of open space loss. For the decade between 1990 and 2000, a total open space loss of 512 ha was determined based on this map. The total loss of the current decade is 82 % higher (936 ha, cf. Table 2).

Finally, it should be noted that the monitoring of this map **cannot record and balance the small-scale losses** of vegetation-covered areas, as they are often located inside or at the edge of residential and commercial areas. In the case of retrospective densification and additions to existing buildings, these areas often fall below the lower threshold of 1 ha of the geometric basis of the Urban and Environment Information System (ISU), meaning that these losses cannot be taken into account. **“Land consumption” is therefore not the same as an increase in impervious soil coverage.** The two terms describe distinct processes and are also considered separately in the environmental policy discourse. While land consumption, in short, describes the increase of the area used predominantly for construction or residential purposes, the exact composition of impervious and pervious areas of these use categories is disregarded in this map. There is a separate [Environmental Atlas Map](#) dedicated to mapping the impervious soil coverage.

Area statistics by borough

Percentages of open space gains and losses since 1945 and of the inventory of open spaces

Figure 2 presents the distribution of open space gains and losses and of the inventory of open spaces in percent for the 12 boroughs of Berlin. All figures are sorted according to the borough numbering system based on the Verwaltungsgliederung (administrative division) of Berlin. At first glance, it is evident that the inner city boroughs of “Friedrichshain-Kreuzberg” and “Mitte” have the lowest shares of green space (< 20 %). In contrast, the shares of open space gains are higher here compared to those of the outer boroughs (Friedrichshain-Kreuzberg with 4.6 %, Mitte with 1.6 %). These are due to gains based on a small number of areas that are large in size, however, and that were previously used by the railway particularly in the inner-city area (e.g. the former railway stations “Görlitzer Bahnhof” in Kreuzberg and “Lehrter Stadtbahnhof” in Mitte). In order to put this information into perspective, however, the percentages provided must always be considered in relation to the absolute area size of the boroughs (as labelled on the bars). For example, although the open space gain has the highest percentage in Friedrichshain-Kreuzberg (4.6 %), the absolute size of the open space gained (94 ha) is significantly lower here than the area of the open space gained in Berlin’s largest borough, i.e. Treptow-Köpenick (156 ha, cf. Figure 3). The 156 ha recorded for Treptow-Köpenick, however, represent an open space gain of only 0.9 % of the total borough area, which is 16,773 ha.

With more than 20 percent, the loss of open space is particularly high in the outer boroughs in the East of the city (Marzahn-Hellersdorf with 28.5 %, Lichtenberg with 21.4 % and Neukölln with 26 %).

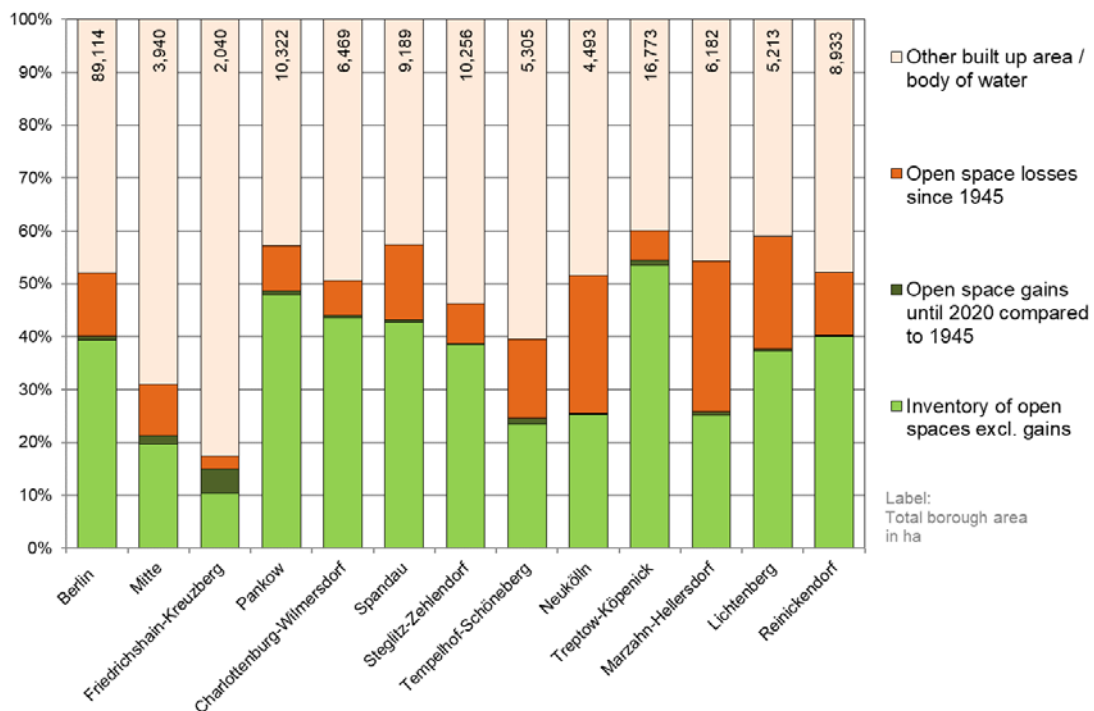


Fig. 2: Area shares (in %) of the inventory of open spaces and the open space gains and losses of Berlin and its 12 boroughs

The absolute area sizes presented here reveal that the boroughs, which have the largest total areas and which are located outside the City Rail Circle Line, are also the boroughs that feature the largest inventory of open spaces (Figure 3). Their shares of forest areas play a major role here: in Reinickendorf (Tegeler Forst) 53.9 % of the green and open spaces are forest areas, in Treptow-Köpenick (Köpenicker Forst) it is 76.6 %, in Pankow (Bucher Forst) 21 %, in Steglitz-Zehlendorf (Grünwald, Düppeler Forst) 63.8 %, in Charlottenburg-Wilmersdorf (Grünwald) 57.2 % and in Spandau (Spandauer Forst) 43.8 %.

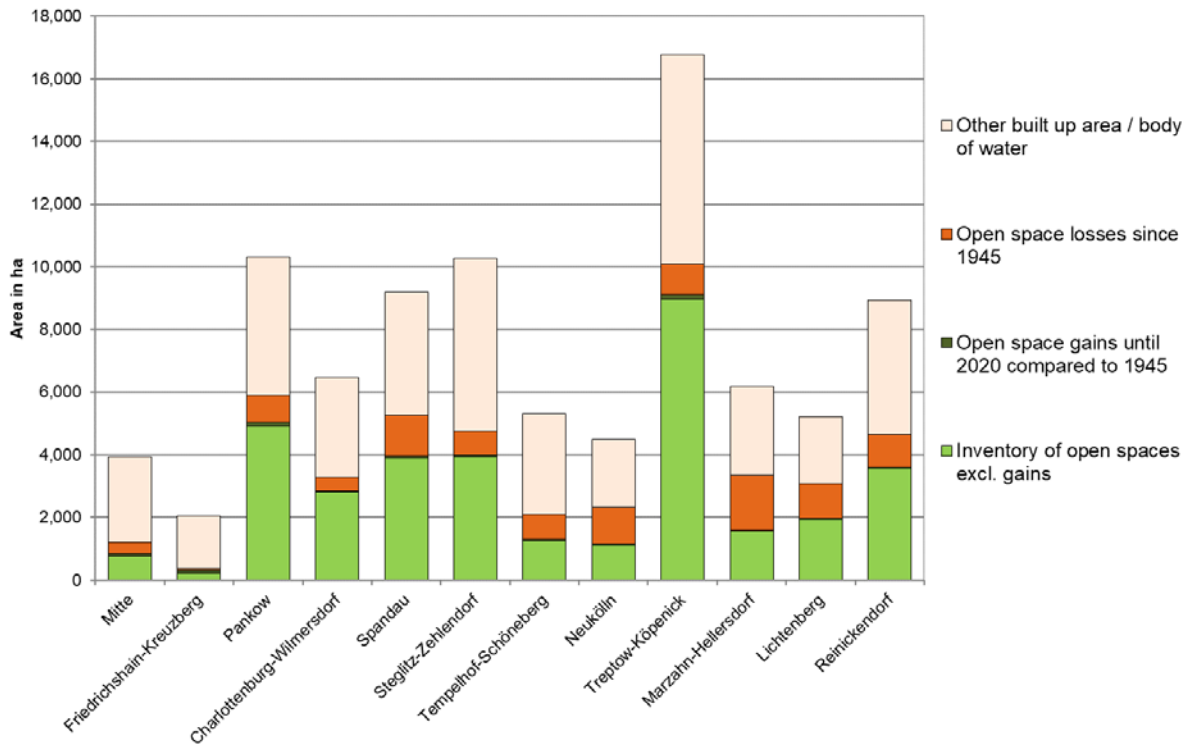


Fig. 3: Absolute sizes of the inventory of open spaces and the open space gains and losses of Berlin's 12 boroughs

Open space losses by borough

In the following two figures, the open space loss is presented by borough (as area shares (in %) in Figure 4 and absolute area sizes in Figure 5 for each time period.

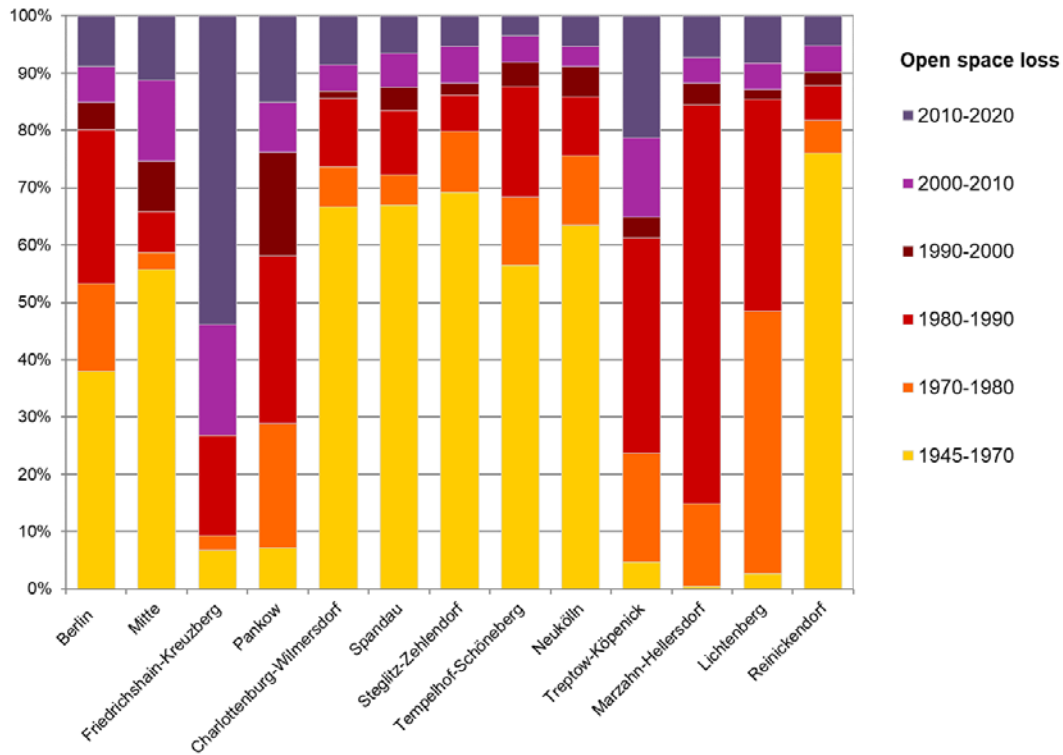


Fig. 4: Area shares (in %) of open space loss for various time periods in relation to the total area of open space loss of Berlin and its 12 boroughs

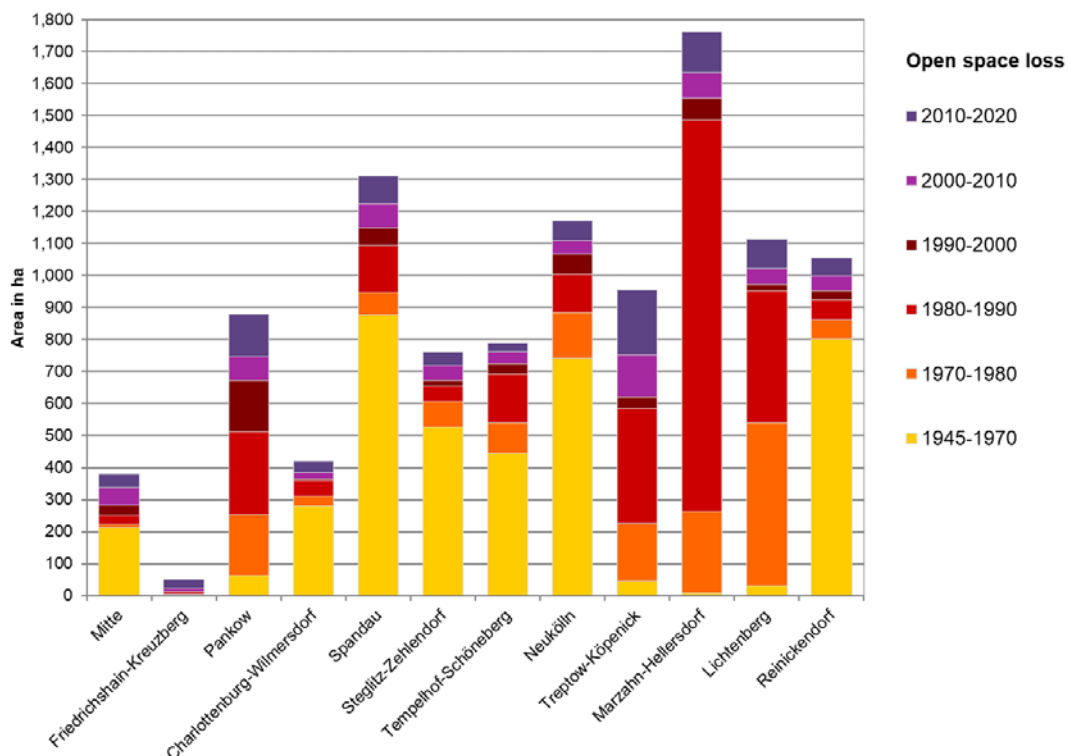


Fig. 5: Absolute area sizes of open space loss for various time periods of Berlin's 12 boroughs

The loss of open space up to 1970 is most evident in the boroughs of the former West of the city. In absolute terms, the largest areas that were built-up are located in the boroughs of Spandau, Reinickendorf and Neukölln. From 1970-1990, large-scale construction projects were implemented primarily in the boroughs of the former East of the city. This applies in particular to the boroughs of Marzahn-Hellersdorf, Lichtenberg, Treptow-Köpenick and Pankow.

Since reunification in 1990, Berlin's overall open space loss has dropped considerably compared to the previous decades, displaying a clear upward trend, however, when considering the entire 30-year period (cf. Table 2). The distribution of the absolute numbers underlines both these statements (cf. Figure 5). In addition to the characteristics of the boroughs, both the percentages and the absolute numbers need to be taken into account for a comprehensive assessment. When comparing the two boroughs Friedrichshain-Kreuzberg and Treptow-Köpenick, which differ greatly in their location in the city and their area size, this becomes apparent. In Friedrichshain-Kreuzberg, an inner city borough, a rather small absolute open space loss of 37 ha since 1990 is mirrored very clearly by the total share of loss of 73.2 %. These numbers represent large commercial and industrial areas along the railway line between Ostkreuz and Warschauer Strasse as well as the residential development at Gleisdreieck. In Treptow-Köpenick, in contrast, a considerably lower share of loss of about 38.7 %, recorded between the years 1990 and 2020, translates into a considerably higher total area of 370 ha of former open spaces that are now being used for construction. The extensions of the WISTA Science and Technology Park in Adlershof and a large-scale commercial, industrial and logistics site in Bohnsdorf in the reach of BER Airport may serve as examples here.

Overall, larger areas tended to be developed in the outer boroughs than in the inner boroughs, as more land was available there. It has already been noted that any loss of open space due to retrospective densification cannot be represented here because of the 1 ha limit.

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