06.07 Urban Structure
06.08 Urban Structure – Area Types Differentiated 2021

Introduction

Both the maps as well as the data on land use and urban structure of the Environmental Atlas draw on concepts and strategies from the 1980s. Over time, parts of the statistical base, methodology and the objective of the study have evolved. At the same time, the differentiated actual use map for Berlin as a whole has become increasingly important.

The actual use map is of crucial importance in many different areas of the environmental sector as well as in urban and landscape planning based on its spatial and specialised differentiation. It will continue to be an invaluable resource also in the future. For example, indicators may be derived from the mapping units, which are then used to develop a variety of ecological planning bases or in city-wide spatial planning.

Like other data compiled for the Urban and Environmental Information System (ISU), the information on actual land use and area types/ urban structure is managed and processed in a standardised spatial reference system. This makes it possible to superimpose different data sets and allows for a smooth data analysis across disciplines.

From December 31, 2021, the spatial reference of the Urban and Environmental Information System (ISU5 in the following) and the specialised datasets on land use will be updated annually in addition to the previous updates every 5 years (most recently in 2020). The reason for this is, on the one hand, that there is no annual recording of the actual land use for the city as a whole and, on the other hand, that the need for the latest information is constantly increasing due to the many changes in land use. The annual update focuses mainly on keeping the statistical blocks of the Urban and Environmental Information System up to date and recording land use changes following structural changes. The annual update is therefore less comprehensive than the 5-year update. The latter draws on a larger selection of geospatial datasets to examine actual land use. Detailed information on the background of the ISU, the different land use and area types, as well as on the 5-year updates may be found in the Final Documentation of 2020 (SenSW 2021).

In addition to updating the geometry and use data, the ISU5 block (segment) area boundaries were geometrically adjusted to the borough and state boundaries in ALKIS as part of the annual update in 2021.

Statistical Base

The annual update mainly focuses on two things, i.e. the review and adjustment of the primary and meta-block boundaries of the ISU5 to new or updated statistical blocks of the RBS (defined by the Statistical Office for Berlin-Brandenburg, AfS), and the recording of changes in land use following structural changes. For this purpose, the AfS's data on building completions and buildings with changed use, as well as data from the Housing Construction Space Information System (WoFIS) and the Commercial Area Information System (GeFIS) were used to identify areas to be reviewed due to new construction or demolition. In addition, a small number of areas was reviewed based on changes in the green space inventory.

In order to determine the actual use during the land use review, various specialised datasets were consulted, regarding, for example, building age, agricultural use or soil associations.

The annual update of the spatial reference of the Urban and Environmental Information System (ISU5) is based on the following resources.

Source data:

- Block map of the Urban and Environmental Information System (ISU5)
- Road areas of the Urban and Environmental Information System (ISU5)

Data from the Senate Department for Urban Development and the Environment:

- Official Real Estate Cadastre Information System – ALKIS (Geoportal Berlin)
- Official Topographic Cartographic Information System – ATKIS (Geoportal Berlin)
- Soil associations of the Urban and Environmental Information System (ISU5)
- Digital orthophotos (Geoportal Berlin), aerial photograph flights in 2020 and 2022
- Building age of residential buildings (Environmental Atlas)
- Flagged items collected since the previous update
- Green space and playground inventory (Geoportal Berlin)
- Map of Berlin 1 : 5,000 (K5) (Geoportal Berlin)
- Peatlands and soil types (Environmental Atlas)
- 2014 Road survey (Geoportal Berlin)
- Primary road network
- Housing Construction Space Information System (WoFIS), SenStadtWohn Berlin

Data from external sources:

- Data on buildings with changed use, Statistical Office for Berlin-Brandenburg (AfS)
- Building completions, Statistical Office for Berlin-Brandenburg (AfS)
- Commercial Area Information System (GeFIS)
- Statistical blocks, Statistical Office for Berlin-Brandenburg (AfS)
- Digital field block register, agricultural reference plots, Ministry of Rural Development, Environment and Agriculture Brandenburg

Methodology

Mapping Rules

For a detailed description of the mapping rules, please refer to Part II of the Final Documentation of 2020 (SenSW 2021). This section provides an overview of the most important mapping rules.

- Minimum size: ISU block segment areas may only be formed if they comply with the **minimum size of 1 ha** and the **minimum width of 20 m**. If a block contains fragments below the 1 ha limit with different uses, the **dominance principle** applies, i.e. the use of the larger fragment is mapped. In exceptional cases, e.g. when mapping soil associations that are particularly worthy of protection or when demarcating railway areas, the minimum size may be deviated from.
- New block (segment) keys: when a **new additional block segment area** is defined, it receives the next higher block segment key that has not yet been assigned. The now reduced block segment area with the ‘old’ use retains the ‘old’ key.
- Merging block segment areas: when **block (segment) areas are merged**, the resulting area retains one of the ‘old’ block segment area keys, usually that of the larger area or the key of the area the for which the use attributes are decisive.
- Differences between ISU and RBS (regional reference system) blocks:
    - Where RBS block boundaries differed greatly from those of the ISU, the **AfS was consulted** and the RBS block in question was **corrected**.
    - **Greenery along roads**: green spaces along roads are not part of the road area but should be included in the adjacent ISU block.
    - **Road area boundaries**: all areas of the ALKIS category ‘Classification according to road law’ and the LGV (Berlin land assets) category ‘Civil engineering of the borough’ are considered areas outside the block according to AfS rules but are part of the blocks in the ISU map. This is the case, for example, for larger car parks adjacent to road areas.
    - Differentiated land use within road areas, such as **medians and traffic islands**, is not reflected in the RBS geometry.
    - **Footpaths**: park footpaths are generally part of the park and are not classified as road areas. Larger forest trails that have been delineated as road areas should remain so, if they do not run along the boundary of an RBS block. The delineation of footpaths should be as differentiated as possible based on aerial photographs (without foliage) and the geodata set of the road survey.

- **New use** not yet visible in the aerial photograph: for new blocks, only existing types of land use or construction sites that are visible in the aerial photograph should be recorded. Planned but not yet existing structures are not mapped.
- **Bridges:** railway lines are shown without interruption. For motorway bridges, the land use under the bridge is mapped.
- Maintaining the **boundaries of soil associations**: maintaining the boundaries of soil associations in populated areas is not a priority. Here, it is more important to precisely delineate the land use visible on the aerial photograph.

Methodology of the Documentation Process

In the course of the update, the existing data of the block and block segment areas was revised both in terms of geometry and factual data, i.e. the categories of building use (WOZ), the categories of green and open space use (GRZ), and the area types (TYP in German, TYPE in the following). In order to document these changes transparently and comprehensively, the same method was used as for recording the changes in the 2020 mapping with slight modifications (see Final Documentation of 2020, Chapter 10). The documentation process is based on the collection of a set of attributes for each block (segment) area. The attributes are then added as numerical fields or text fields to the geodata record of the ISU block (segment) area map.

The process is carried out for all areas that have been changed as well as those that have been reviewed but not changed. This allows for a transparent history of the review and decision-making process, also for future updates. The documentation process and the attributes used in the current update are presented below. Compared to the 2020 update, the attributes have been slightly modified and the numerical codes reassigned (cf. Final Documentation of 2020, Chapter 10). Important changes are listed below.

The attribute [anpassgeo21] now distinguishes between 4 different cases represented by the numerical codes 1-4: neither the geometry nor the block (segment) key was changed, both the geometry and the block (segment) key were changed, only the geometry was changed or only the block (segment) key was changed.

Instead of the previous 3 cases, the attribute [anpassnutz21] now distinguishes between 2 cases. The numerical code 3 is omitted. It was assigned for the case that a smaller block segment area was integrated into a larger block segment area. Now, the old land use attributes of the small block segment area are not documented in this case and the code 1 (= unchanged land use) is assigned.

The general rules for documenting changes were retained. The data format description (only available in German) presents all attributes that were created in the geodatabase for documenting changes, which are attached to each ISU block (segment) area. The documentation attributes of the last update also remain part of the geodata set and provide an insight into the change history.

Methodology of Data Processing

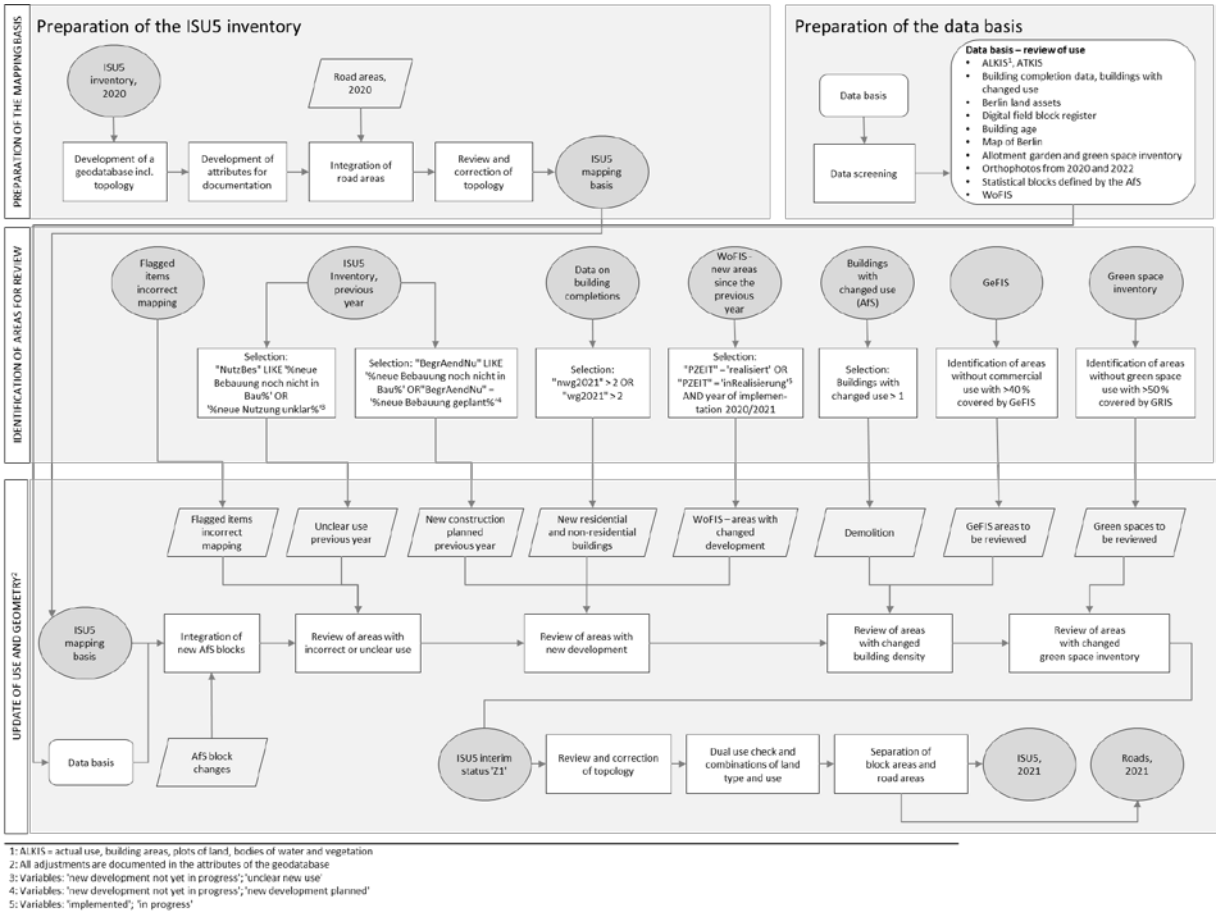

Fig. 1: Data processing diagram for the ISU5 update, as of December 31, 2021

The current update is based on the ISU5 block map (1 : 5,000, spatial reference: Environmental Atlas, 2020) as of December 31, 2020.

To verify the actual use visible in the aerial photographs, data on a selection of specialist topics was used. Prior to processing, the datasets were checked for validity and usability. Based on these datasets, areas to be reviewed in terms of land use were derived through selections and intersections with the ISU5 dataset.

The steps involved in compiling the areas for review are presented below:

- **New development**:
  - Selection of all block (segment) areas from the building completion data for which a building completion (non-residential and residential) of more than 2 buildings was recorded in 2021 (attributes “nwg2021” > 2 and “wg2021” > 2).
  - Selection of all block (segment) areas that are covered by more than 20 % by the areas from the Housing Construction Space Information System with the status “implemented” or “in progress” and the year of implementation of “2021”, “2022” or “n/a”.
- **Building with changed use**: selection of all areas containing buildings with changed use in 2021.
- **Inventory of Green Spaces (GRIS)**: intersection of the “Inventory of Green Spaces, 2021” with the ISU block (segment) areas, identification of all areas that are covered by GRIS areas by more than 50%, but do not have a green and open space use (GRZ) of 100, 110, 130, 140, 150 or 190.
- **Commercial areas (GeFIS)**: intersection of the areas from the “Commercial Area Information System” (GeFIS) with the ISU block (segment) areas, identification of all areas that are covered by GeFIS areas by more than 40 %, but do not have a building use (WOZ) of 21 or 40.
- **Flagged items**: selection of all block (segment) areas for which “unclear new use” or “new development not yet in progress” or “new development planned” was noted in the

documentation attributes during the 2020 update, and selection of all other flagged items collected since the previous update.

The geometry of the ISU5 map is based on the statistical blocks of the RBS (regional reference system) defined by the Statistical Office for Berlin-Brandenburg (AfS). The geometry of both the main and the meta blocks of the ISU5 map is largely consistent with the RBS blocks. The boundaries differ slightly at many points, which often serves to delineate the use more precisely. The 6-digit RBS block key is incorporated into that of the 16-digit block and block segment area key of the ISU5 at positions 4-9. The blocks of the RBS are continually updated by the AfS. Especially in areas with new or changed development, the existing RBS blocks are adjusted or new blocks are defined.
All blocks that were newly defined or changed by the AfS between June 1, 2021 and January 3, 2022 were included in the ISU5 block map as part of the 2021 update. For this purpose, the geometries of the new blocks were delineated, the new main block key was adopted and the land use attributes were reviewed and modified if necessary. The AfS often defines new blocks in areas with changed land use.

All block (segment) areas with at least one reason for review were checked on the aerial photograph for a change/ correction of land use. If there was a need for correction, the geometry and/ or key and/ or use attributes were updated and the change was recorded in the documentation attributes. In addition to the orthophotos, the specialised datasets shown in Fig.1 were used to verify the actual use.
Road sections were also reviewed as part of the current update and modified where necessary. When a new road section was created, it was assigned a new unique road key and the road section was placed in one of the two categories “road of the primary road network” or “other road” using the “primary road network” data set. Any changes made for the road sections were also recorded in the documentation attributes.
Once the update was complete, the land use attributes were checked with regard to the permissible combinations (cf. Final Documentation of 2020, Chapter 8.1), followed by another review of the topology.

After reviewing the identified areas, the ISU block (segment) area boundaries were adjusted to the ALKIS borough and state boundaries in an independent process. As a result, the two sets of boundaries are now exactly the same.

Map Description

The following section presents an overview of the changes. The map description of Urban Structure / Urban Structure - Area Types Differentiated 2020 provides details on the categories used in the maps “Urban Structure” (06.07) and “Urban Structure - Area Types Differentiated” (06.08).

2021 Update

As part of the update from December 31, 2021, a total of 35 new RBS blocks were added and 1,194 areas that had been identified were reviewed to establish whether the geometry or use attributes had changed. Furthermore, the ISU block (segment) area boundaries were adjusted to the ALKIS borough and state boundaries. As a result, the geometry of more than 2,500 block (segment) areas was revised. Table 1 below lists the changes in geometry, keys and use attributes by case for review. It should be noted that there may have been more than one case for review per area. Similarly, more than one type of change may have been implemented for an area, e.g. the boundaries of a block segment area may have been adjusted and the use attributes revised at the same time. Due to these overlaps, the sum of the subtotals does not match the final sum.

Case	No. of areas for review	Changed geometry	Changed key	Changed use	Total changed	% changed
RBS block change	131	43	44	14	63	48
WoFIS, building completion data	327	24	4	31	49	15
Building with changed use	304	29	16	25	43	14
GRIS	64	8	1	14	20	31
GeFIS	188	21	2	21	37	20

Flagged item	467	65	16	148	197	46
Incidental findings / previous mistakes	-	7	0	2	8	
Adjustment of ALKIS boundaries	-	2,695	3	7	2,695	
Total	1,226	2,820	78	243	3,033	

Tab. 1: Statistics of changes to the ISU5 in the 2021 update

Table 2 presents a differentiated overview of the geometric changes for each case for review. Block boundaries were adjusted in particular in the course of adding new RBS blocks to the ISU5 or in areas with new development, which were still quite changeable (cases: WoFIS/ building completion and flagged items). Areas with new development also contain the newly formed road sections. The category “Flagged items” has the highest number of new or changed block segment areas. In this category, for example, the boundaries of the block segment areas and the use attributes were revised in the area of the “Domäne Dahlem” (open-air museum for agriculture and food culture). The adjustment to the ALKIS borough and state boundaries resulted in changes to the boundaries of roads and blocks in more than 2,600 areas.

Case	**Changed block boundary**	**New block segment**	**Merging of block segments**	**Changed block segment boundary**	**New road**	**Changed road**
RBS block change	22	0	1	0	6	15
WoFIS, building completion data	16	4	0	2	0	2
Building with changed use	13	13	0	1	2	0
GRIS	6	1	0	1	0	0
GeFIS	15	2	0	6	0	1
Flagged item	25	11	5	18	0	10
Incidental findings / previous mistakes	3	0	0	2	0	2
Adjustment of ALKIS boundaries	1,561	0	3	3	3	1,126
Total	1,599	22	6	29	9	1,155

Tab. 2: Statistics of changes to the geometry of the ISU5 in the 2021 update

The map below shows how the reviewed areas are distributed across the city, as well as the changes made to the geometry, keys and land use attributes:

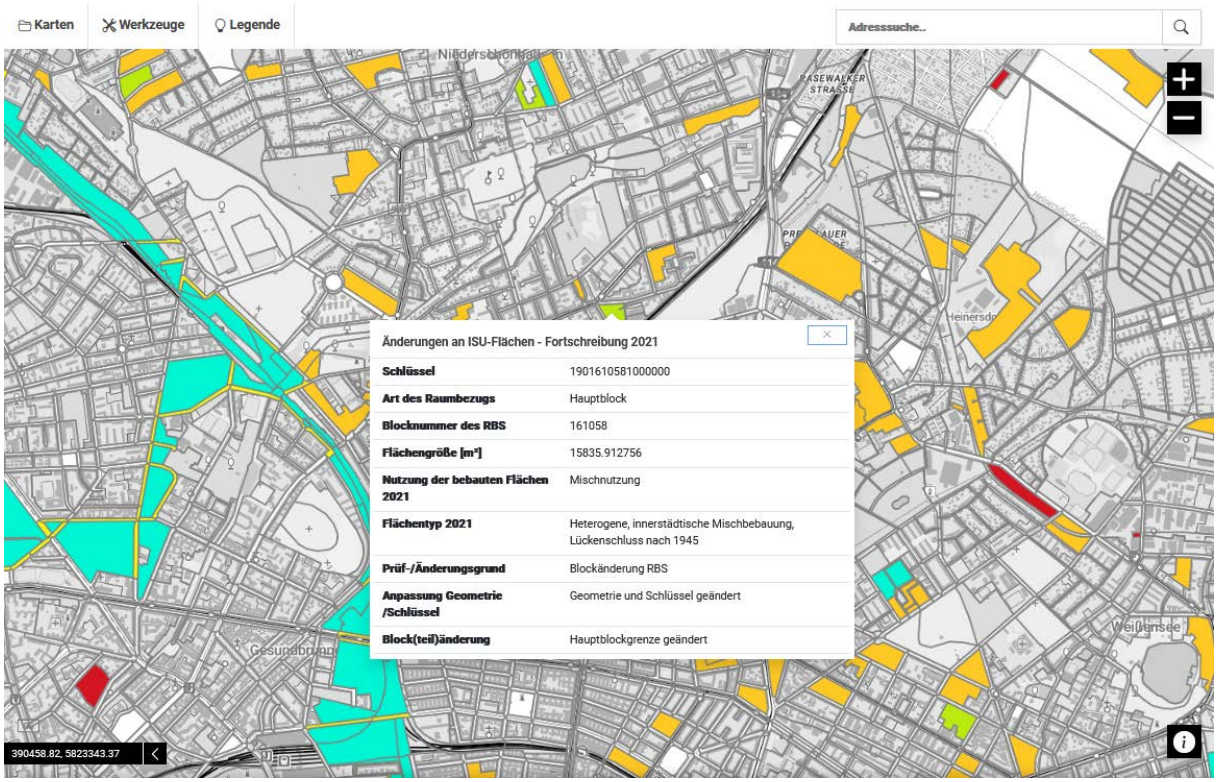

Fig. 2: Changes to ISU block (segment) areas, 2021 update

The area of the former Tegel Airport stands out in particular, as the land use changed after the closure of the airport. The Gatow area is also noteworthy, as it contains an agglomeration of areas that have been reviewed but not revised. This is due to a number of block (segment) areas that were adjusted during the last update based on new RBS blocks. Therefore, a revision was not necessary for the 2021 update.

Areas that underwent major structural changes include the urban development area Europacity north of the Hauptbahnhof (main railway station), the Adlershof Technology Park, a former commercial area on Blockdammweg and an area on Wendenschloßstraße in Köpenick.

At first glance, the change that occurred in the “Airport” area type (TYPE = 93) is striking. With the closure of the former Tegel Airport (decrease of 444 ha), this area type no longer exists in Berlin. The remapping of the areas of the former airport site also explains the change that occurred in three other categories. The green areas of the former Tegel Airport are now mapped as “Fallow areas” (TYPE = 57, increase of 229 ha). The former runways were assigned to TYPE 94 “Other traffic areas” (increase of 105 ha). The built-up areas in the north of the former airport site are used as a Federal Government helipad and were classified as TYPE 41 “Security and order” (increase of 30 ha).

Other changes are linked to new development. The area type “Rental-flat buildings of the 1990s and later” (TYPE = 73) has increased by 28 ha and that of “Densification in single-family home areas” (TYPE = 25) by 26 ha.

The revision of the land use attributes in the Domäne Dahlem area explains the decrease in area type 44 “University and research”. The entire site is part of a foundation, established by the State of Berlin and a citizen’s initiative (Förderverein), and is an open-air museum. The previously indicated use as a research site therefore only applies to a smaller section located in the southeast. The use of the remaining area was changed to area type 45 “Culture”.

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