Multiscalar mapping

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With the emergence of urbanism as an interdisciplinary field of urban research, cartography, similar to ethnography, has enjoyed widespread popularity as a spatio-analytical tool in all space-related research disciplines (Glaser 1974; Lindner 2004). As geography, sociology, ethnology, and anthropology have been combined with urban planning, regional planning, landscape architecture, and architecture—as well as further economic, ecological, or historical fields of research related to urban spaces—urban research has detached cartographic methods from their role as descriptive tools. Just as descriptive-theoretical and design-related disciplines come together in urban research, the field of cartography has evolved (like the field of ethnography, which is not discussed in detail here) from geography, to landscape architecture, and architecture from a visualization tool into an analytical tool and finally into a design tool (Corner 1990; Cosgrove 2004 [orig. 1999]).

What is special about the term mapping compared to the map is the fact that cartography originated explicitly from the graphic production of maps as territorial inventories by means of surveying, while the term mapping clearly evokes the procedural aspects of the production. In mapping, focus is placed on the production of maps as a reflective process during data collection and analysis. We use the concept of mapping to describe, beyond the reference to purely geographical reference models, also the assignment and relatedness of data and/or textures, as is the case in ethnography or in the social sciences (Wildner/Tamayo 2004). Due to its rather loose use of geographic reference models, we believe the term mapping, in contrast to maps, is particularly suited for interdisciplinary studies related to space.

The objective of this article is *to make mapping applicable as a design-based tool in the analysis of urban spaces and ways of life in an interdisciplinary context*. For this purpose, we reflected on our experiences from an interdisciplinary teaching research project, in which we used cartographic methods as one of the key tools. In the project we combined a sociological and urban design approach and, by working collectively on a multiscalar mapping process, developed a methodology for exploring urban phenomena within a socio-spatial context, which we intend for other researchers to apply and develop further.

For the field of sociology, we illustrate the possibilities offered by mapping as a tool for studying spatial phenomena; and for the field of urban design we explicate further the

methods of empirical social research as a basis for mapping. We refer to this integration of methods as relational mapping, which is characterized in particular by its ability to capture the action level. Relational mapping makes it possible to capture graphically and to spatialize both the social factors that constitute spaces and the spatial factors, which in turn shape the social relationships.

This article addresses the integration of methods, as well as the potential of using text and mapping to complement each other in spatial research regarding both the generation and transfer of knowledge. In the applied case, we synthesized four interrelated sociological and urban design levels of analysis into a single comprehensive multiscalar mapping (Fig. 1). While semantic data collection and synthesis processes sort information into a temporal sequence of what was said or what was written, mapping is based on a spatial arrangement, which makes it possible to *interpret parallel and superimposed information*. By virtue of its visual character, a drawing makes it possible to link different levels simultaneously and thus condense the findings. We start by discussing the particular narrative quality of mapping, upon which we address how the content is arranged in our project in order to then describe mapping as a multiscalar process in eight steps.

1 Mapping as a multiscalar narrative

Understanding mappings as *narratives* is deeply rooted in the history of cartography. While design plans, such as the floor plans of buildings, generally refer to a future situation to be created, mappings depict spaces that have already been produced. As such, the action producing the space is always implicitly embedded in the mappings. This can be interpreted as a graphic trace of an action.[1]

Thus, a narrative structure along the lines of a spatio-temporal description resides in every map (Caquart/Cartwright 2014). While oral or written stories describe spatial references in a linear temporal structure as verbal/linguistic narrations—the narration itself unfolds as a succession of words—the cartographic and figurative stories of the mappings communicate references to times and actions in a spatial structure as sign-like narrations; these narrations take place in parallel. Therefore, mappings are limited to a snapshot into which all temporally relevant elements must be inscribed, while texts are limited to linear communication through which space can only be narrated step by step. The readers of mappings undertake a considerably larger share of the synthesis work, as with maps and images. At the same time, the synthesis takes place within a much

1 This is where the historic debate on cartographic works as powerful instruments comes into view, claiming property rights, ownership, and power over territories, people, and everyone involved in the production of a cartographically surveyed, recorded, determined, and therefore politically appropriated space. Both this debate and the deconstruction of this hegemonic power with the rise of critical mapping in the 1980s and the critical practices of counter-mapping since the 1990s were not systematically addressed as part of the educational research project since the mapping methods were applied within the secure spaces of the university in this case and were used "solely for academic purposes" at first. Nevertheless, these aspects were discussed with participants in conversations, interviews, and mental mapping projects, as well as in the results published in journals, books, and websites and at events organized by the local and state governments.

shorter period of time than when reading a text, virtually instantaneously: The contents of the narration are revealed to the readers on the map as an overall picture before they can address the details, descriptions, side notes, and lines of argument that make up the mapping process.

For spatial research in the social sciences, the parallel and superimposed information in the mapping is particularly promising for the analysis as the spatial references can be understood differently than in the linear text.

A third difference between mapping and text is the greater vagueness in mappings as graphic artifacts due to their ambiguity. While both linguistic and cartographic narratives are first translated into meanings and statements following the synthesis performed by the readers, there is a great deal more scope in the synthesis when reading a mapping. This is due to the ambiguous nature of sign systems, which are less explicit in terms of their meaning than the words of a language. The difficulty in creating an informative legend illustrates this in particular, where graphic symbols are captured in words and thus ascribed meaning. Mappings express themselves only indirectly by means of the legend or additional text elements; instead, mapping contents are primarily communicated via graphic sign systems. Although these systems, in turn, are based on established and ideally comprehensible conventions, the medium is a non-verbal means of knowledge transfer. A mapping must first be translated before it is possible to discuss it.

This demonstrates how important the interplay between mapping and interpretive text is in space-related research, which is precisely what offers such great potential.

Mappings facilitate a multidimensional analysis and interpretation by means of spatially structured sign systems. The linguistic interpretation of the—generally ambiguous—drawing and the relationships depicted in it allows for a second, more explicit interpretation and analysis. Only after this second interpretation—or multiple interpretations in multiple texts—is it possible to integrate cartographic findings into verbally structured (academic) discourses. Whether the respective interpretation should be captured in text form, by whom, and at what point in the cartographic experimental design can only be determined in connection with the specific objective of the research. Ideally, the mapping and the text form a mutually supportive, cooperative research format for argumentation in spatial questions.

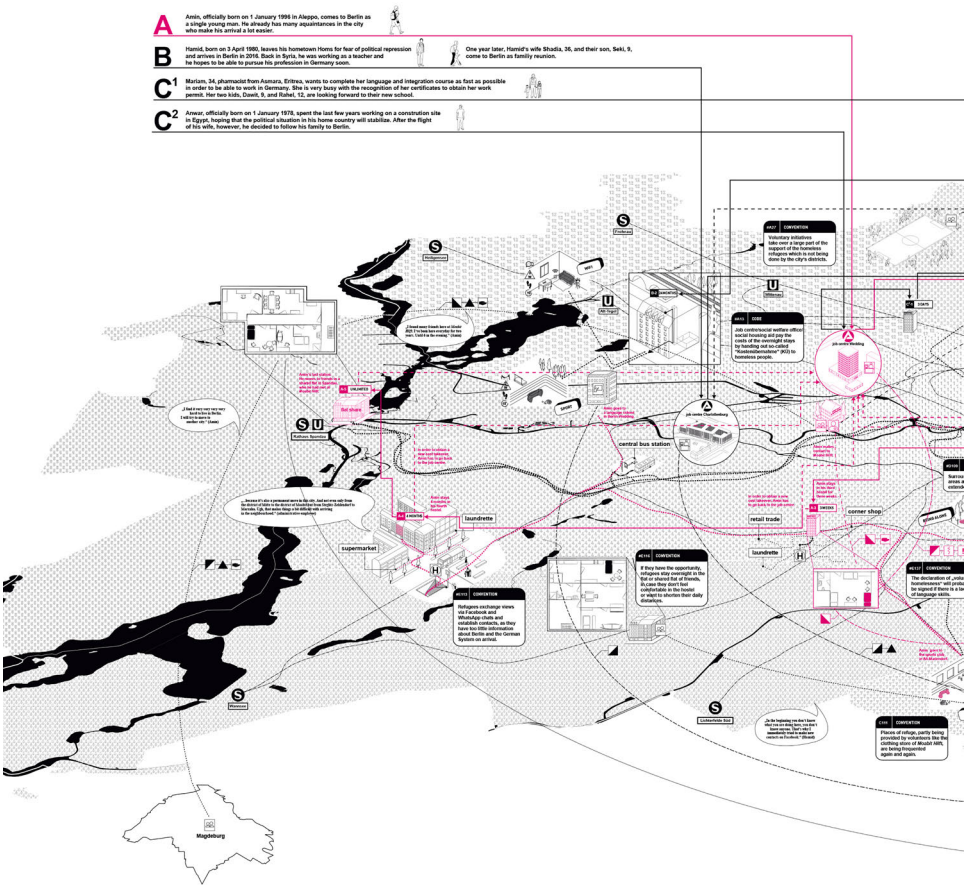
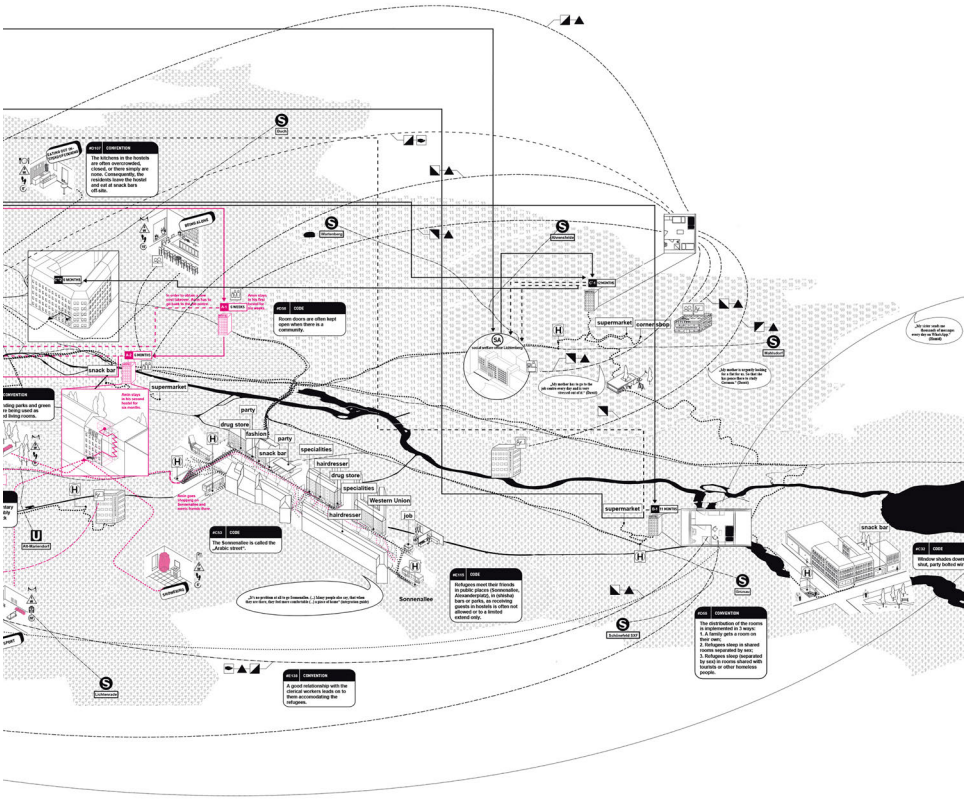


Fig. 1: Mapping project on Berlin's hostel industry with homeless people. | ©Flavia Biianu, Edda Brandes, Pauline Bruckner, Almar de Ruiter, Valentin Dobrun, Finya Eichhorst, Stefan File, Anne Guina, Christopher Heidecke, Dariya Kryshen, Farina Runge, Alina Schütze, Lisa Wagner and Jonas Wulf (map available at: https://depositonce.tu-berlin.de/handle/11303/11090)



2 Case study: The mapping of the hostel industry with homeless people

Against the backdrop of a growing housing shortage in Berlin, we decided to focus on the topic of accommodating homeless people in hostels. This phenomenon, which affected more than 30,000 people in December 2016 (Senate Department for Integration, Labour and Social Affairs 2017) and in summer 2018 (event organized by Senate Department), is not easy to recognize spatially in the city, nor is there much information available about it in public debate. Thus, we hypothesized that this phenomenon has remained hidden, which we confirm and substantiate in the course of our research. The perspective of the hidden nature of inhumane living situations, which can be considered a response to the housing shortage, stems from the debate on urban informality (Dovey/King 2011). The second basis of our approach is founded on the debate surrounding the commons, which speculates about urban goods and spaces beyond the categories of public and private (Ostrom 1990; Stavrides 2016). In the case of the hostel industry, we talk about a forced, nonvoluntary production of space, which nevertheless produces a common good. We used the dual concepts of *codes* and *conventions* to combine these two debates with their different research interests, as well as the two different methodological approaches, based on social sciences and cartography.

The two topic areas intersected with one another at the assumption that space is constituted as a result of the interplay between social action and physical environment (Löw 2001), giving rise to sets of rules. On the one hand, these sets of rules comprise the aspect of conventions, meaning how certain actions are typically carried out (Giddens 1984; Friedberg 1995). On the other hand, they contain the aspect of codes as semantic or spatial sign systems. We understand codes as both the establishment of rules (e.g., in the form of laws) and the spatialization of rules (e.g., signs of usage or arrangements). Despite their differences, both aspects share the fact that codes first have to be used and interpreted in order to gain meaning, which we in turn explore based on the *conventions* of spatial production. Thus, the dual concepts of codes and conventions were used in an interdisciplinary context from the perspectives of sociology and urban design in order to connect the thematic areas of urban informality and spatial commons, as well as to focus on rules and rule-based procedures in the methodology of the social science approach and in the mapping. For both research questions, we were interested in the organizational dimension of the production of space: How are actions coordinated together, and how are rules negotiated?

Our objective of uncovering the organizational phenomena of the hostel industry by mapping codes and conventions was based on the hypothesis that, despite being hidden, the processes, actions, and sets of rules leave spatial traces that can be seen and interpreted upon closer inspection. With this hypothesis, we entered a field of research in which the combination of analytical methods from sociology and urban design/architecture promised to reveal more than they ever could alone. Because mapping is a medium that includes and creates narrations on a wide range of different scales of measurement, it is ideally suited for this type of integration.

To integrate both the topic areas and the methodologies, the project was designed with a two-pronged approach and with various moments for interlinking the different perspectives. Below we describe how these moments can build on one another, although

this is by no means mandatory. We regard our approach as an experimental arrangement that can serve as the basis to develop the methods further. The steps were developed didactically in a teaching project with students, but they can also be translated to interdisciplinary research teams.

2.1 Introduction: Exploratory mapping

As an initial and experimental introduction, it can be helpful for non-designers in particular to create exploratory mappings addressing the spatial reference of the drawing and their own experiences with regard to capturing space. One possibility is to try out a mapping in a one-to-one scale with the aim of testing the concept of space in the act of drawing based on your own body dimensions and imagining the thematic research question that should be developed in the map—in our case, the housing situation of homeless people—cooperatively: in other words, testing the narrated and projected aspects in the mapping. In the project, we made available the workroom that is normally intended for architecture students to the seminar group as a research studio and tasked them with appropriating the space as their space of home for an indefinite period of time by means of surveying and drawing. The students "drew" the floor plans and elevation plans of their appropriated areas and furniture on the floor and wall using simple tools, such as tape.

Fig. 2: One-to-one mapping in the studio. | ©Chair for Urban Design and Urbanization, TU Berlin

2.2 Linkage: Sociological observation levels and urban design scales of measurement

In the second step, it is helpful to connect the research questions of the project, which are derived from theory, to spatial contexts and thus to drawing scales. This results in an analytical reference system between the social science observation levels and spatially constructed scales of measurement. For urbanistic and space-related research questions, there are usually various scales that can be used for the study. The mapping encompasses multiple scales almost automatically. For the social science perspective, different approaches regarding informality were outlined and the terms codes and conventions were clarified in the course of an in-depth literature reading. Throughout the project, we had to continuously amend these approaches based on the challenges that arose, which required a certain degree of conceptual openness for the integration. Right at the beginning of the reading phase, we split up the seminar participants into four groups, making sure to distribute the seven students of sociology, seven urban design, and three architecture students evenly. Each group was assigned an *observation level* that could be related to a corresponding *scale of measurement*: the city-wide level of the administration, the level at which the hostels are embedded in their neighborhoods, the level of the living activities that were originally expected to take place inside a hostel but that often ended up moving outside the building, and finally the level of interpersonal relations among the residents. During the literature reading, each group formulated its own research questions. As an initial means of addressing the object of investigation, guests were invited to the seminar for interviews and were also consulted in individual interviews organized by the groups themselves.

2.3 Thesis development: Concept mapping

In order to interpret new correlations between different theoretical components, relate them to the specific object of research and study site, and make a first attempt at developing a personal graphical language, the linearly structured contents from the literature reading are rearranged into multidimensional concept mappings.

During the project, the concept mappings were elaborated in parallel to the literature reading by visually and spatially correlating text modules with hypotheses, questions, concepts, ideas, and empirical aspects in order to allow for new syntheses. Thus, students and teachers were forced right from the start to link the graphical and visual study methods directly to the verbal and textual collection and reflection. The linguistically formulated texts were "deconstructed": that is to say, they were broken down into key messages and partially referenced to the respective scales.

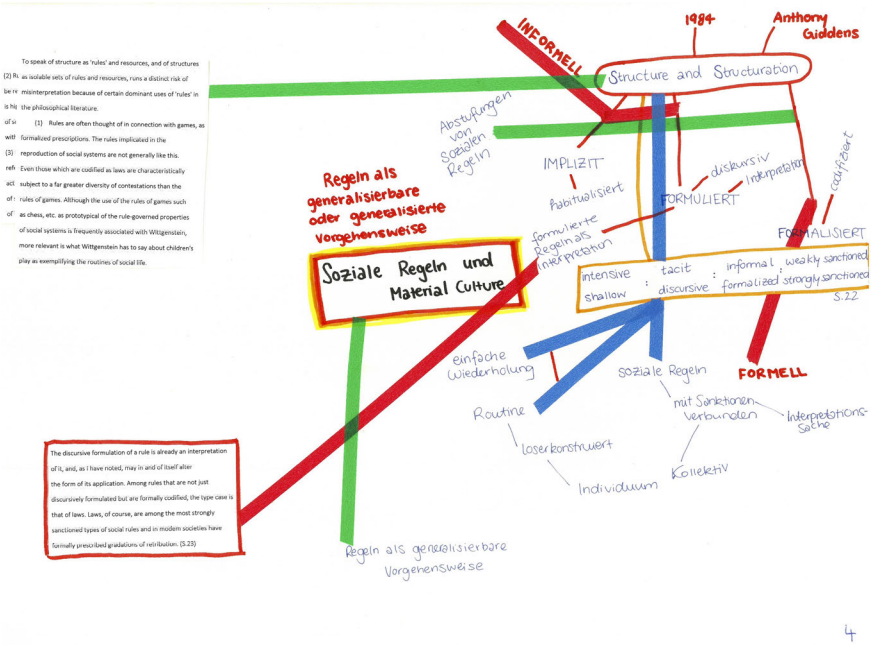


Fig. 3: Concept Map. | ©Luca Sonnen

2.4 Implementing linkages: Individual thematic mappings

The data transmitted linguistically from the literature review and from the research running in parallel in the form of site visits with drawing modes inspired by ethnography, architecture, and planning should now be merged into cartographic sketches for each observation and scale level. Ideally, this results in individual experimental and hand-drawn mappings in which the processes of collecting data and developing hypotheses can be combined gradually in order to derive one individual argument per theme. These individual mappings can depict graphically, for example, individual interior spaces such as apartments, streetscapes, or collective spaces, as well as movements through the city or relations between the different places.

In the project, very different data—from expert interviews, resident interviews, observations, personal drawings, mental maps, GIS databases, and the literature review—were collated in parallel to the theoretical preliminary work and translated into four thematic maps during the first mapping workshop. At the city-wide level, a sketch of the administratively relevant contact points for homeless people was created in order to keep track of the channels used to apply for asylum, for example. At the neighborhood level, the road networks were illustrated between the hostel locations and relevant services such as schools and shopping facilities.

Fig. 4: Compilation of individual thematic maps. | ©Chair for Urban Design and Urbanization, TU Berlin

At the hostel building level, axonometric representations of different apartment types, as well as numerous "compensation areas" outside the apartment provided information about the precarious distribution of functions in the hostels. At the individual room level, infographics were used to show the dependencies between material and immaterial resources in the spaces.

2.5 Synthesis: Synthesized overall mapping

In the next step, the individual thematic and mono-scale mappings are merged into a multiscalar drawing. This step is intended to uncover correlations between the individual observation levels that were less visible until now, thus facilitating the synthesis of the proposed hypotheses. This step poses a major drawing challenge because the type of drawing must be constantly adjusted and revised for the benefit of legibility. This gives rise to questions such as: How big can a zoom-in or spatial detail be shown without covering up the urban structure beneath it? How much writing and how many symbols can the map tolerate before becoming too "dense" and illegible?

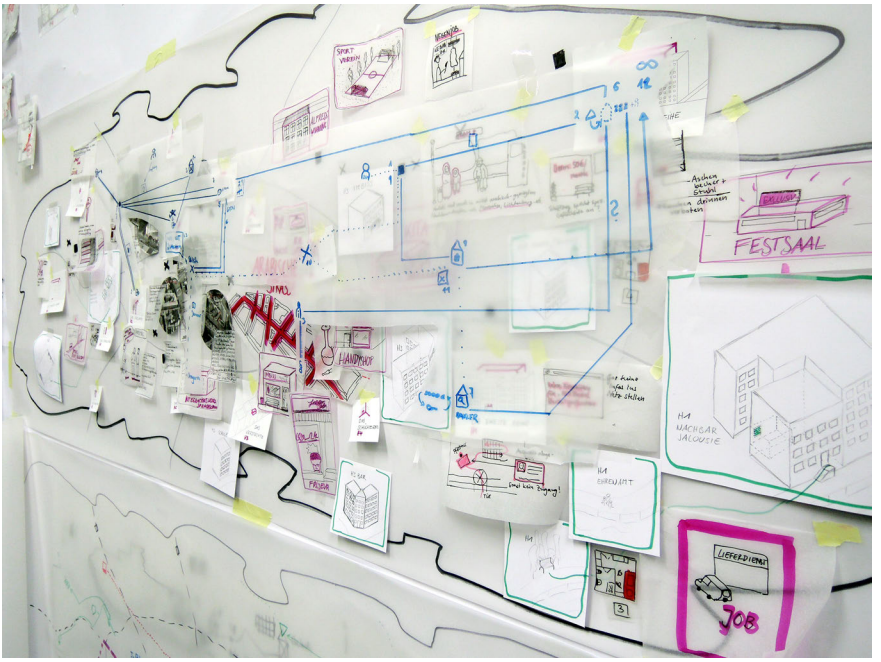


Fig. 5: Preliminary result of multiscalar collage. | ©Chair for Urban Design and Urbanization, TU Berlin

During a second workshop, compiling the four thematic maps into one large overall mapping proved to be the greatest challenge for the project. Multiple attempts were made to draw up a concept by hand for the overall drawing on large-format pieces of paper pinned onto partition walls, whereby it was necessary to check iteratively time and again whether the respective conceptual assumptions could really be brought together with the contents of the four maps.

We experienced a breakthrough thanks to a collage technique in which minimal assumptions were first made about merging the contents and then these assumptions were inserted, pasted into, and embedded step by step using single analogue modules from the different thematic mappings. For this purpose, we used sheets of transparent paper, cut-out paper printouts, copies of scanned hand sketches, adhesive tape, highlighters, and ink pens. During this laborious process of constantly readjusting the overall composition, the most important structural tool was merging the four legends into one, which could then be used as a basis to define a hierarchy and a code for the overall mapping.

2.6 Digitalization: Reproducible artifact

The overall map can now be used to advance the synthesis process by correlating the hypotheses formulated together with all of the research findings. This step serves to create a printable and thus reproducible document. In our project, this organizational process resulted in a graphical spatial model of Berlin created digitally, consisting of a black foun-

dational drawing with textures and in different line widths as a representation of the Berlin urban area.

Fig. 6: Multiscalar map as a reproducible printout. | ©Chair for Urban Design and Urbanization, TU Berlin

The different design layers and elements from the thematic mappings are embedded into this foundation consisting of different urban elements—water and road networks, district borders, administrative locations. The hostel locations themselves were localized, slightly offset; a slight distortion of the urban layout along the vertical axis helped anonymize the hostel locations without impairing the legibility of the mappings. In this version of the map, a four-color code for highlighting elements made it easier to assign the symbols and levels to the four corresponding observation levels and scales levels.

2.7 Reading key: Fictitious stories

Often a legend is not sufficient for communicating the contents of a mapping. It is only useful to readers in the sense that it provides linguistic codes next to the graphic and visual codes. Therefore, it is necessary to create an additional reading key to supplement the legend. Based on the complex data underlying the mono-scale mapping components embedded in the multiscalar overall mapping, this key should make it possible to interpret the trans-scalar correlations resulting from the parallel and superimposed codes of signs.

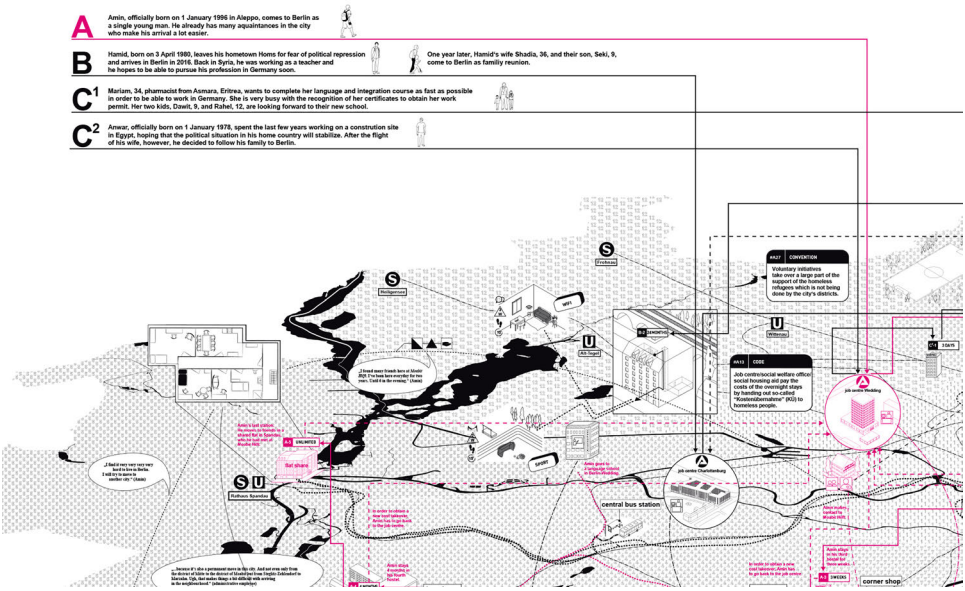


Fig. 7: Zoom-in key. | ©Flavia Biianu, Edda Brandes, Pauline Bruckner, Almar de Ruiter, Valentin Dobrun, Finya Eichhorst, Stefan File, Anne Gunia, Christopher Heidecke, Dariya Kryshen, Farina Runge, Alina Schütze, Lisa Wagner, and Jonas Wulf (map available at: https://depositonce.tu-berlin. de/handle/11303/11 090)

Therefore, to communicate the research by means of the large-format mapping of the hostel industry with homeless people in Berlin (Fig. 1), we had to find a second interpretation key for the project in addition to the legend. An illustrative linear translation of the mapping contents into single storylines was required to demonstrate the complex reference systems with an example. Thus, the group formulated its own interpretation of the mapping before handing it over to the readers for their interpretation work.

The reading key was developed by means of *fictitious stories* about three individual people and a family. Thus, the narratives of four different protagonists were integrated into the map so that it was possible to understand by way of example the special situation regarding *Berlin's hostel industry with homeless people* in accordance with our findings. Although the references to individual people and places were anonymized on the map, they remain localized in the rough context of the city and can be read graphically.

2.8 Text: Describing and interpreting mappings

In the particular structure of a research project, mappings serve as insightful tools that must be outlined and analyzed textually for academic publications. Only at exhibitions can mappings be shown to observers without comment as an invitation to be read and synthesized, as is typical in artistic contexts in particular.

Even if consolidating the four observation levels into the overall mapping revealed new spatial connotations in our project, doing so does not yet explain what this means

for homeless people on the one hand or for the discourse on informality and commoning on the other. The textual interpretation enables researchers to refine their knowledge from the mapping in relation to the defined research question. In addition to the overall mapping and its four underlying thematic maps, finalizing the teaching research project involved the production of four atlases in which the thematic mappings were analyzed textually in relation to the allover mapping and the research question.

After completing the seminar, these four texts were condensed and consolidated for a publication, which was edited based on the mapping-based research (Kelling et al. 2020). Lastly, this corresponded to the request from the Berlin senate to make the findings easier to access for their employees. In this context and to improve legibility, the mapping was revised and a single color was used to highlight a fictitious story instead of the four-colored codes for the four levels (Fig. 1).

3 A spatially structured synthesis method

This description of the development of an interdisciplinary method for addressing socio-spatial research questions can serve as a guide for similar projects and researcher constellations. Adherence to the proposed and proven sequence of steps is less important in this regard.

Rather, the combination of these possible steps depends on the project and must be adapted to the specific working conditions. However, based on the application example, we believe it is important to highlight the interplay between text and mapping in the research process. In order to apply this mix of methods as a structured interdisciplinary approach in the spatial sciences, it is important to bear in mind several challenges:

To facilitate interdisciplinary cooperation and method integration, it is essential to establish a *common conceptual basis* and *research perspectives* from the outset. At the same time, these must be refined in the course of the project based on the challenges that arise, which requires a certain degree of conceptual flexibility.

Work in an interdisciplinary collective requires a certain level of joint unlearning in terms of the members' individual disciplinary approaches in order to accept the relevant tools from the other disciplines. Sociologists should (help) draw and architects should (help) write, even if all of the participants can and should revert to their specific talents and expertise to finalize the work. But a mental and physical understanding of the tool set used by the other disciplines is essential especially in collective work processes.

The workshop format is extremely conducive to providing enough time and space for the complicated negotiation processes when collecting and selecting heterogeneous data, and especially when interpreting those data and relating them to the research questions. The linking of the levels of observation and scales, as well as the compilation of the very different types of data, calls for numerous iterative cycles, which are only possible by progressively discussing the graphically and linguistically structured information. These discussions must be tolerated by the group. If this succeeds, then the both sides stand to gain a great deal of knowledge.

There is a series of helpful approaches intended to facilitate interdisciplinary cooperation. For example, it is possible to integrate the often very different research ap-

proaches—both contentwise and methodologically speaking—in the social sciences and urban design using conceptual intersections, as we did here with the dual concepts of codes and conventions. This makes it possible to search for the same aspects on different scales and to collect very different data in each spatially organized drawing.

It is not always easy to draw data that were collected using social science methods. However, at the levels in the project at which it was the most difficult to provide information about the spatial dimensions of social relationships, we found: In cases where we knew the least about the relevance of space, we learned the most with an integrative methodological approach. The project also showed that it is ok if the focuses of the individual research fields are very different as long as there is an element to link their distinct content and methods, such as codes and conventions. This type of integration can even represent a special opportunity to discover unforeseen relations of meaning and interpretation between the components of narratives, which in themselves are based on comprehensible data collections and analyses, and thus to change the perspective on a research question.

Some might be surprised at how many steps are drawn by hand on paper and other material and only digitized relatively late in the process. We realized that when working on a team with designers and non-designers, it is easier to read physical drawings, to work directly on those drawings, and to rearrange together on a wall in the workroom. Even if digital interfaces and desktops are increasingly performing these tasks, we believe that hand drawings and the conscious use of physical visualization techniques offer an advantage for interdisciplinary work in particular.

Multiscalar mappings enable us to interlace a wide range of different research perspectives by allowing us to transcend the limits of scale and interpret heterogeneous data across scale levels. This results in a spatially structured and linguistically argued image of the overall contexts, which would not be possible to produce without combining the studies into a multiscalar overall mapping. We attribute this to the observation that we are not trained sufficiently in incorporating spatial thinking into our everyday knowledge. Mapping methods can help us counteract this, at least in the field of research.

About the teaching research project

The following people contributed to the research and mapping in the teaching research project on Berlin's hostel industry with homeless people (*Wohnhaft im Verborgenen*): Flavia Biianu, Edda Brandes, Pauline Bruckner, Almar de Ruiter, Valentin Dobrun, Finya Eichhorst, Stefan File, Anne Gunia, Christopher Heidecke, Dariya Kryshen, Farina Runge, Alina Schütze, Lisa Wagner, and Jonas Wulf. The co-authors of the publication *Wohnhaft im Verborgenen. Die Hostelwirtschaft mit Wohnungslosen in Berlin* (English: *Living in Hiding: Berlin's Hostel Industry with Homeless People*) are: Finya Eichhorst, Anne Gunia, Farina Runge, Alina Schütze, Lisa Wagner, and Jonas Wulf.

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