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Article

## Qualitative Methods and Hybrid Maps for Spatial Perception with an Example of Security Perception

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### Abstract

The security/insecurity of our cities has become the subject of public debate in recent years. The individual intuitions about security or insecurity can vary with age, gender, social background, personal constitution and previous positive or negative experiences. They are also constantly (re)produced, as perceptions of space are individual and selective. Noting these variations, materialised factors also play a major role, e.g., recessed house entrances, dense or high hedges, poor orientation options, dark places, etc. Attributing meaning to these materialised factors, real constructs are formed which create positive or negative narratives about certain (urban) spaces, influencing the actual use and design of urban spaces. To investigate the importance attached to certain spaces, qualitative methods are required for examining socio-spatial situations, perceptual processes and attribution. Using different methods in an explorative and in-depth descriptive research phase, such as expert interviews, user observations, surveys on go-alongs, participatory mapping with detailed information on structural and spatial locations, the advantages and disadvantages of method selection are presented. Berlin's Alexanderplatz was used as a case study area to determine perceptions of security in urban areas. We confirmed that despite variations, certain subjective perceptions concerning visibility, brightness, and audibility are collective. Additionally, hybrid maps are used to explain how subjective perceptions of space, combined with 3D graphics, can alert architects and city planners to uncertainty among users of public space.

### Keywords

3D planning tools; go alongs; hybrid maps; participatory mapping; spatial perception; urban resilience

### Issue

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### 1. Introduction

In their living environment, people establish meanings and relationships to public places in the city. In spatial research, the emotional relationship between people and places is a special focus, since people ascribe their own meanings to places based on their experiences and emotions (e.g., Stals, Smyth, & Ijsselsteijn, 2014). The relationship between person and place is

characterised as mutually dependent, as Casey (2001, p. 684) emphasises:

The relationship between self and place is not just one of reciprocal influence...but also, more radically, of constitutive coingredience: each is essential to the being of the other. In effect, there is no place without self and no self without place.

Therefore, place is not simply a passive, neutral background for human activity. Rather, it structures the experience, as well as the feelings of people (Anderson, 2004; Preston, 2003; Tilley, 1994). Edward Relph hypothesises this connection through the model of a perceptual space, which is determined by current and imagined and remembered places (Relph, 1976, p. 11). Subjective security perceptions are consequently the result of individual perception and evaluation processes and are associated with a whole range of emotions such as fear, risk, danger, intolerance, and vulnerability in relationships (Schreiber, 2011, p. 32). Individual interpretations and evaluations of urban spaces consequently influence subjective perceptions. The practical research challenge when investigating the connection between place and person consists of, on one hand, impressions, i.e., the perception of space, especially when these are connected with emotions, are not directly conveyed. On the other hand, places are also linked with intersubjective attributions (Kühl, 2015, p. 36).

The security and insecurity of cities has increasingly become a topic of public debate in recent years. Cities offer protection; as places of cultural diversity where different groups and orders meet, they also harbour risks and dangers. Certain districts, streets, or squares are constituted as criminal or insecure areas. This is expressed in terms such as ghetto, crime hotspot or no-go area (e.g., Glasze, Pütz, & Rolfes, 2005, p. 13). A Google image search on the subject of fearful areas—as well as the relevant scientific literature on it (Hiller, 2010; Rolfes, 2015; Schubert, 2005)—provides a clear picture: the majority of the cases are deserted, sparsely lit underpasses. However, there is difficulty in approaching the issue of security. For city dwellers, it is not so much factual, statistically verifiable crime levels that cloud their opinion, but rather subjective security perceptions, i.e., based on their subjective perception of security. These can often be influenced by negative media reports. City dwellers usually assume a greater risk of becoming victims than they statistically would be (e.g., Hermannsdörfer, 2015, p. 7; Hiller, 2010, p. 2). Overall, the following factors have so far been identified in the scientific discourse (e.g., Blieffert, Floeting, Schmalfeld, & Schröder, 2015; Born, 2009; Hiller, 2010; Müller, 2015; Rolfes, 2015; Schmidt, 2016; Wehrheim, 2012) as essential for citizens' feelings of security or insecurity: Confusing areas, e.g., due to niches in the masonry, recessed house entrances or dense and high hedges (as hiding places for possible perpetrators), poor orientation options, poor lighting, lack of social control of offensive behaviour. Dynamic factors such as a lack of neatness (vandalism, graffiti, littering) or the dominance of certain—seemingly threatening—local social groups are also mentioned.

In our article, we focused on the perception of security in public spaces regarding visibility and audibility, with a special focus on materialised elements in space and concerning the factors gender, cultural background, personal experiences. There has been no systematic

inventory of structural and spatial factors and, above all, an exact characterisation and measurement of places that are perceived as insecure, but also of places that are perceived as secure. Specifically, the research gap consists of the fact that the knowledge about structural and spatial factors named and discussed in the literature is usually not taken from systematic, empirical, or social science studies. Rather, the authors refer to experiences from police practice, in particular to results of simple inspections carried out by police experts with city planners and citizens (Abt, Hempel, Henckel, Pätzold, & Wendorf, 2014; Koskela & Pain, 2000; Ruhne, 2003; Schreyögg, 1989; Zinganel, 2003). Exceptions include a few systematic studies on the effects of urban lighting, which, however, produced highly contradictory results (Krause, 2013, p. 12). Exact dimensions and visual data of factors perceived as potentially dangerous in urban areas were rarely collected. This is what Kamalipour, Faizi, and Memarian (2014) say, in regard to the international context, when they speak of an 'absence of morphological mapping.' The most diverse structural-spatial factors, which are typically perceived as uncertain but also as secure, were neither systematically recorded and inventoried, nor were they precisely described and measured in terms of their characteristics.

To investigate what importance people attach to a certain space, a wide variety of methods are required with which one can grasp the most diverse elements in a socio-spatial situation. With a multi-method approach including visual methods, the perceptions of citizens and experts on uncertainties and security in public spaces were collected.

In our article, we focus on the Alexanderplatz, in the heart of Berlin, to shed light on the individual methods of subjective spatial perception, drawing out their advantages and disadvantages. We aim to present tangible methods which can grasp the subjectively shaped perception patterns, and answer the question, how city planners and architects can obtain security assessments for a place with the help of hybrid map visualisations in a 3D planning tool.

In the following, we present the case study area Alexanderplatz and explain why this location was investigated with regard to security perceptions. Furthermore, we give an overview of the different methods to show the advantages and disadvantages of the perception of space and security. We present our results in so-called hybrid map visualisations and make clear that security perceptions of a place are intersubjectively shared regardless of age, gender and cultural background.

## 2. Case Study Area Alexanderplatz

With an area of around eight hectares, Alexanderplatz is one of the central and well-frequented squares in Berlin. The square was named after the Russian Tsar Alexander I in 1805, but already had a central function as a market and meeting place since the 17th century,

especially when the first train station was built in 1882. At this time, Alexanderplatz served more and more as a traffic junction between the old city and the working-class and entertainment districts in the east of the city. After the destruction of the Second World War, it acquired its present form in the 1960s and 1970s with the construction of striking buildings (Engler, 2016, p. 180). It is surrounded by commercial and office buildings, a central underground and S-Bahn station with regional transport connections and a 39-story hotel. A special feature is that trams run across and stop in the square. Up to 360,000 people cross the square every day (see BerlinOnlineStadtportal, 2017). In recent years, Alexanderplatz has become a focal point of crime. The quality of use of the public space could not be increased significantly despite some efforts (e.g., seasonal markets). Structural measures were not implemented, but rather the Berlin police increased their presence in the square and opened a permanent police station on December 15, 2017 (see BerlinOnlineStadtportal, 2017). Just two years after the opening of the police station, the Berlin police recorded 4,352 criminal offences from January to July, 2019. Most of the registered crimes are robberies (2,231), assault and robbery (469), and drug trafficking (387; Berlin.de, 2019). Alexanderplatz is an interesting case study area as it is the most visited city square in Berlin and subsequently a high-crime spot.

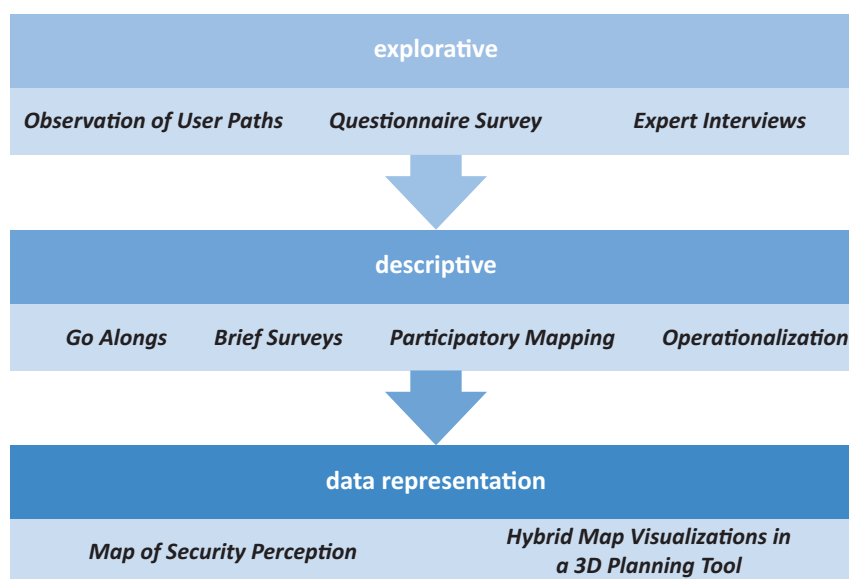
### 3. Methods of Subjective Spatial Perception

In the following, we present an overview of the various methods to show the advantages and disadvantages concerning the perception of space and security. We divided our empirical research into three different phases, which partly overlapped (see Figure 1): 1. an explorative phase; 2. an in-depth description phase; and 3. a data representation phase.

In the explorative phase, the user routes on Alexanderplatz were observed to gain a first impression and access to the case study area. In a next step, we carried out a questionnaire survey at different locations in the square, intending to get the first insight into the sound/acoustic quality and lighting conditions and to determine the first structural and spatial deficits. Also, expert interviews were carried out with representatives from planning and security practice to prepare go-along routes. These findings were the basis for the following in-depth description phase, intending to further investigate individual aspects that have caught our attention. To achieve this, we used the method of go-alongs with the method of thinking aloud. Structural and spatial focus areas were recorded in which uncertainties regarding lighting, sound/acoustics, and visibility were identified by the respondents. In addition to the go-alongs, we continued to carry out short surveys on Alexanderplatz to collect more specific information about the place. During the survey phase, several measurements of light, sound and distances of the determined structural-spatial factors were carried out to verify the respondents' statements, or to underpin their statements. Furthermore, a participatory mapping workshop took place near Alexanderplatz. In the data representation phase, we combined the evaluated results in a hybrid map visualisation for security perception. The hybrid maps are a basis for the data representation in a 3D planning tool so that actors in planning and security-practice receive security assessments.

### 4. Explorative Phase

In order to gain an insight into the case study area Alexanderplatz, the user paths in the square were observed. Also, the opportunity arose to record the light and sound conditions with students by means of



**Figure 1.** Overview of the three research phases and their methods for investigating spatial perceptions.

a questionnaire at a certain time of day to determine the first structural-spatial factors. Through the interviews with experts, we learned more about the character of Alexanderplatz, its use, planned measures and concrete structural and spatial deficits. The initial observations and spatial perceptions of the experts from the exploratory phase were considered in the in-depth descriptive phase.

#### 4.1. Observation of User Paths

In autumn 2018, we conducted observations of user paths at three locations in Alexanderplatz over two days. We did this in the mornings and afternoons to determine how the areas and their functions are being used. Another interest was to find out which space is utilised by which user groups and to deduce which users might not visit the space or possibly avoid it altogether. It is interesting to note that it is possible to determine whether certain public spaces we looked at are more transit spaces or lingering spaces. The example of Alexanderplatz has shown that the paths between the train and tram stations and the department store were the most frequented. Users tended to use the paths along the buildings and less across the square. Even while observing user routes in Alexanderplatz, a lack of convivial space usage became apparent even though the square has a lot of open space on offer. As a result, Alexanderplatz should be viewed more as a transit hub that is mainly crisscrossed by commuters and tourists and used as a transfer point. This was also evident with a view to the user groups who were less likely to be found on the site due to the observation of the user routes, such as large families and senior citizens.

The most remarkable advantage is that the method is particularly suitable for the beginning of a field phase because we were able to determine which target points in the square are highly frequented, e.g., the department stores and train station entrances and which small-scale areas are less frequented or never used. Also, in the case of longer or repeated observations, it is possible to determine how day and night differ and whether this should be taken into account in further surveys. However, one disadvantage is that we do not know why routes are being used in certain ways and have no knowledge of how these routes and their surroundings are perceived.

#### 4.2. Questionnaire Survey on Security Perceptions

In June 2018, a questionnaire survey with 17 students from the disciplines of urban and regional planning as well as sociology took place at Alexanderplatz. The survey was designed to learn more about the perceptions of visibility and audibility in the square. The students were between 20 and 25 years old, 10 male and 7 females. The questionnaires were filled out at a total of 17 specified locations on and around Alexanderplatz (one student at each location). As part of the question-

naire, the students rated the lighting conditions and answered questions concerning perceptibility and direct security awareness. In parallel to the questionnaires, selective exposure measurements were carried out in order to relate the subjectively perceived lighting conditions to physical values. To systematically determine how the perception of visibility, audibility and lighting conditions changes during the transition from day to night, the questionnaires were collected in a half-hourly cycle. In the observation of the user routes, we noticed that Alexanderplatz is rather sparsely frequented after closing time. In many buildings, there are offices, which is why the own visibility by third parties in the evening hours is no longer guaranteed. One result showed the students felt less perceived by other people, while they perceived many people in the square (Figure 2).

On the one hand, the questionnaire survey has the advantage of generating a lot of collectable data in a manageable timeframe. This can then be displayed on a device showing the comparative patterns of visibility and audibility in real-time. Using this approach, we identified focus areas at Alexanderplatz and its surroundings, i.e., small-scale areas with their deficits. On the other hand, the disadvantage of questionnaires lies in their predetermined structure. Only certain aspects of perceptions can be included.

#### 4.3. Expert Interviews

We initially carried out site visits and interviews with nine security experts and planning representatives who deal with the design and security of the site in a professional capacity. These were members of the police force (1), prevention officers (2), district management workers (2), architects (1), city planners (2) and landscape architects (1). The main topics of the survey were the character of the area, urban development deficits and security perceptions, the use of space and its conflicts of use, measures and best practices. From the expert interviews, the first structural-spatial factors in the study area were determined. The following two expert statements concerning the Alexanderplatz confirm the results from the user route observation and the questionnaire collection:

So I don't know where to go, I have a few cafés on the first floor where I know they see me. With whom I can have visual contact, who I can call if something happens to me—a flower shop, a café, a newsstand—which are practically within calling distance if something happens. I don't have that at Alexanderplatz. So a café on the square would contribute to an increased sense of security. (Expert interview, Prevention Council, District Berlin-Mitte, June 21, 2018)

It already has a large dimension, which is why this intimate feeling of being there cannot develop so easily. (Expert interview, landscape architects, May 16, 2018)



Figure 2. Questionnaire survey on security perceptions at Alexanderplatz. Source: VirtualCitySystems GmbH (Background).

The lack of quality of stay in the square leads to a lack of visibility of oneself, which leads to a feeling of insecurity among the users. The results from the expert interviews served, among other things, as a basis for the creation of the go-along routes with the residents.

The advantage of expert interviews is that there is a higher level of knowledge, e.g., about criminal offences. Furthermore, future spatial planning projects and measures can be recorded. Consequently, the relevant research questions can only be comprehensively described in connection with expert knowledge and the everyday experience of visitors and residents. However, the experts questioned mostly work locally and have developed their own perspectives through practical work. The disadvantage is that their perception of the space is limited to a professional capacity. Differences between day and night are rarely expressed.

### 5. In-Depth Description Phase

The go-along method is fundamentally about experiencing an everyday environment and examining the perception and appropriation of spaces. Therefore, it was used in connection with the method thinking aloud to seize spatial perceptions more deeply. The short survey at Alexanderplatz was conducted to confirm or supplement the statements of the respondents from the go-alongs.

When using participatory mapping, it was interesting for us to experience how users enter their perceptions on a map and which attributes they assign to them using symbols (created from the go-alongs). During the phase of the detailed description, we carried out measurements of light and sound in the most frequently mentioned structural-spatial areas. This enabled us to quantify the statements of the study participants and to present inter-subjective perceptions of uncertainty.

#### 5.1. Go-Alongs

When using go-alongs for collecting data, the focus is on the specific spatial experience during an 'interview in motion.' The researcher accompanies the respective study participants in a selected spatial environment and questions can be asked while walking (e.g., Kühl, 2015, p. 36). In research practice, this approach is a combination of participatory observation and qualitative interviews. According to Margarethe Kusenbach, this methodological approach eliminates the disadvantages of interviews and participant observation if the focus of analysis is on the importance of places in everyday experience (e.g., Kusenbach, 2008, p. 351). With participant observation, one cannot always understand all aspects of their perception and experience in the space as they usually do not verbalise their experience (e.g.,

Kusenbach, 2008, p. 351; Löw, 2016, p. 81). In qualitative interviews, everyday experiences are more likely to be verbalised. This cannot always be expressed comprehensively by the respondents especially if the interview does not take place at the location itself (Kusenbach, 2008, p. 352). The methodological challenge is transforming this everyday experience, the implied perception it contains, into spatially relevant actions, something preverbal or non-explicable in the investigation into spoken language. The role and presence of the researcher creates a discussion framework that offers the opportunity for personal exchange concerning experiences, impressions, and emotions on site and thus motivates the respondents to talk about their perception (e.g., Stals et al., 2014).

### 5.1.1. Applying the Go-Alongs Method

The go-alongs were carried out with citizens of different ages, genders and from different countries of origin. They could choose their everyday route. There were suggestions from us within the respective urban area, but no further specifications. Acquiring different target groups and carrying out the investigation was, overall, very time-consuming. The go-alongs were conducted with individuals and lasted 1–2 hours. A total of 16 inspections took place between May 26, 2018 and April 17, 2019. We scheduled the go-alongs with the participants during both day and evening hours to record the different perceptions in daylight, at dusk and at

night. During the go-alongs, we accompanied the respective participants and asked them to use the method of thinking aloud (van Someren, Barnard, & Sandberg, 1994) to describe their perception in terms of visibility, sound/acoustic quality, observability, and brightness. So, unlike a qualitative interview, we did not lead the conversation with questions. Using the method of thinking aloud, we wanted to let the participants describe their immediate impressions to us, i.e., what was going through their heads. Participants were also asked to indicate which characteristics made them feel insecure or secure. During the go-alongs, they pointed out building structures, walls, streets, paths, squares, courtyards, parked cars, plantations and parks in terms of distances, visibility, lighting, and noise events. The reference to specific features and objects is particularly clear in the data excerpted from the Alexanderplatz case study area (Figure 3): “So here you are really surrounded by large grey buildings” (female, 26, non-resident, February 12, 2019, 14:00); “It is such a large space and everything is so fenced off by consumption options. You feel surrounded by all the shopping malls” (female, 26, non-resident, February 12, 2019, 14:00).

A public square like Alexanderplatz, which is surrounded by office buildings, shopping centres and hotels, offers residents and visitors little opportunity to identify with the location and makes it difficult to implement meeting places that target a wide variety of user groups to unite and promote significant social control. As a result, it remains mainly a transit space and less an



**Figure 3.** Alexanderplatz. Source: IRS.

inhabitable space: “A traffic junction. But without quality of stay. And that also attracts criminals” (female, 65, resident, January 7, 2019, 14.00); “Benches to sit down are in short supply” (female, 65, resident, January 7, 2019, 14.00); “Where can I meet up with friends and sit down?” (male, 40, non-resident, February 13, 2019, 16:30); “But when there’s a lot going on, it’s very difficult to get through here and I think the people here are pretty reckless, so everybody runs and that’s why I don’t like to be here unless I have to” (male, 58, resident, January 14, 2019, 15:00).

Alexanderplatz is a good example of how structural changes and different designs have assumed an overall concept over the decades, which has led to frustrations and orientation difficulties, both for visitors and residents trying to navigate the square.

For our research on the perception of security in the city, this method offered an advantage in that the perception of the spatial environment was carried out simultaneously in the concrete investigation situation and was not told to us exclusively from memory in an interview situation (e.g., Müller & Müller, 2017, p. 54). By walking together, it is easier for the participants of a study to express themselves, through the direct connection to the environment, concerning their immediate feelings, attitudes and experiences regarding a certain place. In particular, the presence of the survey situation, which is *in situ* at the specific location, can promote this effect, as Kühl emphasises:

Being in one place during the interview makes it possible to look at the location and to become aware of one’s own experience. In concrete terms, this makes it easier for participants to reflect and verbalise thoughts, feelings, memories and other associations that are linked to and constitute the space....At the same time, concrete statements are more often made spontaneously or impulsively along with external impressions that arise depending on the situation. As a result, the spatially concrete stimulates rich explanations and expands the spectrum of the execution by aspects that would have been forgotten or detached from the context of experience. (Kühl, 2015, p. 39; Authors’ translation)

An example of the lack of orientation at Alexanderplatz clearly illustrates this: “There are no signs so that you know that I have to run here and there. If I didn’t come from here, I would find it difficult” (male, 40, non-resident, February 13, 2019, 18:00); “You don’t know where to go, there is no orientation” (female, 42, non-resident, March 13, 2019, 18:30); and “I definitely wouldn’t find my way around here. The signage is inconspicuous” (female, 40, non-resident, February 14, 2019, 17:30).

There was often a lack of clear understanding of the Alexanderplatz space. Many areas are not differentiated and do not allow passers-by to assign functions. During

a go-along, three levels can be ascertained, the level of experience, the level of current perception and the associated emotions.

As an advantage, we noted that participants were autonomous in the survey situation if they held the recording device in their own hands. Our co-presence as accompanying researchers was also another positive motivation. A conversation often resulted where respondents perceived us as experts in their urban area, yet also as interested and barely informed listeners. As a disadvantage, challenging in application is collecting the large number of statements and relevant information from the go-alongs, which have to be combined with the corresponding photos. In the analysis of the data material, therefore, priority was given to the assignment of areas and their perceptions of uncertainty and security.

### 5.2. Brief Surveys on Security Perceptions

On April 24, 2019, and May 21, 2019, short surveys of passers-by took place at Alexanderplatz. The locale was very busy on both days. A total of 26 people were asked about the structural design of Alexanderplatz and their perception of security there. Furthermore, it was ascertained how often and on what occasions which areas on the square were preferred, and which ones were avoided. Respondents were further asked how they perceived the place through the media. People surveyed included residents of retirement age as well as families on vacation and young men who only used the square as a traffic junction. The method was helpful, however, to validate existing assumptions about the lack of quality of staying spaces and the feeling of insecurity during the night. It was also confirmed that Alexanderplatz is used as a destination-oriented and a passing-through space. Here too, it must be emphasised that speaking about space is a methodological challenge, as Martina Löw (2016) states:

If one specifically asks about the meaning of rooms, the speakers largely fall silent. Spatial action, established connections or simply their own placements are not or only rudimentarily part of the discursive consciousness....Many spatially relevant actions take place extremely naturally and smoothly in everyday life because the knowledge of placements and synthesis is habitualised. It is precisely this inscription of knowledge into the body and materiality however, that leads to the fact that knowledge about spaces is often not explicable, nor does it appear to require naming. (Löw, 2016, p. 82; Authors’ translation)

On the one hand, the short survey was advantageous in that many people could be interviewed on a limited topic in a short time to underpin or check the assessment and perception of a certain area. The method enabled us to interview people directly at the location and thus understand which material-spatial aspects triggered their attitudes, experiences and feelings. On the other hand, this



method has weaknesses. The statements of the participants often remained very general and only superficial impressions were described. Our results show that short surveys cannot reflect the everyday perception that is very strongly influenced by the image of the place (e.g., via media reporting).

### 5.3. Participatory Mapping

This participative method of mapping is suitable for capturing and visualising the subjective perception and empirical knowledge of the space from the perspective of the user. At the same time, an exchange of knowledge and opinions about space is stimulated. The aim of the method is not to create a topographical representation of spatial conditions as detailed as possible but to a form of representation of how space is perceived and constructed as a result of cultural concepts, norms and ideas. Empirically valuable group discussions often arise about how these people perceive a space and which attributes they ascribe to it. This is especially true when several people are involved in a mapping process, another advantage of this method is that if a georeferenced map base is used (e.g., a topographical map or an aerial photograph), everything drawn into the map by hand can be easily transferred to a geographic information system (GIS) program or a multimedia map. Accordingly, qualitatively recorded data (such as the forms of spatial perception) can be related to quantitative data (such as the structural specifics of a location; Reichel, 2020, pp. 31–36).

#### 5.3.1. Participatory Mapping for Security Perceptions

In a workshop on the perception of security in public spaces, citizens and experts spoke about their percep-

tions of insecurity and security in public spaces. Using the example of Alexanderplatz, the participants looked for constructive solutions that could increase the quality and the feeling of security in this square. 21 people took part in the workshop, including residents, non-residents and experts. First, the participants were asked to draw safety perceptions on transparent foils, if possible individually, based on aerial photographs of Alexanderplatz (size A0), concerning their audibility and visibility. They were then instructed to make creative suggestions for improvement. A new transparent film was placed on the aerial photograph for each participant. The security perceptions were initially mapped by colour-coding the corresponding areas. To include the reasons for their perception during the mapping, symbols were prepared in advance and created based on the (in)secure factors ascertained in the inspections. The respondents were able to place these symbols next to the feelings of security they had drawn (Figure 4). Also, during the mapping process, a log was kept of the participants' comments and socio-demographic data such as age and gender were noted.

Without the use of the symbols, compared to the results from the go-alongs, it would seem the statements about Alexanderplatz and its proximity to the train station concerning neglect, orientation, visibility, noise and the uncertainties caused by the tram on the square are congruent. The participatory mapping, on the other hand, provided specific insights into making the secure and positively perceived areas even easier to find. For this purpose, the areas near fountains and parks were all named along with the shopping malls as being suitable for relaxing and socialising.

The advantage of participatory mapping lies with its approach. Those interviewed can decide for them-



**Figure 4.** Participatory mapping for security perceptions. Source: IRS.

selves which aspects and areas on the map are important to them and which are to be neglected, and how this is to be marked. In this respect, both the finished map and the process of map creation are empirically informative. Furthermore, the method helps make questions about spatial planning more efficient, pluralistic and more democratic. This in turn leads to a higher tolerance towards the planned measures and more sustainable effectiveness of the implemented measures. The areas drawn by hand can also be easily transferred to a geographic information system program or a multimedia map. Trends in spatial perception patterns between different groups of people (e.g., broken down by age, occupation) can lead to an increase in knowledge.

However, the questions asked in our workshop about the subjective feeling of security appeared rather general and therefore not so well-suited. Without the use of the symbols, most of the feedback would have been lost. Overall, the go-alongs appeared to us to be much richer in information.

#### 5.4. Operationalisation of Structural and Spatial Factors

The question of how to record the go-along process and how to prepare it for analysis is also raised. In our case, go-alongs were embedded in a multi-method research program in which, in addition to qualitative surveys, we also carried out quantitative measurements of light, sound and distances. Unlike walking-with videos (e.g., Pink, 2007), we did not record our walks on video but saved the conversations as audio recordings. In addition to the audio recordings, we took photos of the features mentioned, such as a building described, and saved them

with the geo-coordinates (Jones, Bunce, Evans, Gibbs, & Hein, 2008, p. 6). Based on the geo-referenced photos and the verbal statements in the course of the on-site visits, structural spatial factors that are responsible for perceptions of uncertainty could be determined as measurement locations (Figure 6). Measurements were carried out at these points to be able to assess the situation on-site at different times of the day and night and at different frequencies. Measurement data on light and sound as well as distance measurements were collected to inventory and check the relevant security perceptions.

Based on the light measurements, we can quantify the statements of the study participants, and there is the possibility of representing intersubjective uncertainty perceptions. In particular, the Fountain of Friendship between Nations in Alexanderplatz and its surroundings were perceived as ‘too dark’ by those surveyed. As shown in Figure 5, the fountain itself is not lit and there are large dark areas: “Compared to the rest of the square, the fountain is pretty dark. You can’t even see the people sitting here” (female, 40, non-resident, February 14, 2019, 18:00).

The light measurements showed values between 3.1 and 3.6 Lux in the dark. In comparison, 1 Lux corresponds to a candle in the moonlight and 10 Lux corresponds to street lighting. The fountain is only indirectly lit by the shop windows of the surrounding shops. The alternation between light and dark areas on the square is also described as unsettling: “That’s what strikes me the most—this play of light here. You always go to light places and then to dark places—dark, light, dark, light” (female, 40, non-resident, February 13, 2019, 18:00); “I’m also honestly a little shocked that nobody else is



**Figure 5.** Fountain of Friendship between Nations at the Alexanderplatz in the dark. Source: IRS.

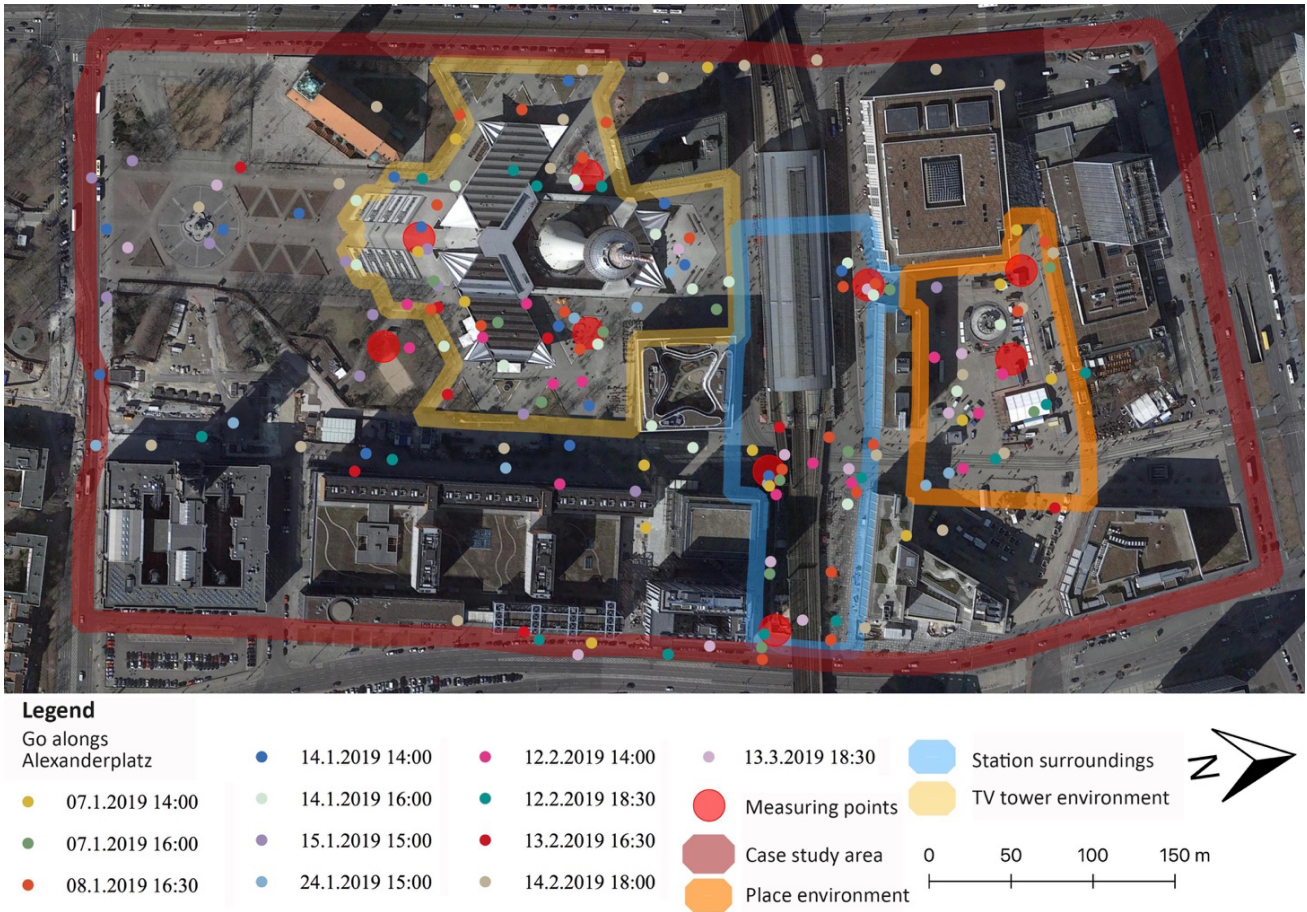


Figure 6. Map of security perception. Source: IRS.

walking along here, you feel totally helpless” (female, 30, non-resident, February 12, 2019, 21:00).

A sufficient uniformity of the lighting is not guaranteed. The bright shop windows also create a glare effect. When measuring sound, we also had to determine the causes of the noise, i.e., whether it was rail noise or road traffic noise: “There is someone in front who is playing music, so if you stand here now and scream for help, you might be lucky to have someone standing next to you who understands” (male, 58, resident, February 20, 2019, 15:00). The audibility tests, which were carried out in places perceived to be loud, showed that a call of about 90 decibels from 20 meters could only be perceived as noise and from 25 meters could no longer be heard. As a reference, samples were taken at an inanimate place without strong ambient noise. Here, calls of about 70 decibels were perceived up to a distance of 90 meters.

On the one hand, the quantitative data (measurements of light, sound, and distances) underpin the qualitative data (uncertainty perceptions) of the study participants. One advantage is being able to use the data for calculations and representations in one tool. On the other hand, measurement inaccuracies cannot be excluded in the measurements of sound, light and distances. For this purpose, we performed 13 mea-

surements on 4 different days at different times at Alexanderplatz to compare and verify the values.

## 6. Data Representation

In the data representation phase, we combined the evaluated results in a hybrid map visualisation for security perception. The hybrid maps are a basis for the data representation in a 3D planning tool so that actors in planning and security-practice receive security assessments.

### 6.1. Using Georeferenced Photos to Identify Intersubjective Perception

As already mentioned in the introduction, in the past, visual data of urban spaces perceived as potentially dangerous and their structural characteristics were rarely collected during so-called city inspections. Photographs were taken on the fringes of inspections to illustrate concrete urban fear spaces, without the photographs having been scientifically analysed and stored in Geo-Tools. Using a Geo-Tool (Figure 6), structural and spatial factors through georeferenced photos are identified and visualised where different participants had expressed the same perception of uncertainty. In the case study area, Alexanderplatz, three main areas were identified: the

station area, the square area and the base area under the television tower. In all three focus areas, the orientation and lighting factors had the greatest impact on the respondents' perception of their security.

Consequently, the result in map view shows that the sensitivity toward security issues centring on material factors is not only subjective but shared intersubjectively. They also enable initial knowledge of the frequency of perceptions of uncertainty through the visualisation in map views. However, the georeferenced data in a map visualisation does not yet say anything concrete about the various reasons for uncertainty perceptions and must be analysed more precisely.

### 6.2. Hybrid Map Visualisations

The data from the various methods of the project were transferred to so-called hybrid maps (Figure 7). In our sense, hybrid maps are visual representations of a topic that allow different stakeholders to get the same view and understanding of a topic and to work together on it. Based on the statements and the quantitative measurements, the various socio-spatial factors assessed as insecure or secure are visualised in an integrated 3D-representation.

In the 3D-urban planning tool shown here, icons were designed to show the collected influencing factors of security perceptions, such as structural and spatial factors, the image of a place, missing offers, the infrastructure (stations, etc.), but also groups of people and social interaction. These symbols illustrate the social indications of a public space and offer the actors support in assessing security. The statements, in combination with the measurements and the representation in visualisations, resulted in comprehensive findings concerning the analysis of the perception of space, which would not have resulted without an intersection of databases and surveys. Whether and how one combines the methods

presented here always depends on the research question or the research subject and should, therefore, be appropriate to the subject.

The presentation in hybrid maps closes a gap between research and practice, as the various quantitative and qualitative data for the structural-spatial focus areas are characterised and related. However, the representation of the perceptions by icons can only be used temporarily because the perceptions of the users can be influenced by seasons, day and night times and short-lived changes on site. This form of presentation is quite new and represents an added value for experts. However, it must be considered that stereotypes and stigmatisations of a place can arise with the experts, which must be reflected exactly.

In cities, structural and spatial factors, among other things, are responsible for the (in)security perceptions of citizens, and in the future, planning practitioners will be particularly called upon to design secure urban spaces. For this purpose, a three-dimensional planning tool is being developed so that architects and planners can better recognise when a location to be planned creates uncertainties. Through 3D simulations, spatial qualities of urban planning designs can be made tangible (Gebhardt, Klemme, & Wiegandt, 2014; Yin & Shiode, 2014), thus enabling new forms of communicative planning, i.e., communication with and participation of stakeholders and citizens (Al-Kodmany, 2002; Billger, Thuvander, & Wästberg, 2016, p. 7; Craig, Harris, & Weiner, 2002; Czerkauer-Yamu & Voigt, 2016; Müller Arisona, Aschwanden, Halatsch, & Wonka, 2012; Silva, 2015).

### 7. Conclusions

With the methods presented here and particularly through the measurements, the perceptions, thoughts, and feelings of public spaces can be made comprehensible and substantiated. Table 1 shows a summary



Figure 7. Hybrid map of security perception in public areas. Source: VirtualCitySystems GmbH.

**Table 1.** Collecting methods for subjective perceptions of security in public spaces.

Qualitative Methods of Encoding Spatial Perception							
Categories	User Paths	„Questionnaire“	Expert Interviews	Go alongs	Short Survey	Participatory Mapping	Operationalization
Time Required	low	low	medium	high	low	high	high
Watched Target Groups	Visitors, Commuters	Students	Security Experts, Urban Planners, Architects	Residents and Non-Residents of different age, gender and cultural background	Visitors, Tourists, Residents	Experts and Residents	x
Advantage of Perception	First insight into the area to be examined	Much data on perceived visibility and audibility, animated/invigorated	Knowledge of spatial planning data, plans and measures	Perceptions of attitudes, impressions, experiences and feelings in relation to materialized elements are collected in situ. Also, when and why a place is avoided	Statements about the location can be checked again. Image of a place can be determined	The interviewees decide for themselves what they think is important in the map	Measurements of light and sound at different times of day and night can provide a sound basis for statements on the perceptions of the respondents
Disadvantage of Perception	No knowledge about why the paths are used and how the environment is perceived	Little in-depth information on the perception of security through closed questions. Only students questioned. Does not reflect everyday perception	Perception to space rather professionally, perception usually refers to the time of day on site	How many survey methods an artificial arrangement, which should be reflected with regard to the mentioned perceptions	Does not depict everyday perception	Vulnerable groups, such as homeless people or young people hardly use these formats, so these perspectives are missing	Quantitative data only. Measurements must be taken several times to adjust the values for accuracy
Results	Is it a transit or dwelling space? Which user groups can be found, and which are missing? Frequency at night and day	Small-scale areas with deficits were identified	The experts' statements, in conjunction with the inspections and mapping, can answer a research question more comprehensively	Structural spatial factors and user conflicts of the location are determined	Attitudes, experiences and feelings about the place are recorded	Tendencies towards spatial perception patters between different groups of people can lead to a gain in knowledge	Can substantiate the statements of the respondents
Results can be displayed in a 3D Tool	Drawings of the paths can be transferred	Can be displayed chronologically and comparatively	Only displayable as quotations	Tracked routes, geo-coordinates of photos can be displayed	Only displayable as quotations	The marking can be transferred to a tool	Sound, light and distance measurements can be displayed

Source: Töppel and Reichel (2020); IRS.

of the methods for collecting subjective perceptions of security in public spaces with their advantages and disadvantages, the time required for implementation, the target groups, the gain in knowledge and the possibilities for presentation in a geographic information system tool. With these methodological steps, our analysis of the results clearly showed that despite the different socio-demographic data and backgrounds of the respondents, certain subjective security perceptions concerning visibility, brightness, and audibility are shared. Therefore, the perception of spaces is always embedded in socio-spatial situations.

In qualitative survey methods such as go-alongs, the user path observation and the short survey were carried out in-situ and allowed us to examine the perception of urban space for its topicality and immediacy. In our experience, these methods can be used to make perceptions, feelings and thoughts related to urban spaces comprehensible. The combination of different methods allows an empirical insight to reconstruct socio-spatial perception in everyday life on different time levels, concerning the past and the future, and in the context of impression and experience. Some of the statements of the respondents were redundant and revealed clear deficits with regard to structural and spatial factors. The respondents regularly commented on the lack of orientation and lighting and the limited quality of stay at Alexanderplatz. Particularly due to the inadequate lighting, secure movement, good spatial orientation, sufficient detail perception and early recognition of danger is even impossible. The quantitative data (measurements of light, sound and distances) underpin the qualitative data (perceptions of

insecurity) of the study participants. The visualisation in map views enabled us to gain insights into the frequency of (in)security perceptions. For all the methods presented here for the subjective perception of security in urban areas and its representation in maps, the fact that the perceptions of public space by the citizens are dependent on the seasonal changes must be taken into account, i.e., can always differ depending on the point in time. As spatial researchers, we assume an understanding of social space, but we cannot assume this perspective in the everyday perception of people. The challenge for spatial research is to make the supposed physical conditions part of the communication in the collection of data.

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### Conflict of Interests

The authors declare no conflict of interests.

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