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Master thesis

A Collaborative Cultural City Map of Dresden for International Women

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A Collaborative Cultural City Map of Dresden for International Women

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Statement of Authorship

Herewith I declare that I am the sole author of the submitted Master's thesis entitled:

"A Collaborative Cultural City Map of Dresden for International Women"

I have fully referenced the ideas and work of others, whether published or unpublished. Literal or analogous citations are clearly marked as such.

DRESDEN, 05.11.2021   Shweta, Naik

The initial task description

Objective:

The aim is to create an artistic paper map that presents meeting places, venues, and cultural institutions of the city of Dresden in particular for migrant women. For this purpose, subjective mental maps are to be created in a workshop with women and children with a migration background,

providing the basis for the artistic city map. The starting point of the master thesis is the development of a methodology for the collaborative cultural mapping project. The final paper map will be based on an abstract representation of the public transportation network in Dresden as a connecting element, and on important venues collaboratively collected by the involved women. The artistic design of the map can be achieved either manually or with the help of digital cartographic tools, such as artistic filters from image editing programs or neural style transfer.

Description:

The Montagscafé at the Staatsschauspiel Dresden is a cultural meeting point and forum for exchange, which offers workshops and invites artists at the interface of migration and art. "We don't just look at migration and culture from a theoretical perspective – we put them into living, breathing, chatting, and laughing practice!" In 2021 a collaborative mapping event is planned with international, multi-lingual migrant women in cooperation with Wanja Saatkamp(1) from the cultural management of Staatsschauspiel Dresden and the architect Grit Koalick(2). Ideally, the master's thesis can support the planning and implementation of the event. The subsequent task of the master's thesis will be the collaborative, artistic design and production of a "subjective" cultural city map of Dresden.

Abstract

The Montagscafé at the Staatsschauspiel Dresden is a cultural meeting point and forum for exchange, which offers workshops and invites artists at the interface of migration and art. In 2021, a mapping workshop was arranged with the female participants of Montagscafe. The first objective of this thesis was to form a methodology to understand the perceptions of international women participants of Montagscafe about the culture of the city of Dresden. It consisted of drawing subjective mental maps and personal interviews with the participants. The subjective mental mapping aimed to understand how international women viewed the culture in the city of Dresden. The participants expressed their views through graphical, verbal, and textual means. The second objective of the thesis was to outline an artistic map design framework to attain a subjective and artistic map of Dresden. The map is intended to be used by international women. The map design framework proposed in this thesis focuses on generating a vector-based map output which is a result of data collection in Google Earth, data preparation in GIS, and editing of that data in the vector editing program. The aim was to obtain an artistic output that can retain its quality independent of the change in scale. Hence, the choice of vector data type was made in the beginning. The thesis gives a detailed outline of the generic framework that can be applied for such artistic and creative map design tasks. The output is intended to be an illustrated map of the city of Dresden showing the cultural points of interest in the old town area.

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List of Abbreviations

AutoCAD - Autodesk's Computer-aided Design
BID – Business Improvement District
BMP - Bitmap Image File
CSS - Cascading Style Sheets
DE – In German / Meaning in German
DVB - Dresdner Verkehrsbetriebe
DXF - AutoCAD Drawing Interchange File
ECMAScript - European Computer Manufacturer's Association Scripting Standard
EN – In English / Meaning in English
ESRI - Environmental Systems Research Institute
GeoTIFF - Geographic Tagged Image File Format
GIF - Graphics Interchange Format
GIS – Geographic Information System
GPS - Global Positioning System
JPEG - Joint Photographic Experts Group
KML - Keyhole Markup Language
KMZ - Keyhole Markup language Zipped
PNG - Portable Network Graphics
POI – Point(s) of Interest
QGIS - Quantum Geographic Information System
SMIL - Synchronized Multimedia Integration Language
TIFF - Tag Image File Format
UNESCO - United Nations Educational, Scientific and Cultural Organization
UNSD – United Nations Statistics Division
WFS - Web Feature Service
XLS - Microsoft Excel Spreadsheet
XML - Extensible Markup Language

Chapter 1. Introduction

1.1. A brief overview of the mapping project

The Montagscafé at Staatsschauspiel Dresden (the city theater of Dresden) is an intercultural meeting point and forum for exchange, which offers workshops and invites artists at the interface of migration and art (Staatsschauspiel Dresden, 2021). This year, a collaborative mapping project takes place in cooperation with Wanja Saatkamp (Project manager, Montagscafé) which focuses on international women and their cultural experiences in the city of Dresden.

This master's thesis shall support the execution of this project. The consecutive task of this master's thesis will be the production of a 'subjective' cultural map of the city of Dresden (Burghardt & Hauthal, 2020). In general, this includes an artistic map design that is based on the ideas drawn by international women collaboratively.

1.1.1. Motivation

The available literature that addresses the cultural constraints has individual map design elements (e.g. studies similar to Korpi & Ahonen-Rainio (2010) specifically addresses map symbols). However, not many studies explore the entire map design process. There is a gap in the study of cartographic design guidelines that can collectively address the *collaborative*, *cultural*, and *artistic* design processes.

1.1.2. Problem statement

Therefore, the scope of this research is to find and establish the overall map design process when it comes to representing culture on a map through a collaborative mapping project. The scope of this research is not limited to any one particular key component of map design like symbology, text, background, etc. This thesis aims to provide an overall framework for producing the subjective cultural map with an artistic design as mentioned above.

1.2. Research Identification

In order to identify the best method for map design that specifically addresses the need for the pragmatic cultural representation of the city of Dresden, it is crucial to understand the point of view of the corresponding individuals (international women in this case) and then to analyze which ways this information can be best represented.

1.2.1. Research Objectives

Forming design guidelines that meet the artistic and realistic requirements, the following objectives are to be considered:

Objective 01 - To investigate & understand the subjective outlooks & expressions of international women about the city of Dresden
(This objective leads to studying the experiences and perspectives of international women participants through women drawing the subjective mental maps and its inferences can support acquiring the qualitative information required for the further steps)

Objective 02 – To outline the method/process for creating a cultural map with an emphasis on the international women users

(Drawing from the answers of objective 01, attaining objective no. 02 leads to the overall design strategy which can be decided and implemented to achieve the final result)

1.2.2 Research Questions

Research questions to address objective no. 01 -: What can be the best methods to extract information from international women participants?

- What would be the most suitable approach to observe the way participant women represent their perceptions of the city?

- What would be the best tools to collaborate for a reliable gathering and management of information?

- In addition to the subjective mental maps or drawings, what other information shared by these participants is important? (e.g. any typical experiences associated with/influencing 'what' or 'how' they draw)

- How this 'subjective' or qualitative data can be organized in structured forms or categories to support the map design?

- Which elements on the map are important concerning cultural information for women participants?

Research questions to address objective no. 02 -: What steps shall the process of map designing have?

(Derived from the answers of objective no. 01, following questions, lay the foundation for the overall map design process)

- Which conventional cartographic design principles are applicable for a cultural map?

- How to create map symbols from pictographic techniques derived from the inputs given by women?

- In which way, positive and cautious, both representations can be shown realistically? (basically, a non – extreme representation, which will not give a false/exaggerated impression)

1.2.3 Innovations Intended

This research aims to fill the existing knowledge gap by forming a concrete method for cultural map design which may result in an artistic as well as a functional city map. The aim is to structure the design process that can balance collaboration, culture, and art simultaneously.

1.2.4. Risks and Contingencies

This study requires interactions with international women preferably in person. Due to current COVID - 19 regulations, the Montagscafe is closed until further notice. If this continues till July, there will be a change of plans to shift this user study and data collection online. (Note: Due to summer holidays at Staatsschauspiel Dresden, collecting data will not be possible during the period of 19th July till 25th August)

Another challenge is the translation of cultural communication at a few points. A possible solution could be to review the translation from international students & members from the Cartography M.Sc. consortium speaking that particular language.

1.2.5. Resources Required

- Information: Available literature
- Data: This research will mostly be based on open data collected from international women participants
- People: Contact with international women communities has already been discussed
- Software and hardware: For data collection & collaboration, an open-source tool(s) will be used (Google earth, QGIS)

For the final map design, licensed Affinity designer, publisher, and photo are available along with the GIS software like QGIS. ArcGIS - The choice of software is to be decided in the later stages of the thesis.
- Finances: Not required

Chapter 2. Literature review

2.1. Culture and Cartography
   2.1.1. Definition of culture

According to UNESCO, culture is defined as
"*…the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, that encompasses, not only art and literature, but lifestyles, ways of living together, value systems, traditions, and beliefs*" (UNESCO, 2001, as cited in UIS, 2009)

Nevertheless, literature around the topic of culture indicates that defining culture has proven to be a complex undertaking throughout history. It also highlights the significance of the appropriate context attached with this term. Bradbury (1982) discusses the interpretation of the word "culture" and how it can be different for different persons. (Bradbury, 1982) further asserts that the meaning of culture is not the same for an artist, for an anthropologist, or a politician; hence implying a rich debate about the definition of culture.

Throughout history, the study of the culture of different nations on Earth was found to be mentioned by earlier geographers like Ptolemy, Strabo, etc. (Peet, 1998). Moreover, Peet (1998) discusses that in the early twentieth century, Cultural geography as an academic discipline was established as a substitute for environmental determinist theories.

Following the cultural geography, Sauer (1925) further points out that geographers who draw inspiration from this tradition see that cultures and societies develop from their local landscapes, but they also shape these landscapes. That defined 'cultural landscapes' as the *collaboration of natural landscapes and the activities of humans*, which forms the very basis of cultural geography (Sauer, 1925).

However, this notion has been expanded over the years with more distinct and complex definitions of culture and has been drawn from a variety of disciplines which include sociology, anthropology, literary theory as well as feminism. (*Cultural Geography*, n.d.) *Not one specific definition of culture was found to be dominating in this discipline.*

Hence, groups in geographic communities have different views about the culture, its role as well as its analysis in a geographic context (Whatmore, 2006). In the context of this thesis, the definition of culture pertains to the one stated before by UNESCO, cited by UIS (2009).

The purpose of this work is to reflect the *city culture.* The term 'city culture' implies and represents the culture of the city - including its urban and non-urban areas. City culture is a part of an interdisciplinary research field of urban planning and development, human geography, anthropology, and sociology, etc. (Gillberg et al., 2012).

   2.1.2. City Culture and its depiction in Cartography

There is a vast amount of literature that illustrates the histories and cultures of cities all over the globe through maps and artworks alike. It does not only depict the historical or

cultural facts but also the individual discoveries of many travelers, artists, or simply the illustrations of how the locals felt in any place.

Great City Maps: A Historical Journey through Maps, Plans, and Paintings is one such example of a book that has over 70 maps and plans of cities. Furthermore, many of these city maps depict the culture of the cities in various styles and through different points of time in history.

Figure 1: Frank Dorn's pictorial map of Beijing, 1936 (Source: DK, 2016, p. 133)

Frank Dorn's pictorial map of Beijing serves as one of the earlier examples of city maps depicting city culture. His aim was to be expected to enlighten the Americans in China about the culture of the capital (*Great City Maps: A Historical Journey through Maps, Plans, and Paintings*, 2016).

The visual tour of this map highlights the distinguishable key graphic elements. It extracts the important design decisions made by the cartographer. The level of details (higher in the popular areas like the bell and drum tower as shown in Figure 2), drawing the most popular international POI larger than the actual proportion (as shown in Figure 3), the twist in the scale of the map in some places to accommodate the POI in the extent of the map, and the labeling of the places intriguingly instead of how they are originally titled as to express it attractively and creating curiosity in map reader's mind as shown in Figure 4 (*Great City Maps: A Historical Journey through Maps, Plans, and Paintings*, 2016).

Figure 2: The Bell and Drum Tower from Figure 1 (Source: DK,2016, p. 134)
Note: A higher level of details in one of the most prominent locations of Bell and Drum towers

Figure 3: Altar of Heaven from Figure 1 (Source: DK,2016, p. 135)
Note: Popular landmark with a larger than normal proportion
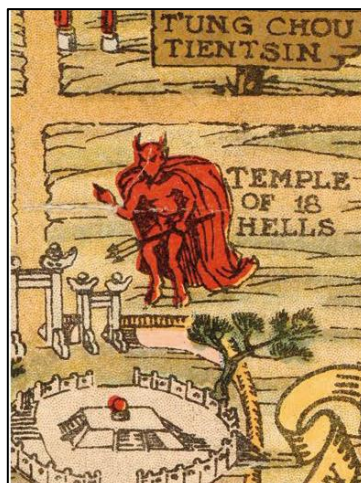
Figure 4: Dongyue Temple intriguingly labeled as "Temple of 18 Hells" from Figure 1 (Source: DK, 2016, p. 135)
Note: Many places in Figure 1 were labelled this way instead of their original titles

Also, it shows, as the significant number of other illustrated maps show, that the cultural maps are not always about accuracy and scale but about the visually relatable expression of the underlying narrative that the map is revealing.

The details shown pictographically are drawn to convey the sense of the cultural activities and elements which are easy for map readers to visually understand. Spatially, the map is not entirely accurate however it succeeded in conveying the information through the illustrations and pictorial elements.

2.1.3. Cartography and the use of pictorial elements to represent the culture

Many maps that were created for historical and cultural information have heavily incorporated pictorial elements in them. *The pictorial elements are the graphic elements that are drawn in an illustrated way, and not necessarily like the cartographic symbols, drawn traditionally to indicate the point data on the map.*

An example in the context of cultural depiction through pictorial elements (like Frank Dorn's map of Beijing) is given in the book *Great City Maps* (See Figure 5).

Figure 5: America, Its Folklore by William Gropper, c. 1946 (Source: DK, 2016)

This map integrates the pictorial elements, for example, by showing ships, pirates, fishermen, etc. in the empty area of the ocean (which otherwise would have been left as it is). Due to the direct impact of the rise in tourism, this trend to bring pictorial elements in the map as a highlight was observed after the 1920s, and the cartography was used as a sketch in the background (*Great City Maps: A Historical Journey through Maps, Plans, and Paintings*, 2016).

2.1.4. Contemporary illustrated maps and the balance between art and functionality

The illustrated or pictorial maps primarily focus on the artistic expression of the spatial elements instead of how things would be represented technically (*Mapas Pictóricos, Joyas Ilustradas*, 2016). Due to the differences with a map that has to prove its spatial

functionality like wayfinding, the illustrated or pictorial maps are at times considered map-related presentations (Meng, n.d. as cited in ShahTaj, 2020).

However, these maps, even when considered as not maps but 'map-related presentations', can still fulfill their objective of landmark recognition and wayfinding (ShahTaj, 2020). This claim can be supported by the vast number of illustrated maps in the market where local businesses and cities use them as a means to reflect the sense of the places pictorially or in an illustrated way and yet are used for guiding people navigate using those maps.
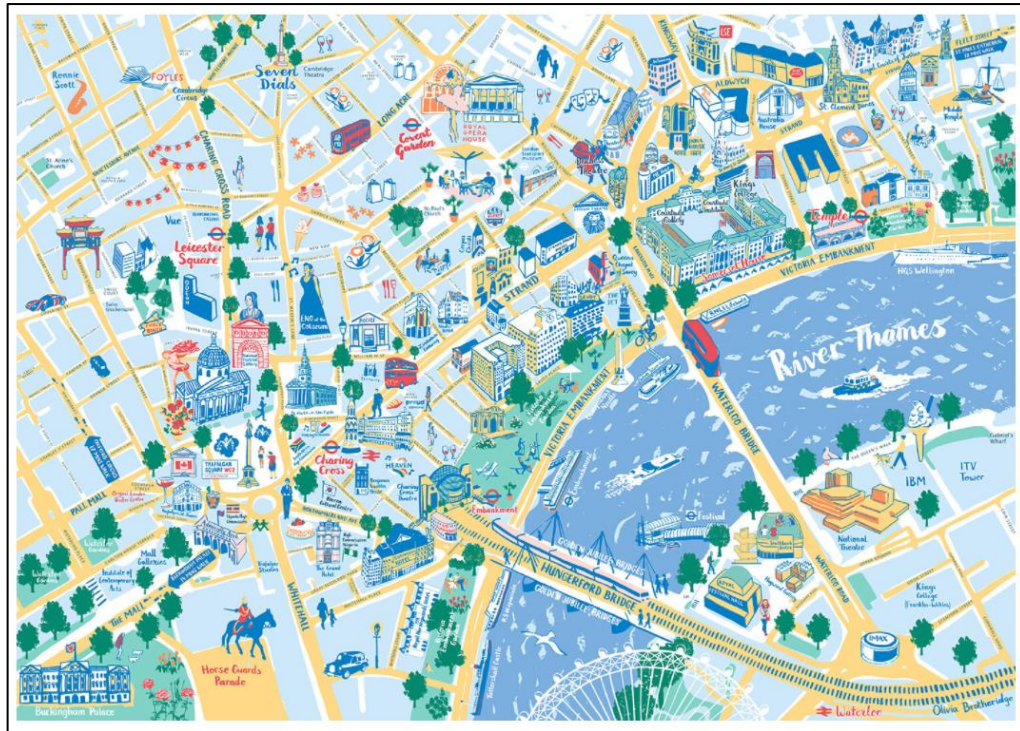
Figure 6: Illustrated map of Northbank BID (Source: Brotheridge, 2021)

An example of this can be seen in Figure 6. This illustrated map is drawn by a London-based illustrator Olivia Brotheridge for the Northbank district. It has been used in multiple formats like printed maps, tourism brochures, websites, and signages installed for wayfinding (Brotheridge, 2021).
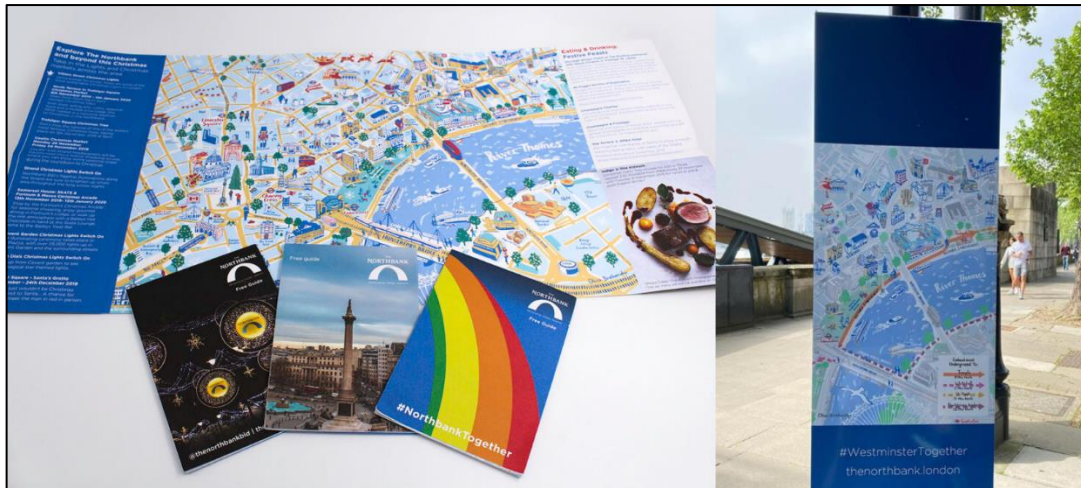
Figure 7: Illustrated map used in the tourist information fold-out and as wayfinding signage (Source: Brotheridge, 2021)

Hence, the contemporary cartography of illustrated maps indicates that combining artistic aesthetics and functionality is very much possible.

2.2. Collaborative techniques

2.1.1. Overview of collaborative techniques applied to understand cultural information

The studies around collaborative techniques to understand cultural concepts or aspects can be found in the educational research which focuses on cultural education or cultural communication and training. One such study done by (Kleschina, 2020) focuses on using cultural maps to teach the undergraduate students about the concept of 'cultural glasses' put forth by Edward Halls to understand 'cultural relativism '.

The research included qualitative and quantitative approaches where more than 300 subjective maps were drawn by students using the collage technique. This article helps to understand how to structure the overall implementation of the research of such nature. Similarly, (Tyner, 1987) explores and explains the relationship between culture and Cartography and how teachers of history can make use of it for the demonstration of a balanced view of the world for their students.

(Gibson et al., 2010) extensively gives the overview of the role of different geospatial technologies as a means to produce maps that are used for analysis in cultural research. It helps to understand the technical aspects that can come across at the intersection of cultural research and cartography.

Korpi & Ahonen-Rainio (2010) sheds light on the nuances involved in the understanding of the cultural influences while designing map symbols. The cultural constraints mentioned in this study help understand the factors & complexities involved when dealing with culture and design guidelines in greater detail.

2.1.2. Subjective mental maps

"….Even the most positivist attempt to map the world as it is – to represent a set of properties systematically, scaling the matrix in which they are embedded in proportion to their ratio in the physical environment – involves a mental conversion. Thus, all maps, from those on classroom walls to fold-outs of city streets and subways to GPS on smartphones and aircraft screens, are "mental maps" whose design rests on the decisions of mapmakers…."

<div align="right">Götz & Holmén (2018)</div>

In the article 'Introduction to the theme issue: Mental maps: geographical and historical perspectives' (published in the journal of Cultural Geography) Götz & Holmén (2018) discuss how all maps are fundamentally mental maps, therefore, making all the maps an artistic conception. However, '*proper maps*' give concrete insights about the underlying mental maps that composed them that can be analyzed or used. Additionally, this also shapes the mental maps of those who further read or use those maps (Götz & Holmén, 2018).

In order to understand how international women view the city of Dresden, the use of subjective mental maps, therefore, plays a very important role. To extract the most from the expressions of women, however, subjective mental maps alone are not substantial. It would depend on individual ability to express their mental images of the city through drawing.

The methodology section further discusses which other techniques are coupled with the subjective mental map drawing to make the extraction of necessary information effortless. It is important to tap into the other methods apart from mental mapping which can enhance the understanding of women's perception.

Chapter 3. Methodology

The methodology is divided into two main sections. The first section focuses on objective 01 thus elaborates the methods adopted to answer the respective research questions. Section two does the same regarding objective 02 as stated in the introduction chapter.

3.1. Methodology for achieving objective 01

(Objective 01 - To investigate & understand the subjective outlooks & expressions of international women about the city of Dresden)

The aim of objective 01 is to extract the subjective views of women which can be converted into a structured data form that can be further utilized for a well-organized map design framework. In order to extract the information, it is important to understand the role of communication in designing the methodology.

In the article *five types of communication* Willkomm (2018) outlines the key five ways of communication as follows:

1. Verbal communication – expressed through spoken words
2. Non-verbal communication – expressed through body language and facial expressions
3. Written communication – expressed through written words
4. Visual communication – expressed through diagrams, images, drawings
5. Active listening – often listening misses out to be a part of 'types of communication'. However, Willkomm (2018) argues that without active listening the communication is incomplete as active listening enables us to assess the needs of the speaker and to interpret the message clearly with an improved engagement.

Hence to understand the subjective views of international women, it is important to combine these types of communication to form an effective methodology. Not one method may cover all these types therefore in this work, a combination of various techniques is applied.

Technique 1 : Personal interviews – these cover the communication in the verbal, non-verbal, and active listening form

Technique 2 : Subjective mental map drawings – these cover the communication in visual and written form

Combining these two techniques the methodology to address objective 01 consists of the following steps:

- Choice of participants
- Forming interview questions
- Method to organize the information collected from the interviews and subjective mental maps

3.1.1. Choice of participants

A total of 10 participants who attended Montagscafe were chosen. To have balanced international perspectives, there was an approximately equal number of participants from each continent. As the definition of the continent may vary depending on the context. In this work, the regional divisions of the world are considered based on the UNSD M49 standards UNSD (1999). As mentioned in UNSD (1999), the geographical regions are divided into 6 main regions like Asia, the Americas, Africa, Europe, Oceania, and Antarctica. However, this work only considers the 5 continents except for Antarctica.

The participation took place as follows:

Asia - 3
Americas - 2
Africa - 2
Europe - 2
Oceania – 1

3.1.2. Interview questions

The interview questions were structured stagewise to understand the subjective views of participants in an organized way. The first stage is to realize the familiarity of participants with maps and their approaches towards navigation through the city. It also gives insights into their cartographic literacy which may prove to be helpful to interpret their mental map drawings and also while designing the map, it may give insights as to which map components the participants focus on.

The second stage is about collecting points of cultural interest. It includes questions around where the participant has had international cultural exchanges.

The third stage is about understanding the areas where the participants possibly have practiced caution. In stage four the participants draw their subjective mental maps.

Stage 01   Understanding participant's
1   What do you rely on when finding directions to places - maps or verbal instructions?
- Have you used any map or maps of Dresden? If yes, can you tell us which maps were they? e.g. the transport linie, or touristic map for site seeing, maps provided by your district or administration of your organization. Or Google maps..etc.
- The maps you see in Dresden, do they feel similar to the maps you have used/seen in your home country/region?
- What feels different in both? which one is easy to use?
2   Do you usually know the directions e.g. where is east or west inside the city?
Or do you use directions like ""in front""/""behind""/""left""/""right"" from where you stand? e.g. Hauptbahnhof Nord is in on the left side of the Rewe and Haupbahnhof is in

front of Rewe" Or do you find way from landmarks e.g. Haupbahnhof./ streets e.g. Prager Str. / areas e.g. your district?

Stage 02   Collecting points (landmarks), lines(paths/streets), polygons(area) of cultural interests
Where do you feel the most international in the city?
Any specific districts or areas or spots or streets?
Which cultural activities do you find yourself doing with fellow international women?

Stage 03   Understanding the points (landmarks), lines(paths/streets), polygons(area) of caution
Have you had any negative or unsafe experiences in the city? If yes, where do you feel unsafe or the need to stay careful and alert?
What are your thoughts on flagging a place as unsafe on the map?

Stage 04   Drawing the subjective mental maps
Guiding the participant through the subjective mental map drawing.

3.1.3. Method to organize the information collected from the interviews and subjective mental maps

The map design approach in this work focuses on vector data formats. In such GIS that is based on vector data formats, the basic units in which the spatial information is represented are *points*, *lines,* and *polygons* (*Vector Based GIS*, 2001).

The information collected from participants will be divided into three categories:

Table 1: Structure for organizing collected data

Category	Geometry	Description
Points	Point	These will include points of meetings, landmarks, or activities at a certain location mentioned by participants
Streets/Paths	Line	These will include the streets or paths mentioned by participants
Area	Polygon	These will include any areas, districts, or neighborhoods mentioned by participants

Sorting the information in this format will help process it swiftly in any GIS software or program. To further mark these points, lines, and areas on their respective geographic location, Google Earth Pro is used. (*Google Earth Pro*, 2021) is a desktop application that allows the storage of data in the above-mentioned format.

(DeRoy, 2016) has developed a similar methodology explained in the guide *Direct-To-Digital Mapping Methodology: A Hands-on Guidebook for Applying Google Earth.* It explores the potential of Google Earth Pro for participatory mapping mainly for indigenous community-based data collection. It includes an advanced methodology that can be applied for a larger number of participants and also for a projects of rather technical nature.

Another resource for such participatory mapping projects is the (Google Earth Outreach Program (2021) which includes learning material from the 'Geo for good' summit which includes sessions on applications around social inclusion.
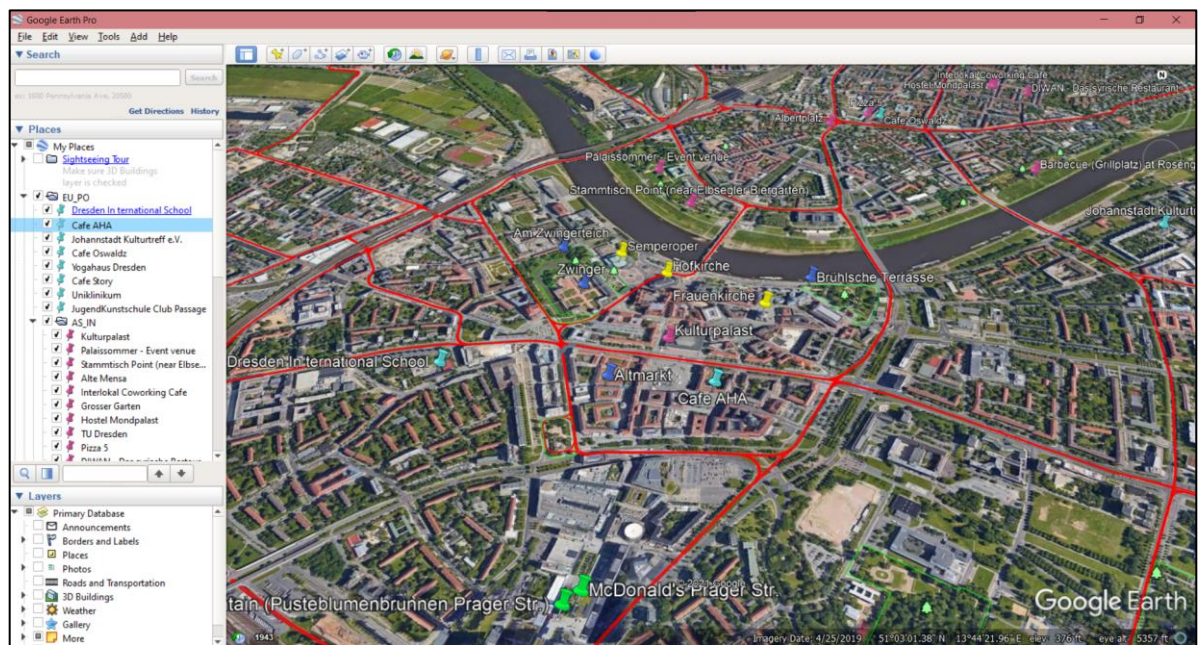
Figure 8: Snapshot of data collection on Google Earth

The information from the interviews will be recorded in an audio format. The transcripts of these audios will be generated. The transcripts were generated using Descript (2021) which is a desktop application for transcribing audio files. Not all transcripts were automatically transcribed and needed manual corrections. The transcripts can be found in the appendix section.

3.1.4. Results from participant interviews and subjective mental map drawing activity

The following pages include the subjective mental maps drawn by participants and the geographic data mentioned by them in the corresponding tables. It includes brief remarks about the cultural experiences and the map design recommendations shared by the participants. High-resolution files for all maps can be found in the appendix.

Figure 9: Subjective mental map drawn by participant no. 01 from Asia

Results of personal interview + subjective mental mapping for
Participant number 01 from Asia

This personal interview was conducted with the help of translation from Arab to English by an Arab-speaking volunteer. Due to this, the notes are included for this interview instead of a transcript. The participant spoke and understood a little bit of English and mainly used Arab and German languages while speaking.

Following are the areas about cultural places and activities mentioned by the participant:

Table 2: Cultural places shared by participant 01 from Asia

Points	Streets/Paths	Areas
Frauenkirche	Prager Strasse	Altstadt
Montagscafe	Along Elbe	Neustadt
Flee Markets		
Hauptbahnhof		
Grosser Garten		

Following are the areas regarding caution mentioned by the participant:

Table 3: Places of caution shared by participant 01 from Asia

Points	Streets/Paths	Areas
Hauptbahnhof	Alauenstrasse	

Selected remarks shared by the translator :

"In Syria, where she comes there are no good maps as such. Like they do not have such correct maps. So there is no comparison between the maps in Germany and back home. She says "We only ask people for directions back home.

"Also, when she first started using maps here she didn't know how to use them. She didn't know the directions like North from where she's standing. So she used to stand without knowing that. Now it is better. She prefers maps over verbal instructions."

The translator also shared the hesitation or shyness expressed by the participant upon questions related to places of caution.

Figure 10: Subjective mental map drawn by participant no. 02 from Asia

Results of personal interview + subjective mental mapping for
Participant number 02 from Asia

This personal interview was conducted with the help of translation from Arab to English by an Arab-speaking volunteer. Due to this, the notes are included for this interview instead of a transcript. The participant did not speak English and mainly used Arab and German languages while speaking.

Following are the areas about cultural places and activities mentioned by the participant:

Table 4: Cultural places shared by participant 02 from Asia

Points	Streets/Paths	Areas
Johannstadt Kulturtreff	Along Elbe	Around Frauenkirche
International garden in Johannstadt		Altstadt
Frauenkirche		Johannstadt
Kulturpalast		

Following are the areas regarding caution mentioned by the participant:

Table 5: Places of caution shared by participant 02 from Asia

Points	Streets/Paths	Areas
Pohlandplatz		Prohlis
Grosser Garten		Neustadt

Selected remarks shared by the translator :

She says *"the international garden is very very beautiful. Near Johannstadt. Bus 70 goes there."* This indicates the navigation along the transport lines is preferred by the participants.

She says she would like to talk about racism.

Upon asking where does she find are people racist, she responded as follows -
"The person is racist, not the street."
Therefore she said that marking places on the map this way may not convey the truth.

Figure 11: Subjective mental map drawn by participant no. 03 from Asia

Results of personal interview + subjective mental mapping for
Participant number 03 from Asia

Following are the areas about cultural places and activities mentioned by the participant:

Table 6: Cultural places shared by participant 03 from Asia

Points	Streets/Paths	Areas
TU Dresden	Prager Strasse	Neustadt
Mensa	Along the Elbe River	Riverside area
Grosser Garten		Loebtau
Stammtisch spot near Elbsegler Biergarten (International Friends Dresden)		Barbecue area near Rosengarten
Hostel MondPalast		
Interlokal Coworking space		
Palais Sommer		
Pizza 5		
Diwan		
Albertplatz		
Kulturpalast		
Hauptbahnhof		

Following are the areas regarding caution mentioned by the participant:

Table 7: Places of caution shared by participant 03 from Asia

Points	Streets/Paths	Areas
Albertplatz	Alaunstrasse	
Around Pizza 5		
Hauptbahnhof		
PEGIDA march		

Selected remarks or comments by participant:

"I prefer things that are structured and organized, easy to read when it comes to maps. I don't expect them to be very, I don't know, fun, animated. I just expect them to do their job…in the easiest way possible… Something like a simple map, but also a kind of map that is properly structured and the colors, the information there is easy to understand. even for somebody who's not good at using maps."

"if the map is translated to English or something, then the names of the streets will not be accurate. it might get confusing. The whole translation process can make us less efficient."

"I don't remember places based on the north and the south and west parts of this. I remember names, I remember the regions, the location… so I know the different quarters of Dresden. I know that this is Neustadt and then we have Altstadt, Striessen, Suedvorstatdt, Then Pilnitz like that"

"I would not flag a place like that (as unsafe) because it's unfair to the people there and you know, the people who own shops there."
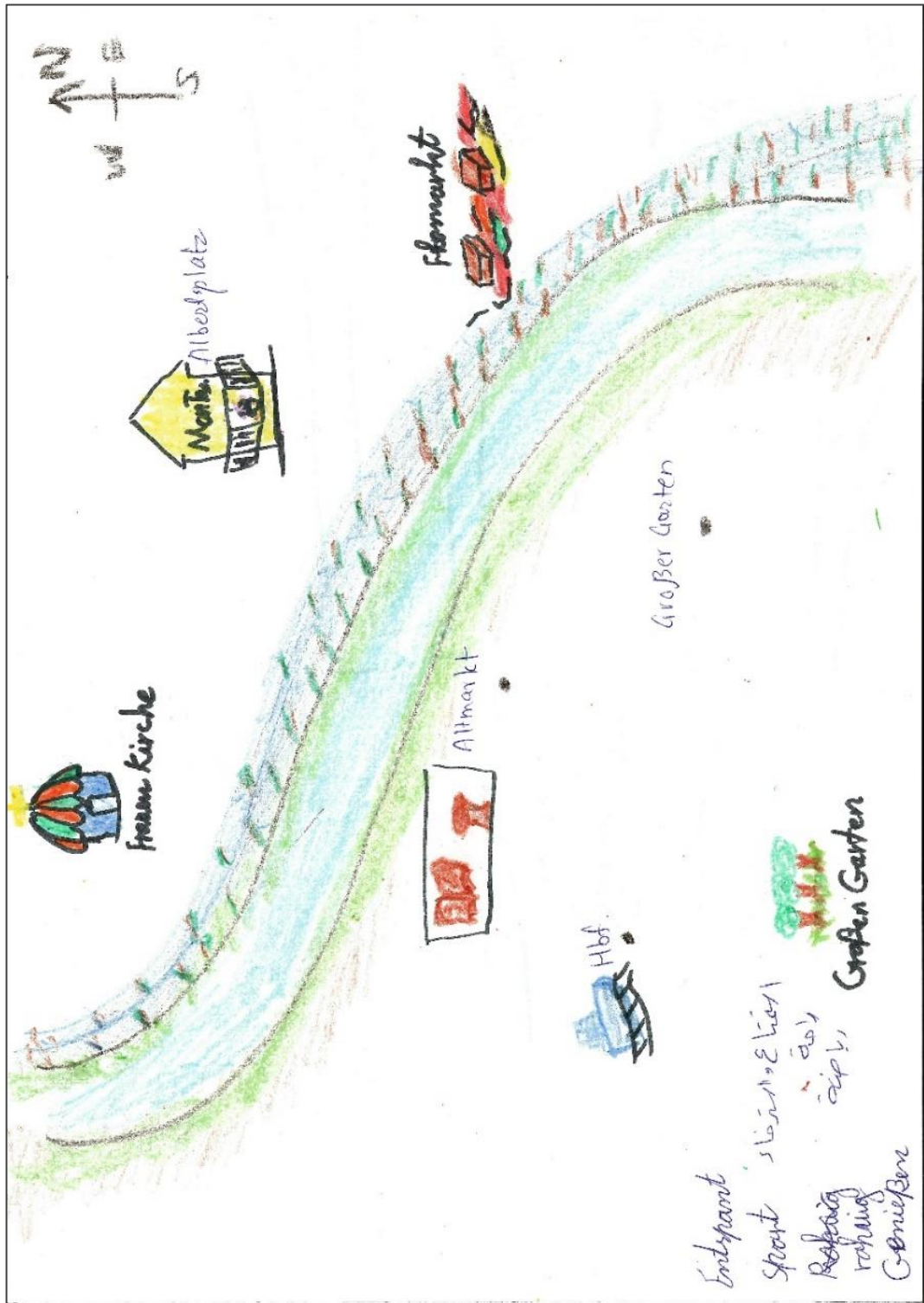
Figure 12 : Subjective mental map drawn by participant no. 01 from Europe

Results of personal interview + subjective mental mapping for
Participant number 01 from Europe

Following are the areas about cultural places and activities mentioned by the participant:

Table 8: Cultural places shared by participant 01 from Europe

Points	Streets/Paths	Areas
Dresden International School	Along Elbe	Around Frauenkirche
VHS		
Johannstadt Kulturtrefffen		
Café Story		
Max Plank institute		
Café Oswaldz		
Yoga house		
Café AHA		
Uniklinikum		

Following are the areas regarding caution mentioned by the participant:

Table 9: Places of caution shared by participant 01 from Europe

Points	Streets/Paths	Areas
Hauptbahnhof		Prohlis
Football matches		Gorbitz
marches		

Selected remarks or comments by participant:

About showing both cultural and places of caution on the map: *"Depends on what we want to communicate with this map. If you are trying to show international places to meet or speak different languages or if you trying to show safe place."*

About map design: *"..in Scotland, on every leaflet, what they have is fantastic. It was always written as the street, a short map of showing what is around. In Potsdam, this map that we got from one exhibition, it was not enough to find direction. People found it hard to read. Why not simply just put 3 streets with names and something that is big, what is special around there. Like a supermarket, church…If you ask, in Europe, you may usually get help. But that person (who is answering) may not know where those places are…"*

"The international family group (on Facebook) has a lot of information for international families moving here. They also have meetups that families may find helpful"
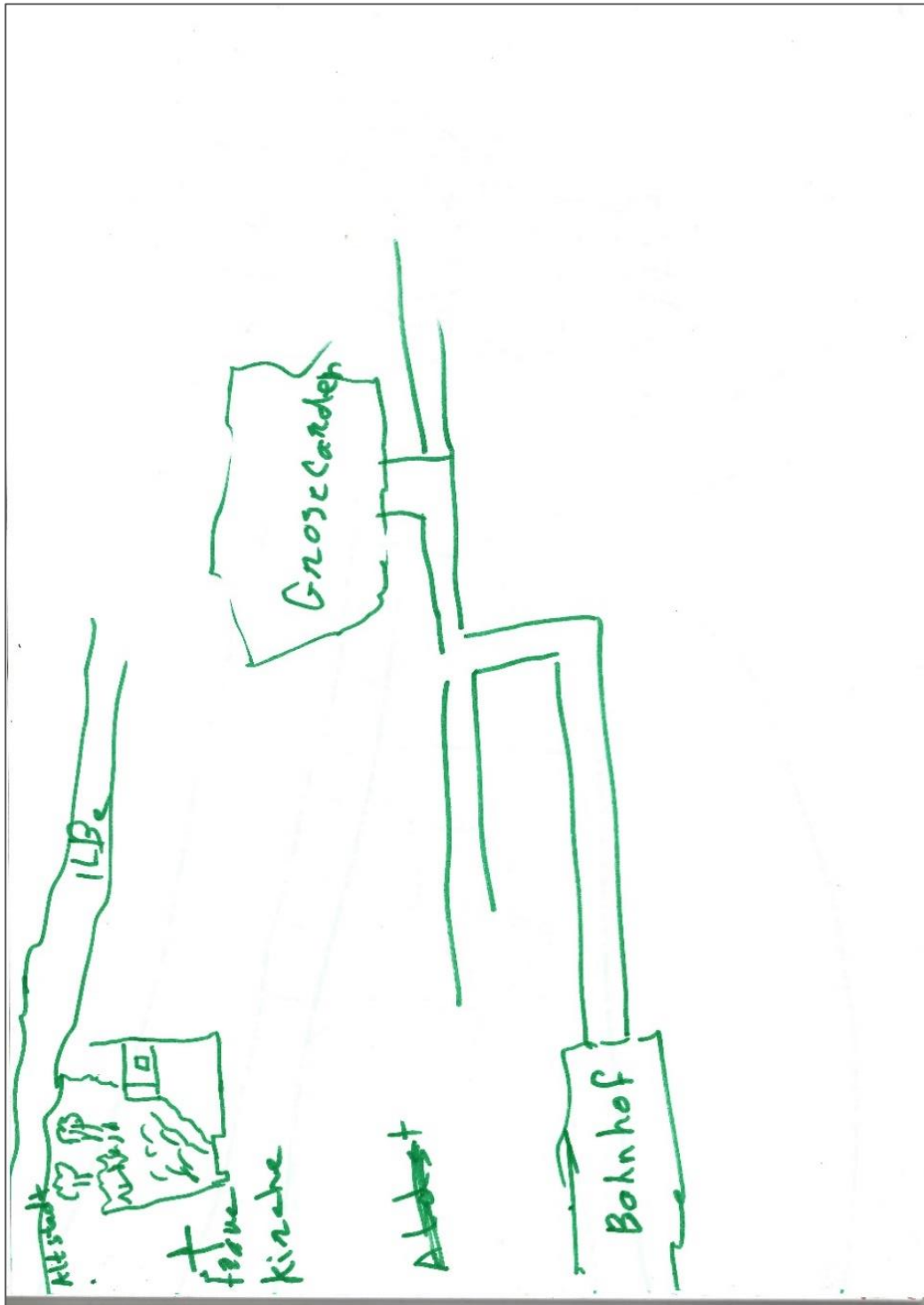
Figure 13: Subjective mental map drawn by participant no. 02 from Europe

Results of personal interview + subjective mental mapping for
Participant number 02 from Europe

Following are the areas about cultural places and activities mentioned by the participant:

Table 10: Cultural places shared by participant 02 from Europe

Points	Streets/Paths	Areas
Stammtisch spot near Elbsegler Biergarten (International Friends Dresden)	Prager Strasse	Neustadt
Montagscafe		
El Cubanito		
Ragazzi shop (Continental clothing)		
Saigon supermarket		
Atelier Schwartz ...Kulturtreffpunkt (multicultural meeting point)		
Albertinum		
ABC-Tische (Umweltzentrum Dresden)		
Mora Bar		

Following are the areas regarding caution mentioned by the participant:

Table 11: Places of caution shared by participant 02 from Europe

Points	Streets/Paths	Areas
Hauptbahnhof	Alauenstrasse (at night)	

Selected remarks or comments by participant:

"Well, I never thought about how beautiful a map is. It is important to me that they're very clear and not confusing."

"To me also the international people sitting on the streets, give me a feeling of internationality, which I really enjoy."

"I have the most interaction and connection for the people at Stammtisch. So maybe I will draw people here. Arms in arms in circle. This would be for Mora bar and Stammtisch meeting here.."

About showing caution on map: "The map could tell me to not go there when it is actually not that dangerous. You know. but may be instead of showing that, what if a map shows let's say grayish area. If you could link them to the unsafe area and link it to where you can find help or so… So it's like just notifying them that yeah, like not flagging."
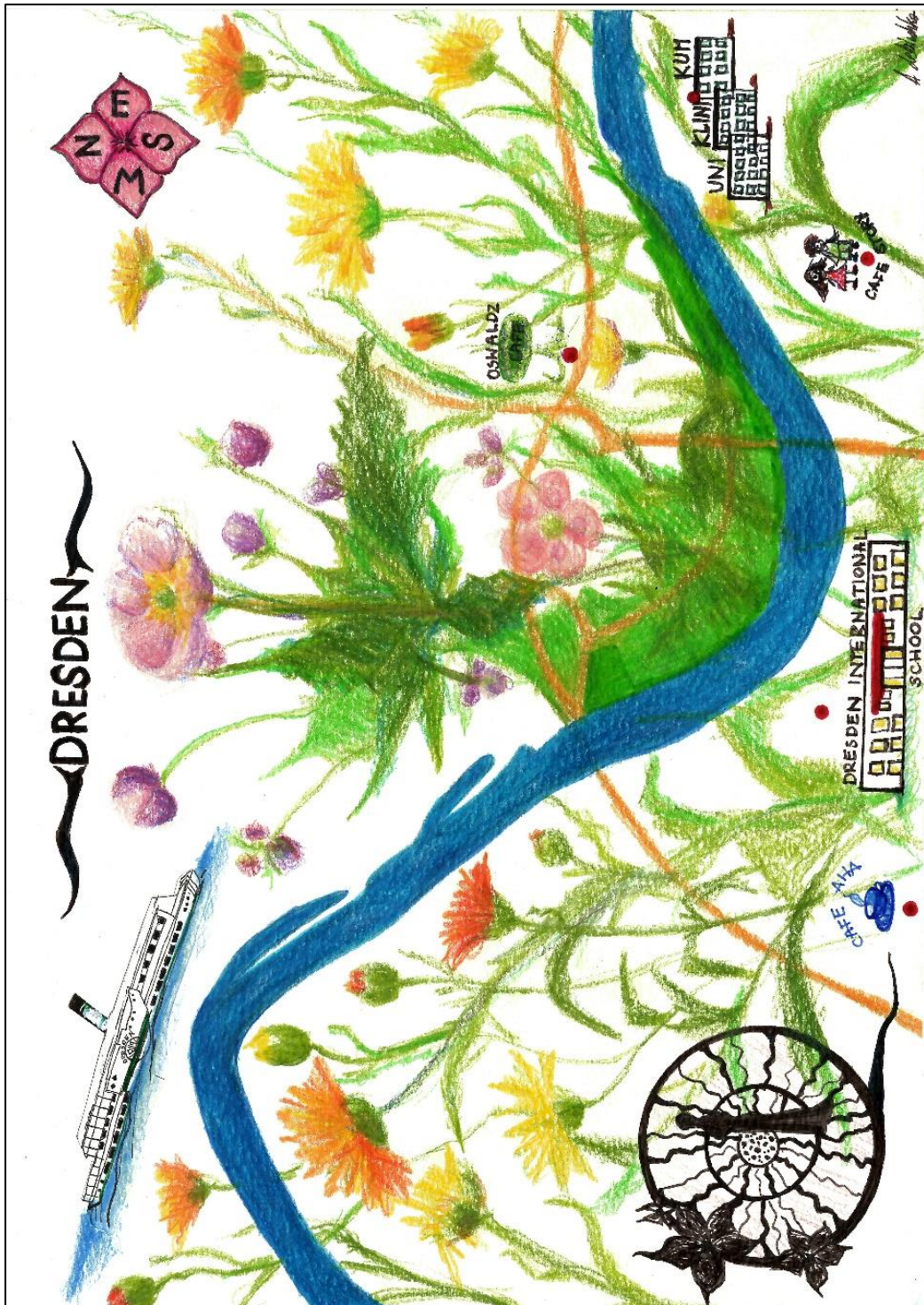
Figure 14: Subjective mental map drawn by participant no. 01 from the Americas

Results of personal interview + subjective mental mapping for
Participant number 01 from the Americas

Following are the areas about cultural places and activities mentioned by the participant:

Table 12: Cultural places shared by participant 01 from the Americas

Points	Streets/Paths	Areas
Alaunpark	Alaunstrasse	Neustadt
Concerts in Neustadt	Along the Elbe river	
Altmarkt		
Brühlsche Terrasse		
Am Zwingerteich		
Zwingerpalace		

Following are the areas regarding caution mentioned by the participant:

Table 13: Places of caution shared by participant 01 from the Americas

Points	Streets/Paths	Areas
		Industrial area in Neustadt

Selected remarks or comments by participant:

Tramlines are the mental reference:
"Here is Synagoge. Then we go straight and then Pirnarischer Platz. Now I am drawing more along the tram. And then straight is Altmarkt. Then this was the point of free city tour."

"I think it is important to know that you haven't had that [negative] experience but someone has had it. So you can still keep that in mind. You never know. You know to may be (on the map) put like shadows. Not like specific colors. But kind of fuzzy area or color. You can sense that something is going on here."

Figure 15: Subjective mental map drawn by participant no. 02 from the Americas (part 01)

Results of personal interview + subjective mental mapping for
Participant number 02 from the Americas

Figure 16: Subjective mental map drawn by participant no. 02 from the Americas (part 02)

Results of personal interview + subjective mental mapping for
Participant number 02 from the Americas

Figure 17: Subjective mental map drawn by participant no. 02 from the Americas (part 03)

Results of personal interview + subjective mental mapping for
Participant number 02 from the Americas

Following are the areas about cultural places and activities mentioned by the participant:

Table 14: Cultural places shared by participant 02 from the Americas

Points	Streets/Paths	Areas
Café Aha	Alauenstrasse	Neustadt
Kardamom – Oriental Café		Johannstadt
Christmas market		Altstadt (Pretty Altstadt buildings)
Stammtisch spot near Elbsegler Biergarten (International Friends Dresden)		The area behind Rundkino with different small international businesses and shops
Nightfly club		
English meetup clubs		
Couch surfers meetups		
Grosser Garten		
Dresden meetups		
Mandala – boulder hall		
Winery Wackerbarth Castle		

Following are the areas regarding caution mentioned by the participant:

Table 15: Places of caution shared by participant 02 from the Americas

Points	Streets/Paths	Areas
Neustadt bahnhof		Near Carolabrücke on Altstadt side

Selected remarks or comments by participant:

"Oh, I do use them, but they're so busy that it can be really difficult. I kind of wish they had, um, a separate one that just had the trams on it. Yeah. Because when you look at all the tram and bus routes, at the same time, I find it really difficult to find the tram that I'm looking for."

"A lot of people like local people meet through shared interests, they'll join a sports club or something like that. Mandala, I should mention, is a place that a lot of international people are and like any of the climbing gyms. like that (Mandala) is a Boulder hall."

"I would want the flag (to indicate caution) to be not based on a feeling, but based on. No actually incidents like facts. and I would maybe separate verbal harassment and physical harassment"

About showing the cultural and caution information on the map: "I've seen on maps is where there's an overlay. So you can select which things you want to come out because it is digital.. then people who weren't interested in that wouldn't have to have it, but then if they just said, show me also like the areas that are safe, it would come up."
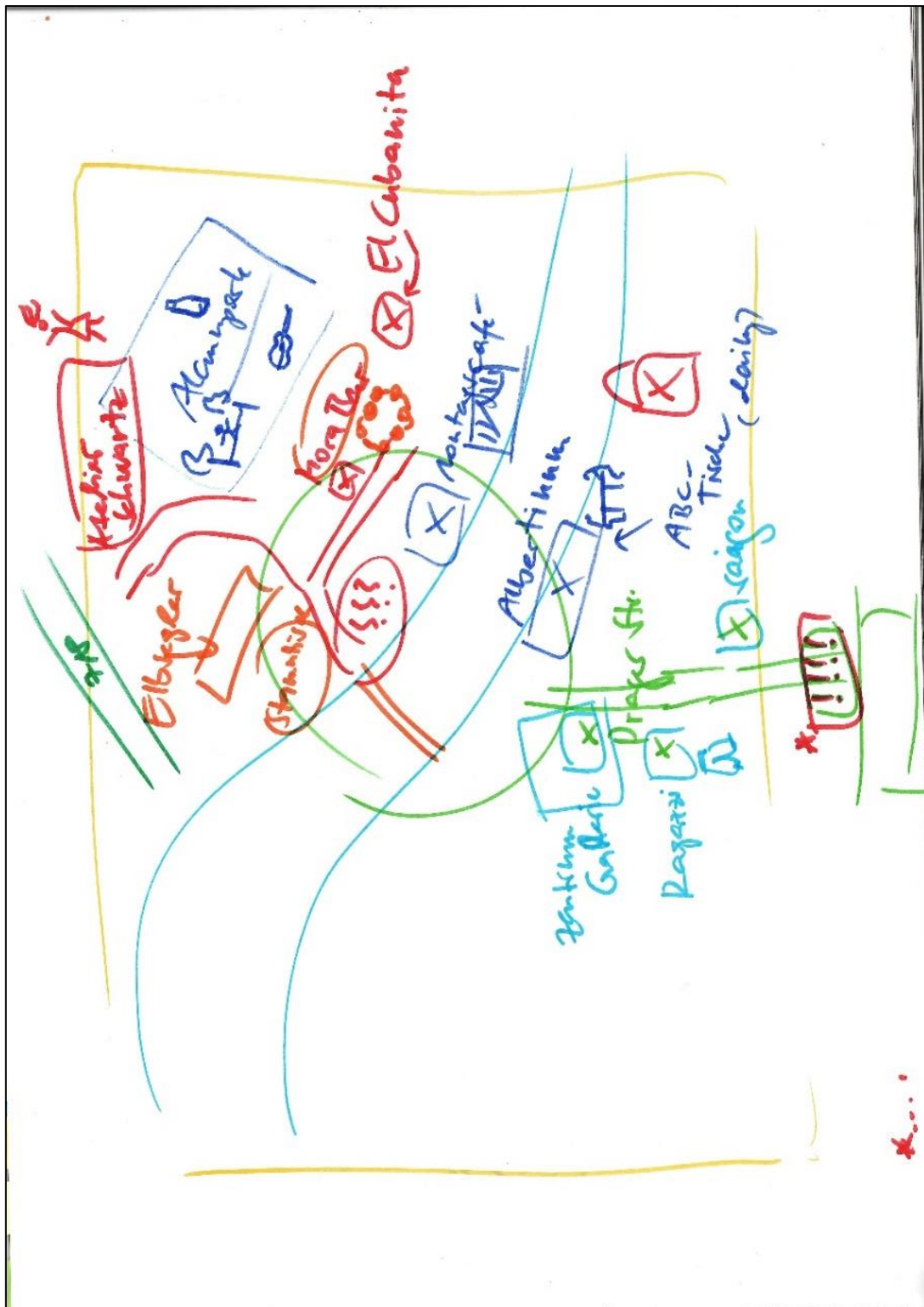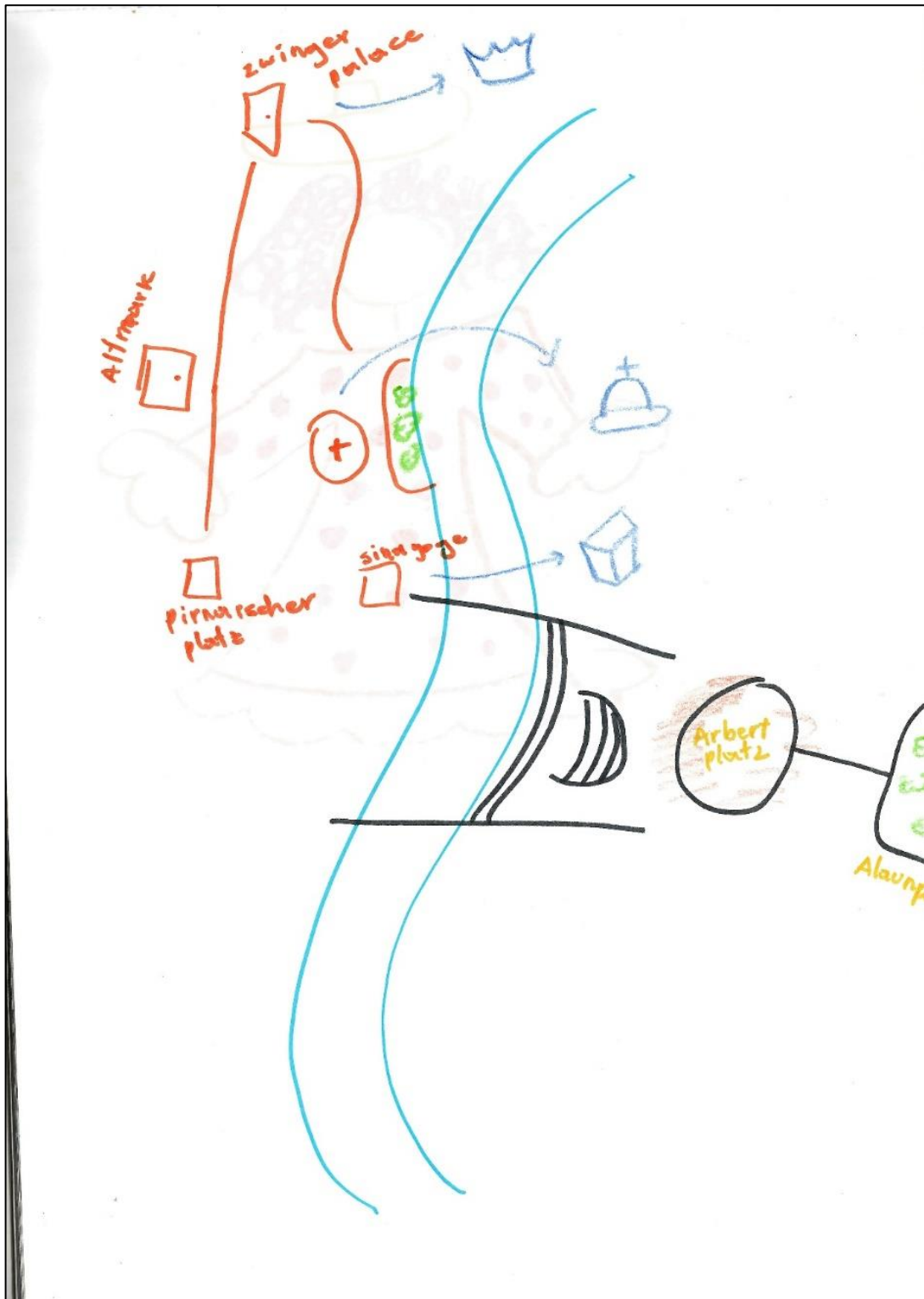
Figure 18: Subjective mental map drawn by participant no. 01 from Africa

Results of personal interview + subjective mental mapping for
Participant number 01 from Africa

Following are the areas about cultural places and activities mentioned by the participant:

Table 16: Cultural places shared by participant 01 from Africa

Points	Streets	Area
Pusteblumenbrunnen (a fountain in the middle in front of McDonald's)	Prager Strasse	Neustadt
Hauptbahnhof	Alaunstrasse	
Stammtisch spot (International Friends Dresden)		
My House club		
Lobo club		
Elbamare Erlebnisbad - Water park		

Following are the areas regarding caution mentioned by the participant:

Table 17: Places of caution shared by participant 01 from Africa

Points	Streets	Areas
Amalie-Dietrich-Platz		Gorbitz
Merian platz		Around Hauptbahnhof

Selected remarks or comments by participant:

About showing caution on map:

"So, yeah, I think that businesses in that area will be affected, but also you will know what you're getting yourself into. It's better that way. Um, if you know, you're going to the ghetto area, then - if I am a ghetto person, then I may like to go there. And if I'm this person that only wants the quiet areas, then I would know the kinds of places that are safe...

When I first came in Dresden and was searching for accommodation... I moved in, I stayed there. I was happy. I didn't see anything at all. And three months down the line. And now people said, Why are you living in Gorbitz? it's dangerous! And then that's when I was like, I entered into this blindly, you know, I didn't really do much research or how can there be such an area that is so dangerous that everyone knows about it..."

Figure 19: Subjective mental map drawn by participant no. 02 from Africa

Results of personal interview + subjective mental mapping for
Participant number 02 from Africa

Following are the areas about cultural places and activities mentioned by the participant:

Table 18: Cultural places shared by participant 02 from Africa

Points	Streets/Paths	Area
Hauptbahhof	Prager Strasse	Altstadt
Studentenwohnheims	Along Elbe river	Innere Alltstadt
Language cafes	Alaunstrasse	
SLUB		
Frauenkirche		
Picnic spots near Elbe		
TU Dresden		

Following are the areas regarding caution mentioned by the participant:

Table 19: Places of caution shared by participant 02 from Africa

Points	Streets/Paths	Area
Zschachwitz train stop		Zschachwitz
		Around Hauptbahnhof
		Gorbitz

Selected remarks or comments by participant:

"I think I would appreciate it if that (map) is not cluttered with so many places, like just to get an overall picture, maybe less details…"

"And then if I actually want to get somewhere, then I can like use the Google maps…"

"If I ever do that (giving directions), then it's only like with the tram stop. It's like you come with tram number three, and then you walk five minutes left, five minutes right. Then it should be almost close. Like you should start looking for my address..

"…it would be nice to know a way to get help when something happens, especially being a foreigner and not really knowing how to speak German. It can be very hard… I feel for other people who had to go through these kinds of things. You don't know the language and you try to speak to someone you think they can help you, but then they, they can't speak English either…"
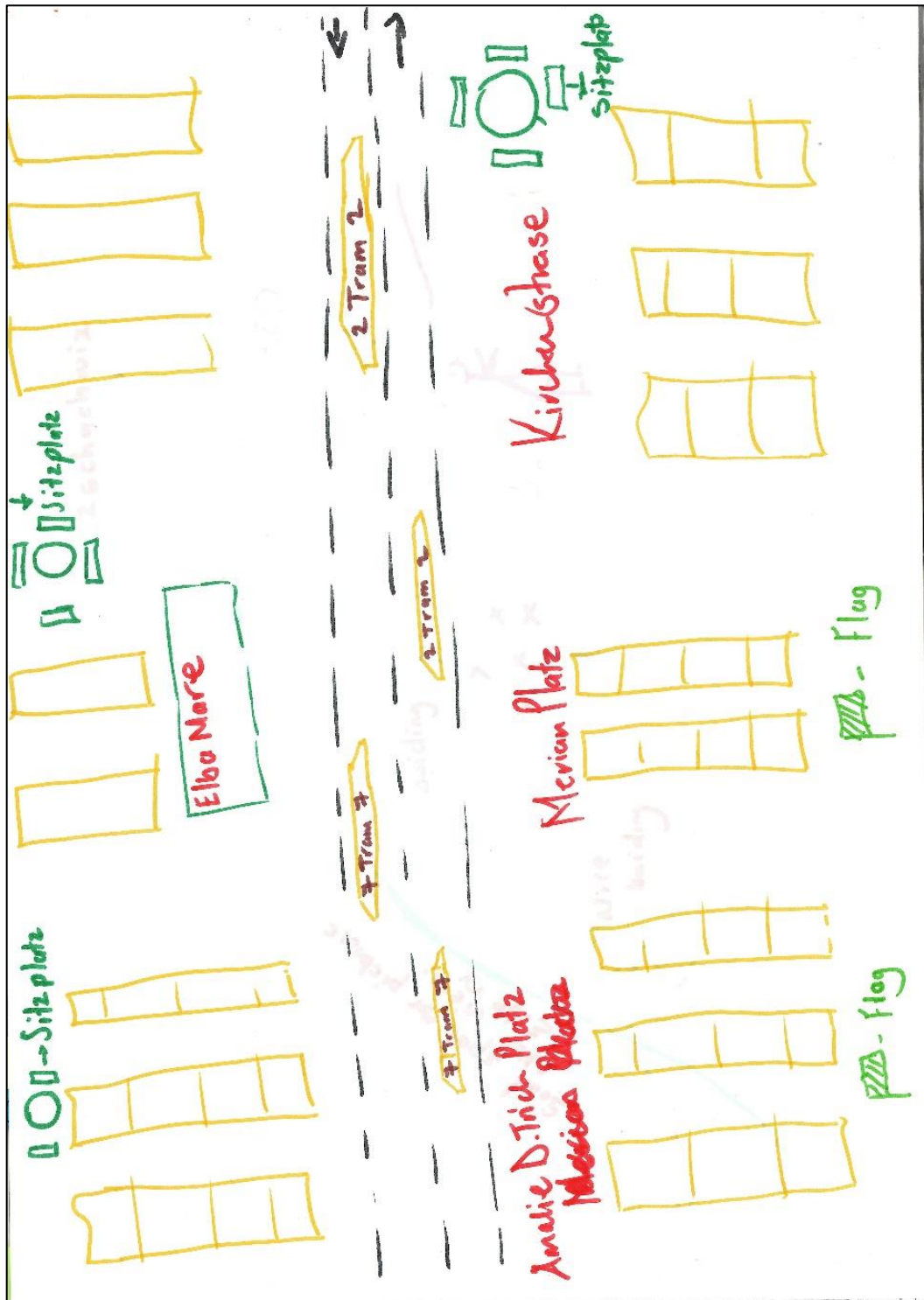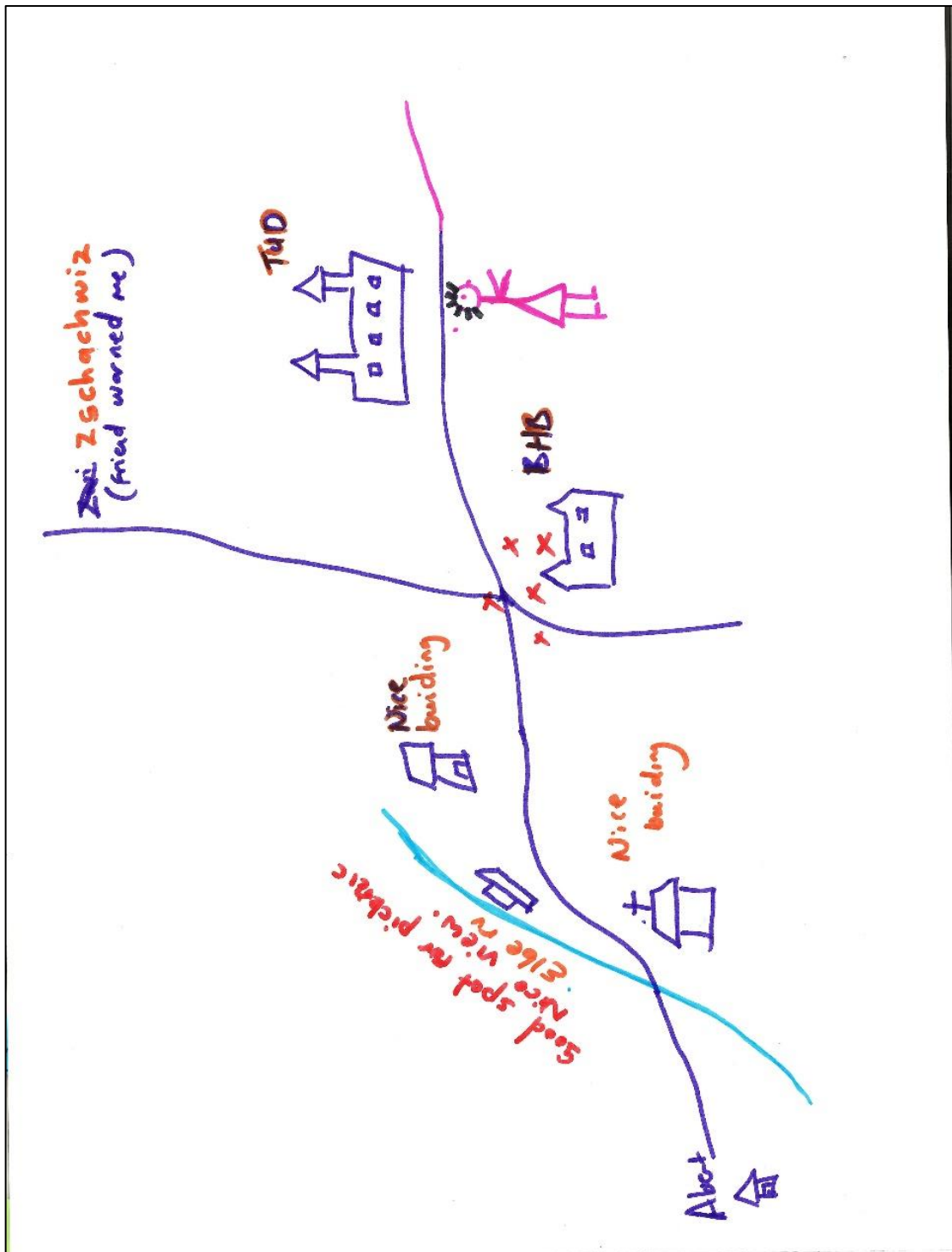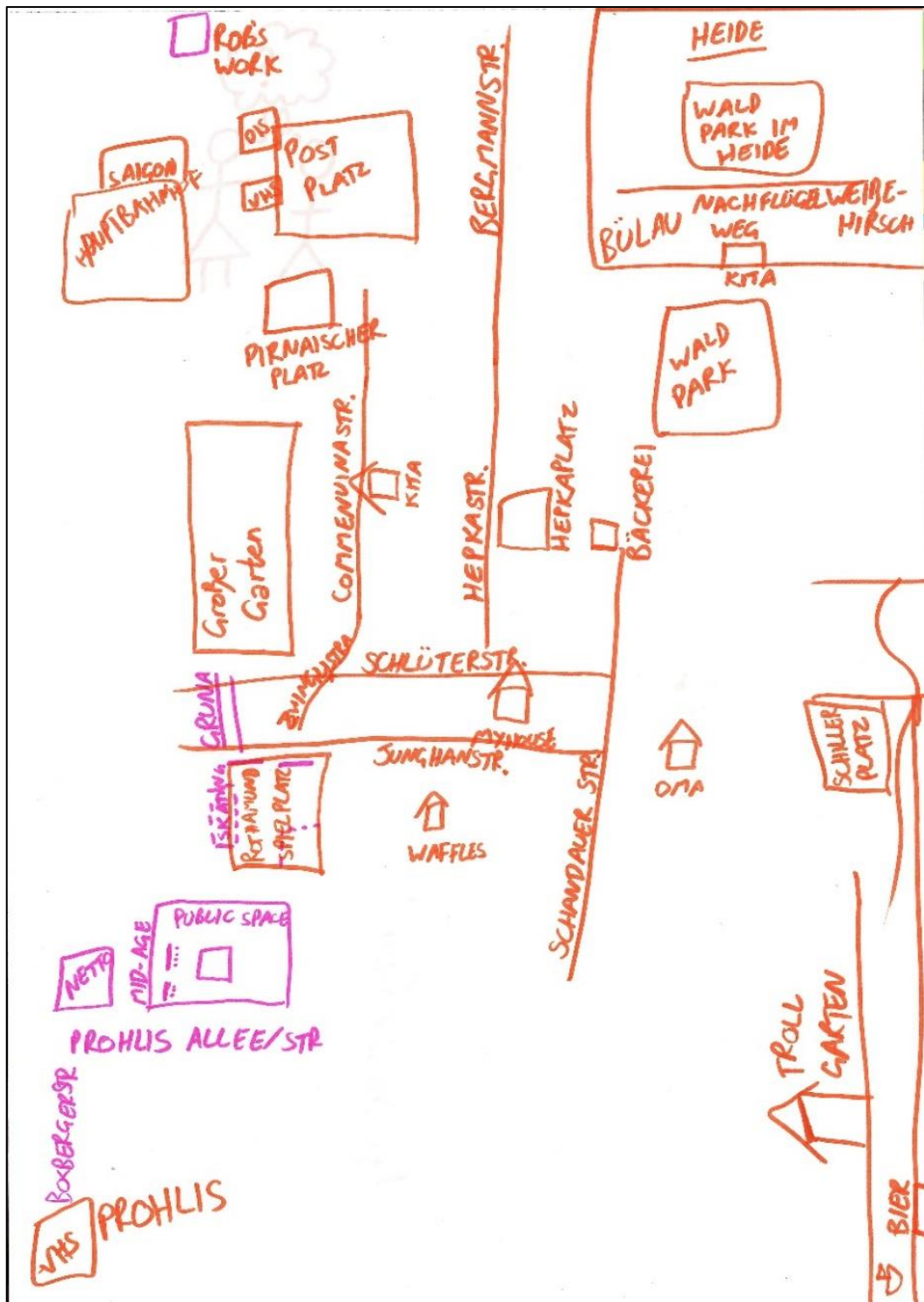
Figure 20: Subjective mental map drawn by participant no. 01 from Oceania

Results of personal interview + subjective mental mapping for
Participant number 01 from Africa

Following are the areas about cultural places and activities mentioned by the participant:

Table 20: Cultural places shared by participant 01 from Oceania

Points	Streets/Paths	Areas
Kitas	Along Elbe	Neustadt
International School Dresden		Gruna, Striesen (particular European international)
Waffls Cafe		
VHS (Volkshochschule)		
Saigon supermarket		
Trollgarten		

Following are the areas regarding caution mentioned by the participant:

Table 21: Places of caution shared by participant 01 from Oceania

Points	Streets/Paths	Areas
	Around Prohliser Allee	

Selected remarks or comments by participant:

"...in Germany, public transport maps, way more detailed, um, which is good and bad. Sometimes I get lost because there's so much detail. Like can't find what I need, especially in tourist maps.

Whereas back home, the tourist map of Melbourne, for example, the streets are laid out, but only the major streets are named and only the major points of interest are sharp. So if you want to get from where you're standing to that interesting church, for example, the maps are very clear because it doesn't show you everything on the way to the church. Whereas I find here so much information is presented, but I kind of lose myself in the detail..."

"I really struggle in Dresden because nothing's like parallel or linear. In Melbourne, it's just a whole lot of parallel streets. It's always really easy. It's so in my brain, everything is always parallel and that does not work here."

About caution:"Yeah. I would like that. Not, I mean, not necessarily cheap, blacked out and 'don't go there' maybe some marking to indicate. I don't know how to phrase it without being condescending, because I wouldn't want to condescend people and say, you know, you will, 100% have a bad time and you can't do with it, but it would be nice to have some indicator that people have had a bad experience there.

"Also, there is an area of Dresden. It is, um, less educated, lower socioeconomic has some pretty entrenched properties up there. and I think that community to see that their area on a public map built as unsafe or scary would only kind of compound the issues that already existed."

3.2. Methodology for achieving objective 02

The objective 02 concerns the map design steps. This section elaborates on the chosen approach for map design.

The cultural city map in the context of this thesis will be an illustrated map. When it comes to designing artistic maps, cartographers have a variety of data types and methods to choose from. From hand-drawn techniques to using raster and vector editing software programs, one can choose the method based on what type of output is required.

Some factors that were considered while choosing the right technique for the final map design were –:

- Uniform data format
- Scalability of the final product
- Number of updates/changes required in future
- Ability to prepare data for different types of print or online media

3.2.1. Raster vs. vector data type for maps

Data models also referred to as data types are the ways in which the real-world data is represented on maps. There are two kinds of such data models or data types namely raster and vector (Humboldt State University, 2018).

Raster graphics are usually called bitmaps as they are composed of tiny pixels (Jeffrey, 2020). On the other hand, vector graphics are based on mathematical instructions (Jeffrey, 2020), or in terms of spatial data, they are based on primitive geometric data as points, lines, and polygons (Humboldt State University, 2018).
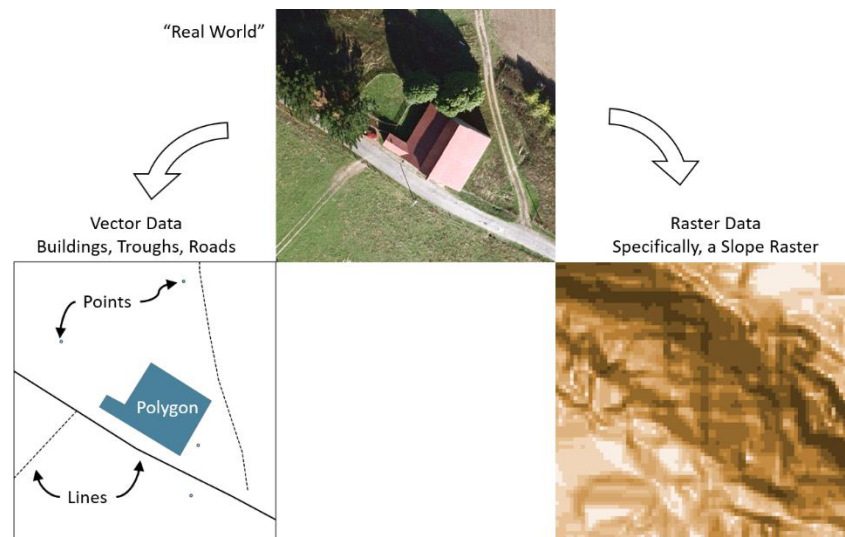

Figure 21: Real-world representation of spatial data (Source: Humboldt State University, 2018)

Raster data format has been used widely used for art forms. Images in BMP, GIF, JPEG, PNG, and TIFF file formats have been in practice for a long time. They are primarily used when the focus is on obtaining a continuous data image, for example, a photograph. In GIS, there is a GeoTIFF file format in which the raster imagery is georeferenced (NASA Earthdata, 2021).

Upadhyay (2018) provides an overview of vector file formats that are used for maps. Some of these file formats are ESRI shapefile, AutoCAD DXF, Keyhole Markup Language (KML), and SVG. The primary use of vectors in cartography is to attain scalable representation without losing the quality of graphics.

3.2.2. Using Scalable Vector Graphics (SVG) for an illustrated map

The illustrated maps created in vector formats provide wider flexibility compared to the use of raster file formats. Den Heijer & Eiben (2012) share the findings from their research on using SVG for evolving art. They found SVG to be a flexible and powerful means of representation of such art.

(Pavazza & Pap, 2012) further emphasize the compatibility of SVG with the web standards like XML, CSS, XLS, ECMAScript, and SMIL. It focuses on the advantages offered by SVG file format as they found it to have provided dynamic control over the data representation.

In addition to this, the paper by Juan-Armero & Luján-Mora (2019) explores the role of SVG in addressing the issues of accessibility with outdoor geographical web maps. Similar to the literature mentioned here, there are a significant amount of other studies that have found SVG to be a versatile file format for informative graphics for static and dynamic, online and print purposes.

Comparing raster and vector data types, vector data types provide certain advantages that are based on the literature and also the factors mentioned in section 3.2 in the context of this work. In this work, the initial data collection and categorization took place in the vector file format .kmz (Keyhole Markup language Zipped) which contains the zipped KML files representing the vector data.

This vector data can be further processed in GIS software. The spatial data from KML can be exported into shapefiles as well as SVGs which makes the data manipulation easy for GIS as well as illustration purposes. Exporting the spatial data layers into vectors by using SVG enables the editing of shapefiles or KML files without the loss of accuracy and quality.

Therefore, the further steps in map design focus on having a uniform vector data file format. This helps with creating an illustrated map where every vector layer can be updated as required. The final map can be scalable without the loss of quality and can be adapted for any print or digital media.

A significant advantage of having data in vector format is that it would create not just an artistic city map intended to be used by international women users. Moreover, it would also be useful for city planning authorities to analyze the data in GIS to draw spatial insights from the data.

Thus the implementation section focuses on implementing the proposed map design framework that is based on creating a vector illustrated map output.

Chapter 4. Implementation

4.1. Overview of existing frameworks for illustrated map design

Before moving to the proposed framework to design the map, it is important to take a look at existing techniques and their advantages and drawbacks. One of the most widely chosen methods to draw illustrated maps is using raster data format. It is usually combined with the digitization of hand-drawn elements in an image format.

In the book *The Art of Map Illustration: A step-by-step artistic exploration of contemporary cartography and mapmaking*, Hancock et al. (2018) have provided step-by-step processes used by them to create artistic illustrated maps. The processes mentioned in the book include the hand-drawn processes and the tools and materials that can be used. It also covers multiple approaches using digital tools like photoshop and illustrator. Most of the digital techniques mentioned in the book use the combination of vector and raster data format.

Another useful resource for illustrated mapmaking is the online course *Illustrated Map Creation: Reflecting a City's Essence* by Stef Medan. The course explores a similar methodology as the ones mentioned in the book by (Hancock et al., 2018). By creating hand-drawn features and processing the scanned outputs digitally in photoshop, the method creates a raster illustrated map output. (Medan, 2021)

However, none of the techniques provide a purely vector-based method of design. The proposed framework in this thesis involves creating a workflow that is entirely based on vector graphics instead of combining it with raster elements.

4.2. Proposed framework for the creation of vector-based illustrated map

Most of the illustrated maps invite the map readers to explore the map content instead of giving them a conventional cartographic product that is up to scale and accurate (Hancock et al., 2018). However, providing maximum geographical accuracy in the illustrated maps may make the map functional while it serves its purpose of being aesthetically appealing to the map readers.

In the well-known book *How to lie with maps* by Mark Monmonier, the author has addressed the dual role of maps. The dual role implies the role of the map to be aesthetically pleasing and also being informative at the same time. Monmonier (2018) points out that when the focus of cartographers is excessively on making the map aesthetically or artistically enticing, the maps may turn out disorderly and misleading.

Realizing the versatility of maps and their ability to play a dual role should enhance the map reader's experience as well as it should not distort out of proportion the very geographic facts that it is conveying (Monmonier, 2018). Considering this, the level of abstraction with geographic accuracy and scale (which usually is undefined in the case of illustrated maps) in regards to the final map product in this work is kept as it is without distorting the locations of points, lines, or areas.

The design aims to balance what Monmonier (2018) has referred to as 'form' (the visuals or aesthetics of the map) and 'function' (as in the task of the map to inform about the facts accurately and with a proper scale). Pursuing the artistic design may end up in a map that suppresses information that, which according to Monmonier (2018), might be artistically inconvenient. Hence, striking an appropriate balance between form and function has been given high emphasis in this research work.

The following framework can be applied generically with the preferred choice of GIS and vector editor program to create an illustrated city map -:
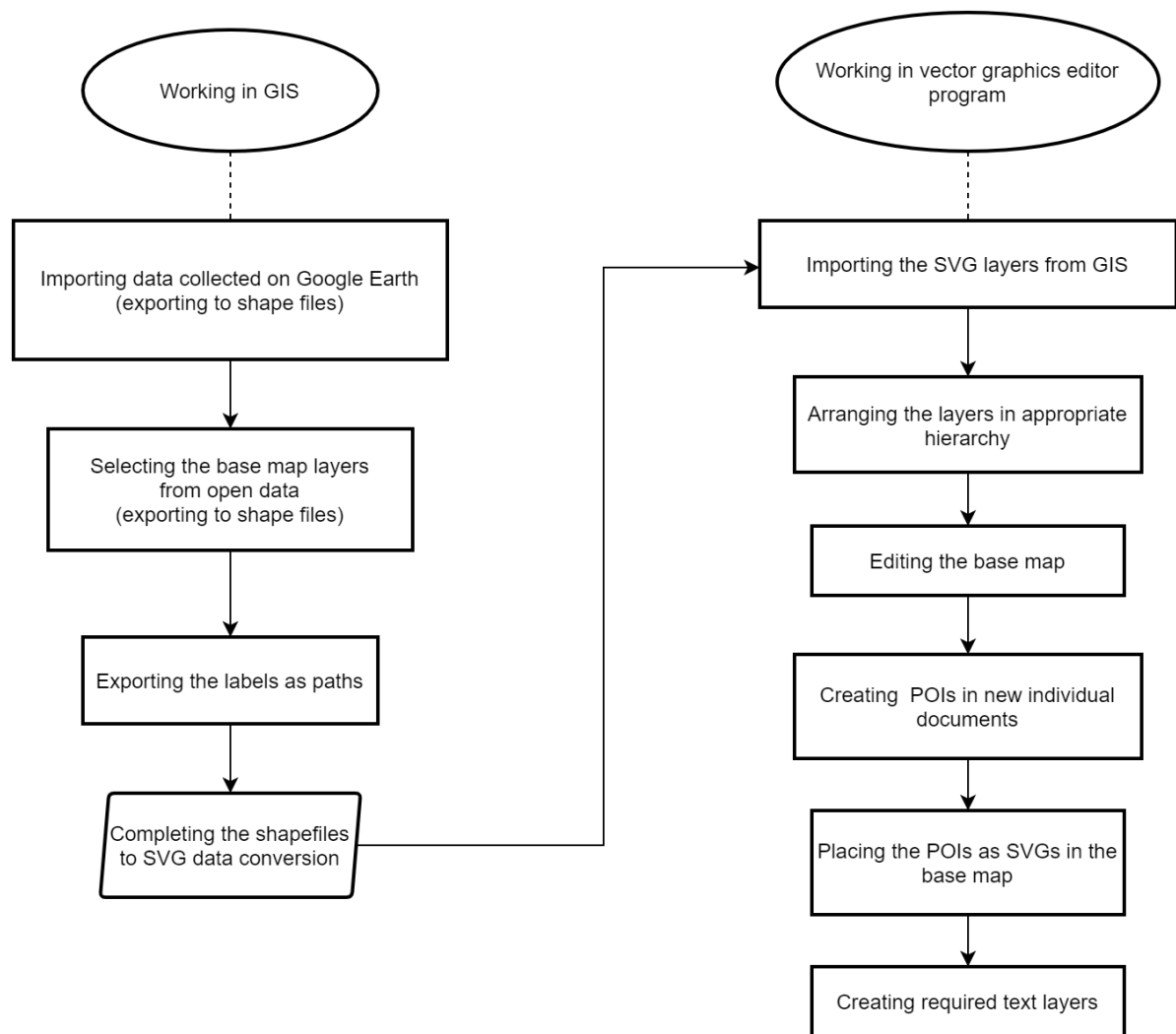
Figure 22: Proposed framework for the creation of vector-based illustrated map

4.3. The choice of GIS software and vector editor program

There are different licensed and open-source software and programs are available that can be used in this process. To keep the process achievable generically, the choice of software and program focuses on an affordable yet quality solution for cartographers as well as graphic artists and illustrators.

For GIS workflow, Quantum GIS i.e. QGIS is used in this work. It is a well-known desktop GIS application that can view, edit and analyze geospatial data and it is available free of cost for download (*QGIS*, 2020).

For vector editing, Affinity Designer is used in this work. This vector editing program offers a free trial version for 90 days as well as offers a licensed version at an affordable price. It has made it a popular choice of graphic designers and illustrators that are aiming for professional yet reasonable software for vector editing (*Affinity Designer*, 2021). The licensed version 1.10.1.1142 is used in this work.

There are other superior choices of softwares available as well. However, these come with a license that is quite higher in cost compared to QGIS and Affinity Designer. For example, 'ArcGIS Maps for Adobe Creative Cloud' is such an option where ArcGIS maps can be edited and enhanced in Adobe Illustrator and Photoshop (ESRI, n.d.). Many use cases can be found on the blog of ESRI with the filter ArcGIS Maps for Adobe Creative Cloud (ESRI, 2021).

It is also crucially important to consider hardware requirements before deciding upon such selection. Additionally, before selecting the software programs, it is recommended to go through the reviews on different forums posted by other users to get an overall idea about the performance, benefits, and potential problems related to that particular software.

4.4. Step by step implementation of the framework

(Steps in QGIS)
Step 01: Importing data collected on Google
The vector data collected for individual participants on Google Earth was saved in .kmz format on the device. This data was then imported and viewed in QGIS. Later, the individual layers were merged into one layer for the whole project to simplify the further processing. This layer was exported into the SVG layer.
Name of the layer file: POIs_consolidated

Step 02: Selecting the base map layers from the base data
The base data was collected from the open data resources provided by the city of Dresden. The site is in the German language as well as the datasets (*OpenDataPortal Dresden*, n.d.). Link to the site -:
https://opendata.dresden.de/informationsportal/#app/startpage

From the *Themen* (meaning Topics in English) of *Geographie, Geologie, Geobasisdaten* (EN: Geography, geology, geospatial base data) was chosen for the city - Dresden, the year - 2021. The following filter was applied:

Thema: Geographie, Geologie, Geobasisdaten
Raum: Dresden
Zeit: 2021
The following layers were imported as WFS and were saved in shapefiles. The layer of Districts was imported to understand the extent of different town areas.

Layer	Straßenbahntrassen (EN: Tram routes)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=107&
Type	WFS
Geometry	Line (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=107&service=wfs&request=getcapabilities

Layer	Verkehrswege (EN: Traffic routes)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=41&
Type	WFS
Geometry	Line (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=41&service=wfs&request=getcapabilities

Layer	Wege (EN: Pathways)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=41&
Type	WFS
Geometry	Line (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=41&service=wfs&request=getcapabilities

Layer	Haltestellen Dresden - Barrierefreiheit (EN: Tram stops – barrier free access)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=1593
Type	WFS
Geometry	Point
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=1593&service=wfs&request=getcapabilities

Layer	Stadtteile (EN: Districts)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=188&
Type	WFS
Geometry	Polygon (Multipolygon)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N – Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=188&service=wfs&request=getcapabilities

Layer	Oberflächengewässer (EN: Surface Water) / Elbe
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=41&
Type	WFS
Geometry	Line (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=41&service=wfs&request=getcapabilities

Layer	Straßenbahntrassen (EN: Tram routes)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=107&
Type	WFS
Geometry	Line (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=107&service=wfs&request=getcapabilities

The following layers have been taken from the theme *Kultur, Freizeit, Sport und Tourismus* (Culture, leisure, sports, and tourism). In that Grünes Dresden layer (EN: Green Dresden) was imported as WFS as a participant mentioned and drew that *"Dresden is green to me"* due to the trees and parks and playgrounds around the city. From this WFS connection, the following individual layers were selected.

Layer	Park- und Grünanlagen (Flächen) (EN: Parks and green spaces - areas)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=300&
Type	WFS
Geometry	Polygon (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=300&service=wfs&request=getcapabilities

Layer	Spielbereiche (Flächen) (EN: Playgrounds - areas)
Layer information	https://kommisdd.dresden.de/net3/public/ogc.ashx?Service=Ikx&RenderHint=TargetHtml&NODEID=300&
Type	WFS
Geometry	Polygon (MultiLineString)
Projection	EPSG:25833 - ETRS89 / UTM zone 33N - Projected
Link to data	https://kommisdd.dresden.de/net3/public/ogcsl.ashx?nodeid=300&service=wfs&request=getcapabilities

Rendering data as WFS layers were slower compared to rendering shapefiles. Therefore instead of directly working on the WFS layers, it is recommended to convert them into shapefiles.

After converting all these layers into shapefile, they were arranged into the desired hierarchy (top to bottom) as follows:
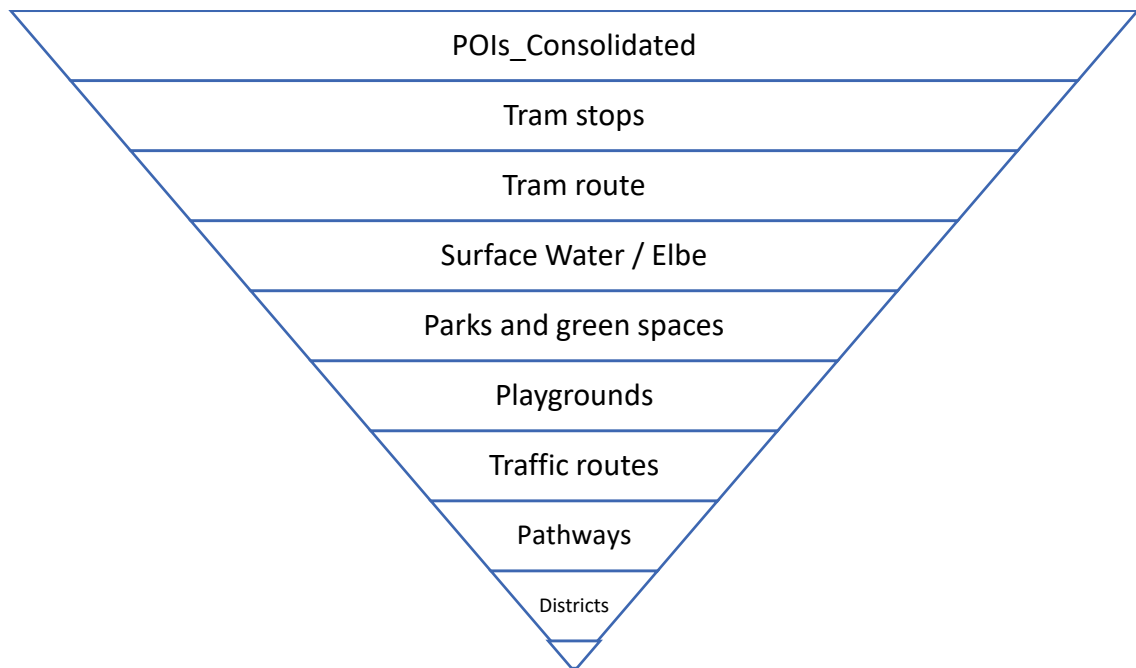
POIs_Consolidated

Tram stops

Tram route

Surface Water / Elbe

Parks and green spaces

Playgrounds

Traffic routes

Pathways

Districts

Figure 23: Layer hierarchy for the map design

Step 03: Exporting the labels as paths

To render the labels as vectors in the vector editing softwares, they are required to be exported as paths or curves. This converts the text into lines or curves that can be edited as paths in the vector editing program. In the layers mentioned above, the labels of POIs and tram stops were activated for export. The labels for other layers were later created in Affinity Designer as needed.

Step 04: Completing the shapefiles to SVG data conversion

The desired map extent was set up in the QGIS layout manager. The scale was set to 1:5000. This consists of the final map extent that is aimed for in the Altstadt area. To export the shapefiles to SVG, the following export options were chosen as shown in the next figure. It is important to select "Always Export As Vectors" so that all the layers are separately exported into SVG without getting rasterized as some rendering operations may require some layers to be rasterized for better rendering. (QGIS, 2021).

Also, for texts, select "Always Export Text As Paths" for better rendering quality. Exporting texts as objects may offer the editing of the text as text in external softwares however it may reduce the rendering quality. Therefore exporting texts as paths for better quality graphics is recommended (QGIS, 2021).
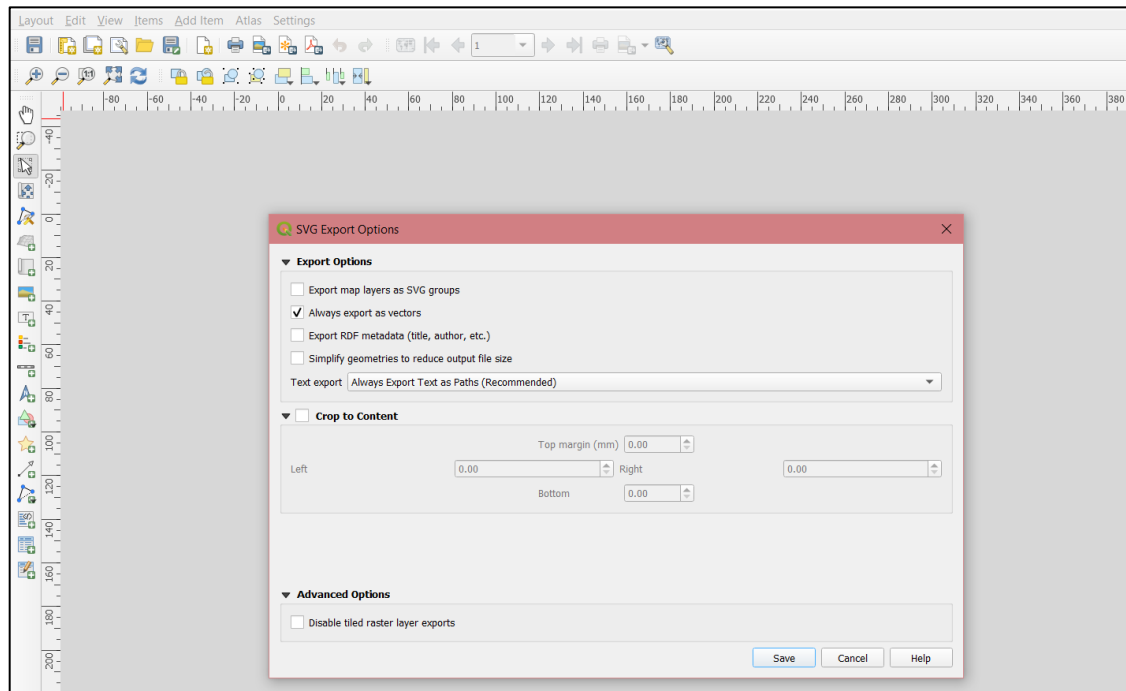

Figure 24: Export settings in QGIS for desired SVG output

Steps in Affinity Designer :
Step 05: Importing the SVG layers from GIS
To import the SVG output from the GIS process, simply place the SVG on the desired page size in Affinity Designer. Since the SVGs are scalable the output quality would remain the same for changes in the scale. The SVG output from GIS was placed in Affinity Designer. There all the separate layers were visible for the layers mentioned before in the exact hierarchy.

Step 06: Arranging the layers in the appropriate hierarchy
This step is optional in case the exporting of shapefiles to SVG was done individually for each layer. The SVG export done in the previous steps was however organized in GIS as shown in the hierarchy pyramid before.

Step 07: Editing the base map
In this step, only the base map is edited and not the symbols for POIs. The base map consisted of the base layers mentioned before and the layers were edited and given artistic effects using the brush tool in Affinity Designer.

a) Editing line (multistring) data layers:
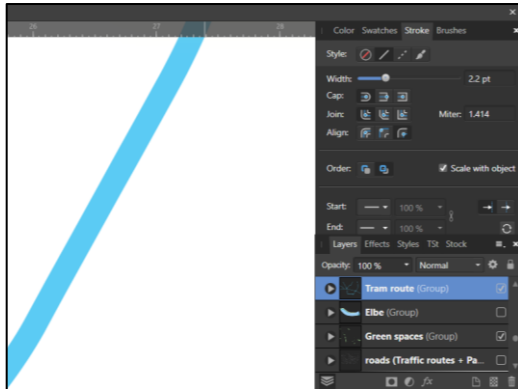
Figure 25: Plain SVG layer without brushstroke   *Figure 26: SVG layer with acrylic brushstroke*
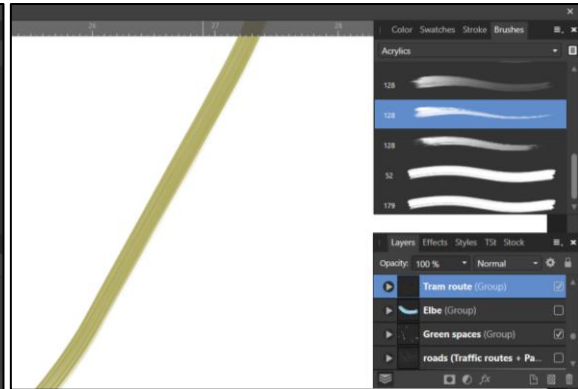
In the figure above, on the left is the vector layer that has the plain line stroke upon importing. However, upon selection of the layer and then selecting the brush type from the right-side panel, the plain line stroke can be converted into an artistic stroke of the brush. In the image, the brush shows the acrylic effect with brush no. 128.
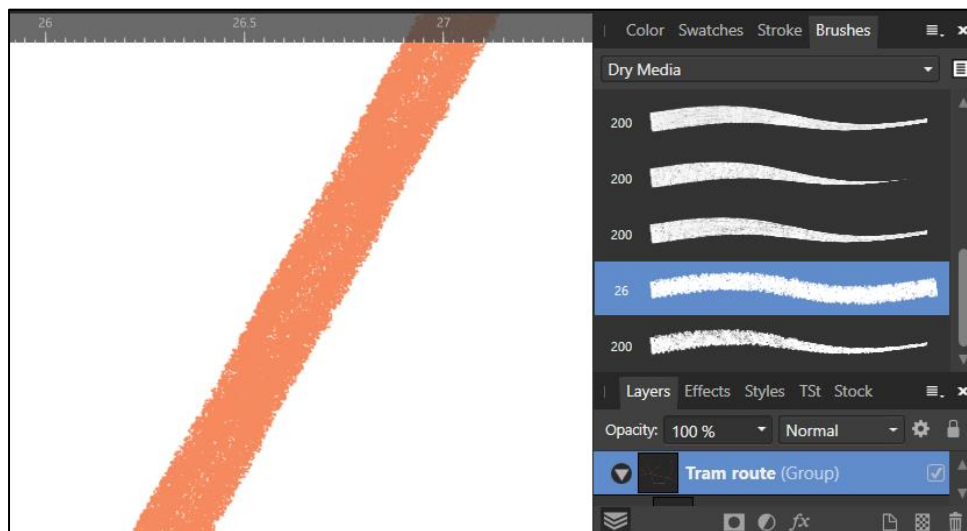
Figure 27: SVG layer with crayon-style brushstroke

In the final map production, to represent the effects as drawn by participants in the subjective maps, dry media brush no. 26 was selected. It is giving a crayon-style look to the tram route layer. All the other layers were edited in a similar way.

b) Editing the polygons (areas) and adding textures to them without using raster textures

One of the main challenges in working with vectors is that the closed paths or polygons have a plain texture or color. One way to apply texture to vector polygons is by adding noise in the color. However, that ends up rendering the layer as raster and reduces the output rendering quality. Therefore, instead of using raster textures or noise in the color, the approach adopted was to make use of a 'mask'.

Figure 28: SVG Polygon with a plain fill color and no texture

Figure 29: Creating the desired brushstroke vector texture layer using the brush tool
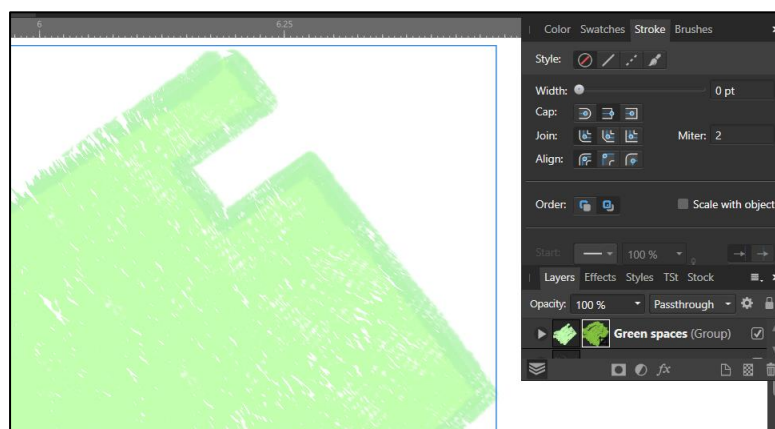
Figure 30: Result of masking the vector texture layer to the SVG polygon

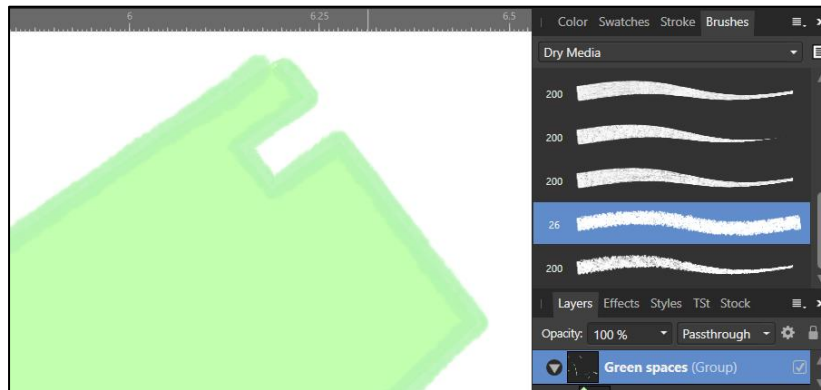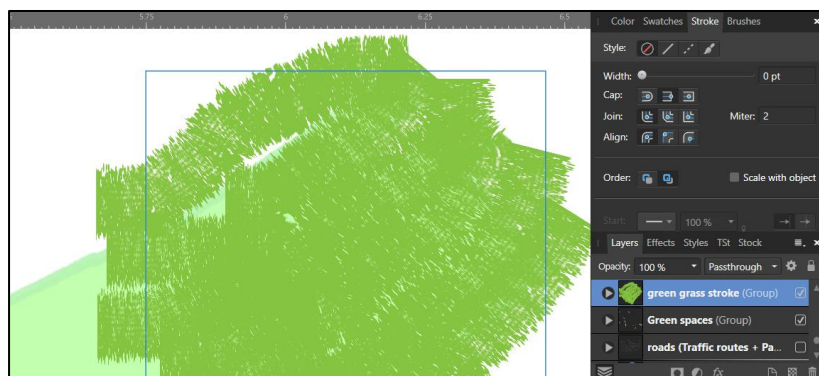In these figures, the layer of green spaces is given as an example. The first figure shows the plain fill for this polygon. The edges have a brushstroke however, the fill is plain. In order to have brush texture inside the polygon, another layer with desired brush stroke was created. This can be best achieved if one is using this application on iPad as the Affinity Designer is available to use for iPad. There, creating hand-drawn streaks with the brushes would be smoother compared to this case of a desktop application.

The brush stroke layer was masked to the green spaces layer and the texture can be seen in the last figure above.

Step 08: Creating POIs in new individual documents

The POIs can be created by considering the graphical, textual, and verbal remarks made by participants. Thus individual POIs can be designed in separate Affinity Designer files. One way is to digitize any suitable existing graphical elements drawn by participants. As shown below. And another way is to convert the textual or verbal inputs into graphics.
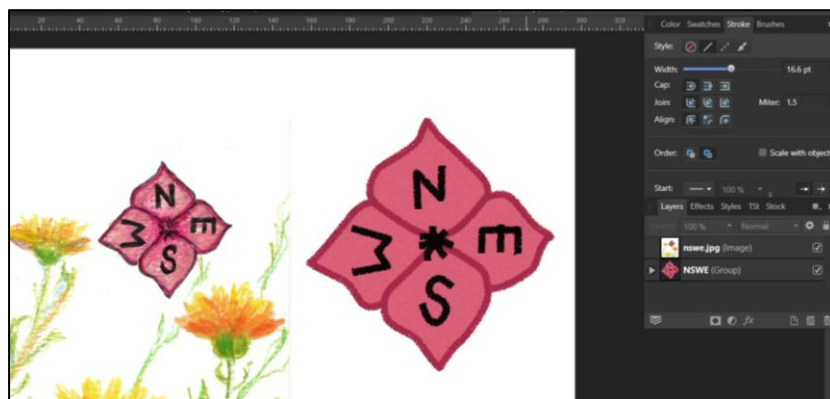
Figure 31: Digitization of a graphical element drawn by a participant

Figure 32: Creating a POI with activity described verbally by a participant
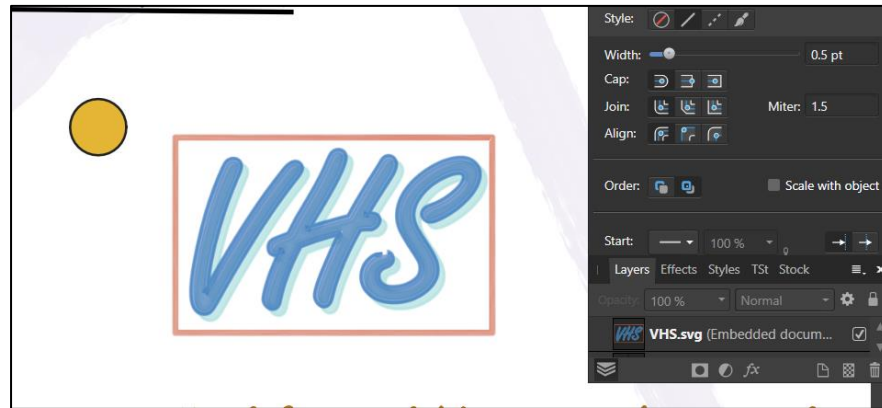
Figure 33: Creating a POI with text as described textually by a participant
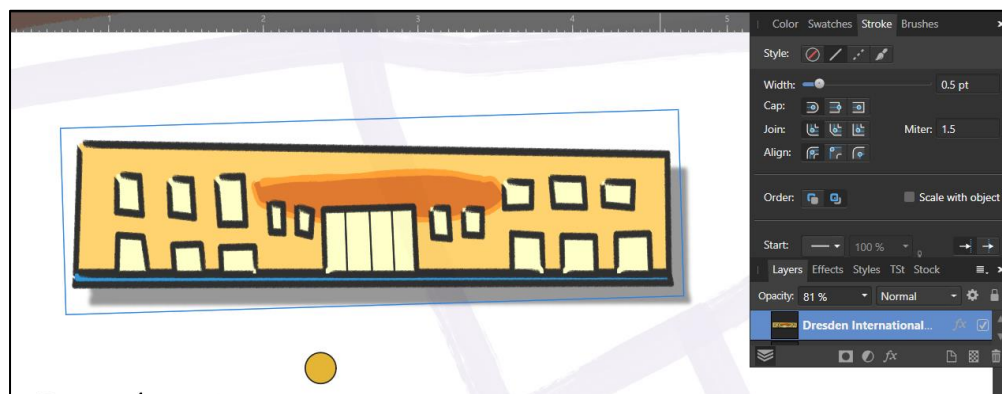
Figure 34: Digitized landmark POI drawn by a participant

It is important to understand that the subjective mental maps do not represent the map graphics as the conventional cartographic design. For example, the POIs in the conventional cartography can be represented by uniform icons or symbols, however, in subjective mental maps. The POIs were drawn in different i.e. non-uniform ways. They were represented using landmarks, symbols, activities, text, or were described verbally by a participant. Since the final map must represent the subjective views of the participants, the same principles of expressing spatial information are followed for the final map.

Step 09: Placing the POIs as SVGs in the base map

After designing the individual POIs, they can be placed as SVGs in the base map. The advantage of having separate POI files is that they can reduce the clutter on the layer panel in the base map file. Designing with vectors may result in a lot of small vectors grouped together and therefore managing the layers properly is as important as designing their details.
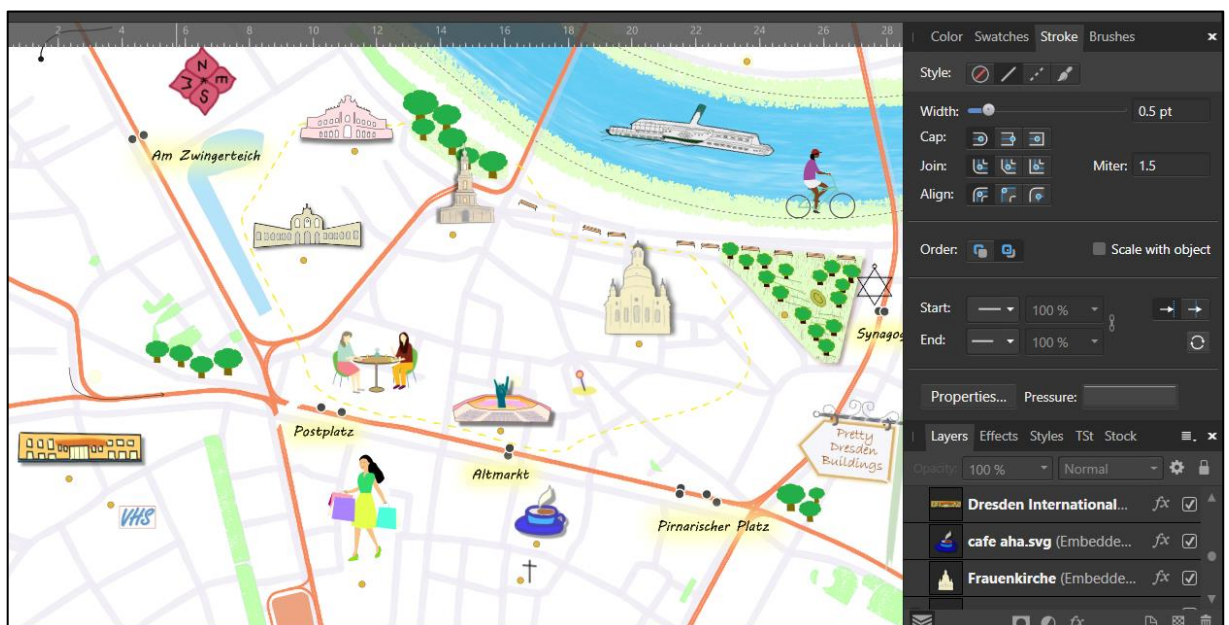
Figure 35: POIs placed as SVG on the base map

Step 10: Creating required text layers

Text layers in the map design do not only consist of the place labels but also the text associated with the description of certain areas by participants and the explanatory text. Texts help the map users interpret the graphics around it better. Simple explanatory text in the map around main POIs was suggested and anticipated by the participants.

The map carries these suggestions in the design as well. In the following figure, it can be seen how the text is arranged. This also follows the mental images of the participants and their verbal expressions over the conventional cartographic principles.
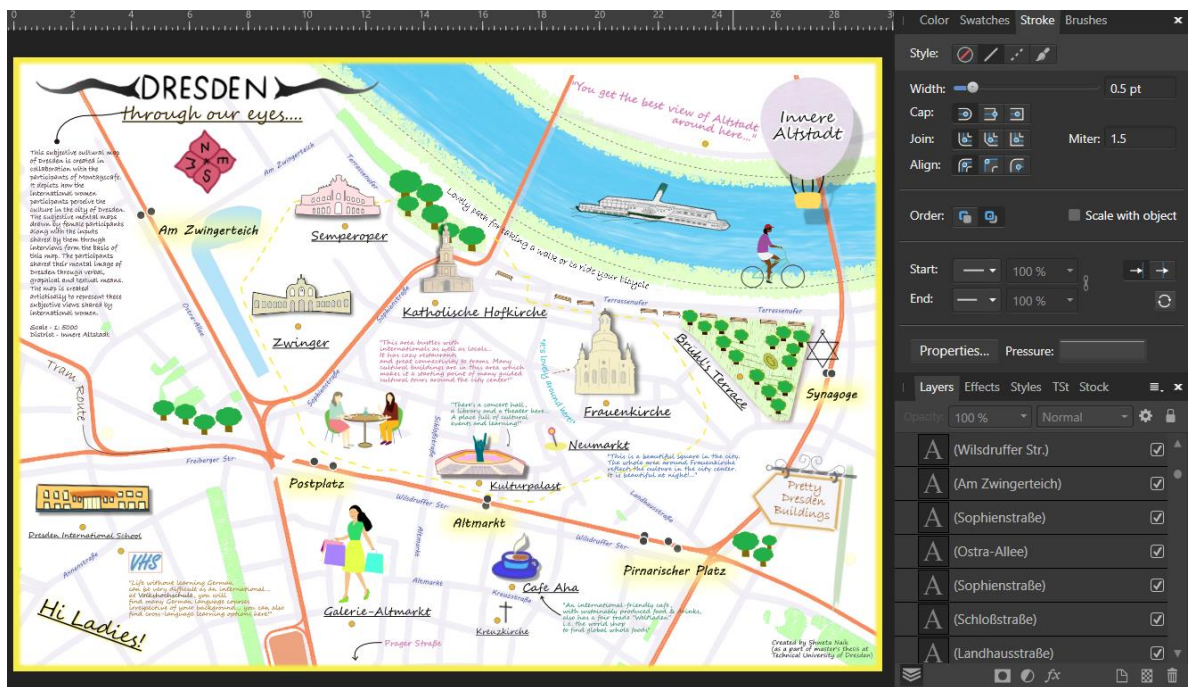
Figure 36: Creating the text layers

4.5. Result of implementation of the map design framework

The final map output of the 1:5000 scale for Dresden Altstadt is shown in the following figure.

A high-resolution map image can be found in the appendix section along with the SVG file.

Figure 37:Result of implementation of the map design framework

Chapter 5. Discussion

This section discusses how the research objectives and research questions were answered through this thesis.

Research questions to address objective no. 01 -: What can be the best methods to extract information from international women participants

- What would be the most suitable approach to observe the way participant women represent their perceptions of the city?

Finding: Personal interviews coupled with subjective mental map drawing activity effectively resulted in understanding the subjective perceptions of international women participants.

- What would be the best tools to collaborate for a reliable gathering and management of information?

Findings: Google Earth was proven sufficient to gather the information collected from the personal interviews and subjective mental map drawing activities. The collected data was proven to be well-organized for further processing based on the structure explained in the methodology section. For keeping the verbal information organized, it is useful to have written transcripts of the interviews instead of having to refer to the audio file whenever necessary.

- In addition to the subjective mental maps or drawings, what other information shared by these participants is important? (e.g. any typical experiences associated with/influencing 'what' or 'how' they draw)

Findings: It was observed that the mental map drawings were influenced to a larger extent mostly on how the participants navigated themselves inside the city. Also, as the participants were international, each one influenced navigating the way they did based on the way they were used to navigating in their home countries. They expressed how they compare the geography or certain geographical features in their home countries and the geography or geographical features of Dresden city. Thus it proves that the questions around navigation and getting to know how individuals with distinct backgrounds perceive a certain place.

Individual participants may have different stories and a sense of place to share about the same place or location. Therefore active listening and understanding the context in which these stories and perceptions were shared is crucial before proceeding to objectify them. It is important to always keep in mind that the views are subjective and hence may differ

in some cases and the further verification of the truth must follow the objective judgment if required.

- How this 'subjective' or qualitative data can be organized in structured forms or categories to support the map design?

Maps are inherently designed in layers that follow the specific hierarchy. To have simple and easy management of layers, the data was structured as points of interest (POIs), streets/paths (lines), and areas (polygons) based on the primitive geometric structure of any spatial data in vector GIS. In the context of this work, as it focused entirely on having a vector-based output, this structure to organize qualitative data was proven to be effective. It may differ should one have another type of output like pixel-based output or a mix of pixels and vectors.

- Which elements on the map are important concerning cultural information for women participants?

Findings: Most of the results from mental mapping indicated that the POIs or the point data was larger compared to the two other categories i.e. lines or polygons. The participants distinctly expressed the cultural information in the forms of landmarks, symbols, activities, and text – most of which were for POIs.

These expressions were not uniform however a certain similarity of perceiving the places was noticed. For example, instead of a building at a certain location, the activities were more significant and gave a quicker understanding of that spot for a participant.

A couple of participants also shared that they do not see the city's cultural landscape spatially or in a form of a map, but more in the form of the events or activities happening in a certain quarter of the city. This, they said, was possibly the reason they were unable to draw the exact or a roughly correct cartographic representation of the city in their map-drawing task.

The influence of using digital maps like DVB navigator and the use of GPS navigation mostly with Google maps was strongly mentioned by participants. Therefore they had two different mental images of the city – one for culture or as a subjective sense of places, necessarily not an accurate or to-the-scale representation of the city, and one for navigation which was highly influenced by Google maps.

Research questions to address objective no. 02 -: What steps shall the process of map designing have?
(Derived from the answers of objective no. 01, following questions, lay the foundation for the overall map design process)

- Which conventional cartographic design principles are applicable for a cultural map?

Findings: A map design that aims to convey "subjective" perceptions of the individuals would certainly differ from the conventional cartographic designs. It would require preserving the original expressions of how the individuals view rather than attempting to objectify it. One needs to consider the following remark by Götz & Holmén, 2018 while designing a map product based on subjective mental maps or showing the subjective views of a place :

"As we see it, a mental map, rather than being an object, is a theoretical construct not observable in its original repository – the human brain. It is accessible to scrutiny only when reified via behavioral, oral, textual, or graphical acts." - (Götz & Holmén, 2018)

- How to create map symbols from pictographic techniques derived from the inputs given by women?

Findings: Some of the POIs were created outlining or digitizing the original icons or symbols drawn by participants. There is no one way to represent a place as a point. Therefore these different ways of representation can be adapted in the map product showing subjective views of the individuals.

- In which way, positive and cautious, both representations can be shown realistically? (basically, a non – extreme representation, which will not give a false/exaggerated impression)

Findings: Based on the remarks made by participants, it was recommended to represent the cultural or positive aspects and the safety or caution information separately. One participant mentioned that she would like to see that in different layers that can be turned off and on based on the requirement in a digital map.

One of the main concerns expressed by participants about showing areas of caution or considering safety was that case of flagging areas or places as unsafe may result in affecting that location inappropriately. It may impact the image of that location and in case there are existing issues with communities, that may worsen by seeing a cautious representation of their (community's) homes on the map.

On the other hand, participants also emphasized that there should be some kind of notification on a map that may subtly inform about the caution to be practiced at respective locations without flagging the place as unsafe or an area to be extremely alert about. The information about where to contact for help and what can be done as the first response in any uncomfortable situations was something that participants mentioned they would like to see on such a map.

The most important remark of all was that - before showing any areas or places to practice caution at, the cartographer must verify the facts and communicate those facts with proper context and explanation. Often facts and numbers can be misleading when they are poorly explained on a map. The factual information that the participants mentioned they would like on such map is the facts about the previous cases of unsafe events, the nature of any assaults i.e. verbal or physical, that took place at a certain location, etc. However, simply giving out a number or figure of crime data is not sufficient and would probably misinform the map users.

About the graphical representation of the information of such nature, participants mentioned that they would prefer a subtle or a fuzzy demarcation of the areas or places where they must be cautious instead of sharply pointing out these locations. As stated above, they preferred the indirect representation to not see an adverse impact on the locals and businesses in that respective location.

Chapter 6. Challenges

- COVID-19 restrictions: In the first half of the year 2021, there were certain restrictions on holding events and meeting people which resulted in slowing down the interview meetings. Later, as the vaccination was made available widely for all the persons without the former conditions, the events needed rescheduling due to vaccination appointments and due to the immediate health effects experienced by it.

- Finding participants from Oceania was challenging.

- Personal interviews and subjective mental mapping activities indeed contain a lot of information. The transcripts that are required for the proper information management can be time-consuming in some cases as the transcript generating applications may fail to recognize the voices due to varying accents. Some participants that were speaking standard English had the voice input well processed by the transcribing application. However, the rest of the transcripts needed manual preparation for the most part. The German words mentioned by all the participants were also not processed with the transcribing application.

- Working with vectors may seem time-consuming if one uses a desktop application and is not an expert in using the vector editing software tools. This can be solved if one uses convertible devices with touch or screen input. With the help of an active pen device, it would speed up the process of drawing or sketching the POIs and give them artistic effects.

- The participants may have different individual abilities to express information through sketches or drawing mental maps. Therefore not all subjective mental maps may give a clear representation of the sense or perception of the place. It is non-negotiable to use other techniques like personal interviews along with the subjective mental maps as a way to bridge that gap of information not shown graphically on the subjective mental map drawn by a participant.

Chapter 7. Future work

"In the current era of disoriented globalization, we believe mental maps will continue to be crucial tools for insights into the ability of ordinary people to make sense of the world and into the compasses of their political leaders."

(Götz & Holmén, 2018)

Subjective mental mapping activities indeed bring various information to the surface which may go unnoticed concerning the places. It highlights the good or positive sense of places as well as it sheds light on the issues related to locations. In this research, the end-users of the map product are international women. However, the information collected and the workflow adapted can prove helpful for drawing insights for city planning authorities as well.

The information where participants expressed the need for infrastructural changes or the areas where they perceive the places as safe or unsafe has not been shown on the map produced in the context of this thesis. However, such map products can be created specifically for city planning authorities which may follow the objective map design approach built upon the data and framework of design used in this work. However, one crucial aspect of such map product creation must be that the number of participants must be larger and must come from those respective areas of the city. This may give more accurate insights than only the subjective views of a small group of participants.

The data collected in this thesis may serve as a guiding example however is certainly not enough for a map to be used by city planning authorities to gain objective insights from the subjective expressions of these citizens. It would be interesting to develop a methodology for such participatory or collective mapping for gaining insights into the concerns of female citizens.

Another reason such future work may benefit not just city planning but also individual female citizens is that, the way women map the places differs from the conventional maps that have been created predominantly by male mapmakers or cartographers. (Moloney, 2020). Therefore such a subjective mental map may bring to the surface many concerns that can be useful for bringing positive changes in the communities.

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Appendix

Link to all appendix files and folders as mentioned below:

[https://drive.google.com/drive/folders/1AZgUO4AgrDa4QFECvUQvupipM NzhSVUP?usp=sharing](https://drive.google.com/drive/folders/1AZgUO4AgrDa4QFECvUQvupipMNzhSVUP?usp=sharing)

1. Consent form for interviews and subjective mental map drawing activity

2. Interview transcripts

3. Subjective mental maps

4. Final map files