

# Planning for Aesthetics of Public Space

Planning for electric vehicle charging stations in  
Košice

**Miroslav Hudák**

Supervised by Malene Freudendal-Pedersen



**AALBORG UNIVERSITY**  
DENMARK

A thesis presented for the degree of Master of Science

**URBAN PLANNING AND MANAGEMENT**



KOŠICE

In cooperation with the city of Košice

June 4, 2020



**AALBORG UNIVERSITY**  
DENMARK

**Urban Planning and Management**

**Technical Faculty of IT and Design**

**Department of Planning**

**Aalborg University**

Rendsburggade 14,

9000 Aalborg, Denmark

**Title:**

***Planning for Aesthetics of Public Space***

*Planning for Electric Vehicle Charging  
Stations in Košice*

**Keywords:**

electric vehicle supply equipment, aesthetics, public space, Košice

**Project Period:**

February 2020 to June 2020

**Author:**

Miroslav Hudák

**Supervisor:**

Malene Freudendal-Pedersen

**Pages:** 84

**Appendix:** 11

# Abstract

The share of sold electric vehicles is growing every year and they are common within most parts of Europe, America and China and are proliferating quickly into all parts of the world. The related infrastructure, necessary for charging, is also a stable part of urban spaces all over the world. However, while there is a lot of attention paid to the functional aspect of charging stations, usually less attention is paid to the aesthetics and visual pleasantness. As a result, these stations are often installed in city centers and other coherent urban areas, which underwent certain development over years and such a new interventions are sometimes disrupting the coherence of these spaces. This report builds upon existing planning and design documents, which describe the aesthetic considerations and recommendations for charging stations, to find out how these can be adjusted for specific urban context of the city of Košice. To do so, there is a questionnaire used to find out what are the specific conditions in Košice, and how could the charging stations not burden the public space, but rather contribute to its aestheticization. This is done via documents analysis, literature review and questionnaire, which was purposely distributed to eight public space experts. The research problem and its findings are framed with the theory on 'mobilities in situ' by Ole B. Jensen, as a way of understanding how changes in physical setting of a city could have far-reaching consequences on the behavior of people and public life in general. The results of this study shows that charging stations hold the potential to contribute positively to the public space aesthetics. An overly made between the common recommendations for charging stations, and specific conditions in Košice, puts forward that charging stations could play a role in reducing visual smog and clutteredness, creating a better sense of place, educating citizens about environmental or city topics, or in proliferation of art throughout the city. By adopting some of the principles raised in this research, charging station could not only be perceived as necessary evil, indispensable technical infrastructure of a city, but could coalesce seamlessly with the given urban space and become a part of a coherent urban space.

**Keywords:** electric vehicle supply equipment, aesthetics, public space, Košice

# Preface

This report has been written in connection to the 4th semester thesis requirements for the Master's in Urban Planning and Management program at Aalborg University. The research and writing was conducted from February 1st until June 4th, 2020. The report is structured as follows: the main body of the research report consists of an introduction with research questions, literature review with introduction to the city of Košice, theoretical framework, methodology, two analytical chapters, discussion answering the 3rd subquestion, and conclusion. The report ends with personal reflections on the research experience, and appendices, including a questionnaire guide and individual responses of inquired people.

The literature references are cited according to the APA style (author, date) within the text, with a full bibliography found at the end of the report. Since the report talks about aesthetics, an important role is given to the visualizations and figures. There is a fair number of these, as they are often providing more insight than the written text.

I would like to thank to many people who supported me and helped me with this thesis. First of all, I would like to thank to my supervisor Malene Freudendal-Pedersen for being always ready to help, for being supportive and understanding. Secondly, I would like to thank to people from Architectural Department at the Municipality of Košice, especially to Martin Rybár, who was always responding very promptly to all my inquiries. Furthermore, my thanks go to all the questionnaire respondents, I am really happy they have been willing to share their professional point of view. These people are namely Martin Rybár and Miroslav Mižák from Košice Municipality, Michal Hladký, Michal Hudák, Viktória Mravčáková, Ondrej Vecan and all 3 students from Technical university in Košice. Special thanks goes to Dominika Ľudviková for facilitating the contact with the students. Last but not least, I would like to express my profound gratitude to my family for continuous support and encouragement through not only the process of writing this thesis, but my whole stay in Denmark.

# Table of Contents

|  |            |
|--|------------|
| <b>Abstract</b>  | <b>II</b>  |
| <b>Preface</b>   | <b>III</b> |
| <b>1 Introduction</b>  | <b>1</b>   |
| 1.1 Research questions . . . . .   | 4          |
| 1.2 Thesis objectives. . . . .   | 4          |
| 1.3 Structure of the research report . . . . .                                 | 5          |
| <b>2 Literature review</b>   | <b>6</b>   |
| 2.1 Climate crisis in European context. . . . .                                | 6          |
| 2.1.1 Reducing CO <sub>2</sub> emissions of passenger cars - before 2020 . . . | 7          |
| 2.1.2 Current actions for reducing CO <sub>2</sub> emissions . . . . .         | 8          |
| 2.2 Electric vehicles . . . . .  | 9          |
| 2.2.1 Growing market . . . . .   | 10         |
| 2.2.2 Different types of EVs . . . . .   | 11         |
| 2.2.3 Charging of EVs . . . . .  | 13         |
| 2.3 Public space. . . . .  | 15         |
| 2.3.1 Public space crisis . . . . .  | 16         |
| 2.3.2 Aestheticization . . . . .   | 17         |
| 2.4 Urban aesthetics . . . . .   | 17         |
| 2.5 Košice as a problem case . . . . .   | 19         |
| 2.5.1 Environment . . . . .  | 20         |
| 2.5.2 Urban and cultural context . . . . .                                     | 21         |
| 2.5.3 Population . . . . .   | 21         |
| 2.5.4 City-planning documents. . . . .   | 24         |
| 2.5.5 Repercussions of missing regulation . . . . .                            | 25         |
| 2.5.6 Electromobility in Slovak legislation. . . . .                           | 27         |
| <b>3 Framing the problem</b>   | <b>28</b>  |
| <b>4 Theoretical framework</b>   | <b>30</b>  |

|          |  |           |
|----------|--|-----------|
| 4.1      | Staging mobilities model . . . . .                           | 30        |
| <b>5</b> | <b>Methodology</b>   | <b>34</b> |
| 5.1      | Research design. . . . .                                     | 34        |
| 5.2      | Methods . . . . .  | 36        |
| 5.2.1    | Questionnaire . . . . .                                      | 36        |
| 5.2.2    | Document analysis. . . . .                                   | 37        |
| 5.2.3    | Literature review . . . . .                                  | 39        |
| <b>6</b> | <b>Public space deficiencies and opportunities in Košice</b> | <b>40</b> |
| 6.1      | Public space deficiencies . . . . .                          | 40        |
| 6.1.1    | Commune . . . . .  | 40        |
| 6.1.2    | Experts . . . . .  | 41        |
| 6.1.3    | Students. . . . .  | 42        |
| 6.2      | Public space opportunities. . . . .                          | 42        |
| 6.2.1    | Commune . . . . .  | 42        |
| 6.2.2    | Experts . . . . .  | 43        |
| 6.2.3    | Students. . . . .  | 43        |
| 6.3      | Concluding remarks . . . . .                                 | 45        |
| <b>7</b> | <b>Aesthetic considerations for EVSE in documents</b>        | <b>50</b> |
| 7.1      | General considerations. . . . .                              | 51        |
| 7.2      | Localization and context. . . . .                            | 51        |
| 7.3      | Vandalization . . . . .                                      | 54        |
| 7.4      | Comfort . . . . .  | 54        |
| 7.5      | Safety. . . . .  | 55        |
| 7.6      | Station body . . . . .                                       | 57        |
| 7.7      | Colors. . . . .  | 58        |
| 7.8      | Signage . . . . .  | 58        |
| 7.9      | Contact details and instructions. . . . .                    | 58        |
| 7.10     | Branding . . . . .   | 59        |
| 7.11     | Concluding remarks . . . . .                                 | 60        |
| <b>8</b> | <b>Discussion</b>  | <b>61</b> |

|           |  |           |
|-----------|--|-----------|
| 8.1       | EVSE considerations in the light of Košice . . . . . | 62        |
| 8.2       | So how could the EVSE in Košice look like? . . . . . | 66        |
| 8.2.1     | Minimization . . . . .                               | 67        |
| 8.2.2     | Normalization. . . . .                               | 69        |
| 8.2.3     | Maximization . . . . .                               | 72        |
| 8.3       | Concluding remarks . . . . .                         | 74        |
| <b>9</b>  | <b>Conclusion</b>                                    | <b>75</b> |
| <b>10</b> | <b>Reflections</b>                                   | <b>78</b> |
|           | <b>Bibliography</b>                                  | <b>79</b> |
|           | <b>Appendix</b>                                      | <b>85</b> |

# List of Figures

|   |    |
|---|----|
| <b>Figure 1</b> CO <sub>2</sub> emissions within EU in different economy sectors          | 6  |
| <b>Figure 2</b> Pie chart shows GHG emissions produced by transportation in 2014          | 6  |
| <b>Figure 3</b> Constant rise in the number of electric cars in circulation worldwide     | 10 |
| <b>Figure 4</b> Annual growth of available EV models at European market                   | 10 |
| <b>Figure 5</b> Different types of electric vehicles                                      | 12 |
| <b>Figure 6</b> Charging times to provide 100 km of battery electric vehicle driving      | 14 |
| <b>Figure 7</b> Administrative division of the city of Košice                             | 20 |
| <b>Figure 8</b> Green and blue infrastructure of Košice                                   | 22 |
| <b>Figure 9</b> Inversed figure ground plan of the city                                   | 22 |
| <b>Figure 10</b> Fluctuation of the number of citizens residing in Košice                 | 23 |
| <b>Figure 11</b> Rise in the number of citizens living around Košice                      | 23 |
| <b>Figure 12</b> Spatial distribution of population in Košice                             | 23 |
| <b>Figure 13</b> Medley of existing EVSE of different visuals in the city of Košice       | 26 |
| <b>Figure 14</b> Blueprint for surface signage of an outdoor EVSE by ZSE                  | 27 |
| <b>Figure 15</b> The staging mobilities model   | 31 |
| <b>Figure 16</b> Research design framework  | 35 |
| <b>Figure 17</b> Respondents of a questionnaire survey                                    | 37 |
| <b>Figure 18</b> Documents used for the analysis of aesthetic considerations for EVSE     | 38 |
| <b>Figure 19</b> Visual smog on the example of Jumbo Centrum in Košice                    | 40 |
| <b>Figure 20</b> Concluding table of all the problems of public space aesthetics          | 46 |
| <b>Figure 21</b> Table of the opportunities for improvement of public space aesthetics    | 47 |
| <b>Figure 22</b> Analysis of public space in Košice through 'staging mobilities' model    | 48 |
| <b>Figure 23</b> Analysis of public space in Košice through 'staging mobilities' model    | 49 |
| <b>Figure 24</b> Overview of cord management systems                                      | 56 |
| <b>Figure 25</b> Aesthetic considerations for EVSE through 'staging mobilities' model     | 60 |
| <b>Figure 26</b> Port location for battery electric vehicles sold in the USA in 2016-2017 | 63 |
| <b>Figure 27</b> Options of how reflective materials could be processed                   | 68 |
| <b>Figure 28</b> 'Cloud Gate' piece by Anish Kapoor in Chicago                            | 68 |



|  |    |
|--|----|
| <b>Figure 29</b> Ignacio Ciocchini's proposal for the looks of an EVSE                   | 69 |
| <b>Figure 30</b> EVSE design in the context of broader city center in the city of Vienna | 70 |
| <b>Figure 31</b> Different variations of city skyline in Košice                          | 71 |
| <b>Figure 32</b> City skyline used at the bus stops in Copenhagen                        | 72 |
| <b>Figure 33</b> Jay Shogo's design for EVSE in the city of Takoma Park                  | 73 |
| <b>Figure 34</b> Cindy Herrera's design for EVSE in the city of Takoma Park              | 73 |
| <b>Figure 35</b> Appearance of EVSE according to the 'staging mobilities' model          | 74 |

## List of Acronyms

**ACEA** – European Automobile Manufacturers' Association

**BEUC** – European Consumer Organization

**BEV** – battery electric vehicle

**EC** – European Commission

**EU** – European Union

**EV(s)** – electric vehicle(s)

**EVSE** – electric vehicle supply equipment

**FCEV** – fuel cell electric vehicle

**GHG** – greenhouse gas

**HEV** – hybrid electric vehicle

**ICE** – internal combustion engine

**JRC** – European Commission's Joint Research Centre

**PHEV** – plug-in hybrid electric vehicle

**ZLEV** – zero- and low-emission vehicle

# 1 Introduction

## *Striving for sustainable future*

The number of people living in cities has been rising steadily, and the trend is expected to continue in the future. In order to maintain favorable conditions for living in cities, the sustainability efforts must be followed, as they are drafted by United Nations in their Sustainable Development Goals (UNITED NATIONS, 2019). One of the biggest threats, endangering our cities nowadays, is pollution, created mostly as manufacturing process externality, but also as a result of extensive usage of vehicles with internal combustion engine (ICE), which are releasing a lot of tailpipe emissions. There are multiple ways to deal with the extensive emission levels in cities. One solution could be to put a greater emphasis on public transportation, which would substitute usage of private cars. There is a whole new concept of sustainable mobility, where mobility is perceived as a service and customers are served by autonomous electric vehicles. Having this ambition in mind, our current efforts could be directed towards an already existing and widespread technology, the in-between step towards sustainable mobility, the electric vehicle.

The electric vehicle is a promising option to create a more sustainable mobility system for the future. However, the introduction of electric vehicles into society poses several challenges, such as new driver-pedestrian interactions, limited driving range, time needed for recharging the battery and high initial costs (SILVESTER, ET AL., 2013). Closely related is yet another great challenge – the use of electric vehicles requires an adequate charging and electric grid infrastructure, as well as dedicated solutions for vehicle charging and storage that are optimally integrated into the urban environment. Therefore, very careful consideration needs to be undertaken regarding public space, as all these innovations, if not thought about thoroughly, have a potential to be detrimental to the public space quality.

## *Public space quality*

For a long time, a great number of urban designers, architects, planners and scholars of urbanism have been concerned with the quality of public space. Although many of them have been working toward developing measures of public space, much more empirical work is required to measure the performance of public spaces more efficiently (MEHTA, 2014). One of the researchers, who came up with a conclusion on public space quality, is Carr, who put forth a holistic and comprehensive narrative, suggesting that ideal public space is responsive, democratic and meaningful (CARR, ET AL., 1992).

A whole new concept of public space comes with Jan Gehl's framework for understanding the use and sociability of public space, as he suggests categorizing outdoor activities as necessary, optional and social (GEHL, 2012). Necessary activities, such as going to work or school, are not dependent on the quality of environment, people simply take the shortest and most convenient path. Opposite to that are

optional activities, for example taking a leisurely walk or lingering, only occur when the environmental conditions are optimal. Social activities are a result of a high level of optional activities requiring a high environmental quality. Jan Gehl suggests that better urban quality brings more opportunities for better urban life and therefore more people are attracted. Seen from the other perspective, the lower the quality of urban space is, the less opportunities for urban life it provides and thus people have no reason to come and spend time here. The suggestion is that there is a clear correlation between quality of a public space and number of people using it.

Using Gehl's framework it is possible to categorize the qualities of public space as ones that make the space work – so make the space being used, and ones that make it desirable – users are satisfied and prefer to linger and socialize (MEHTA, 2014). In other words, these are qualities functional and aesthetic. Mehta, based on the work of previously mentioned researchers, devises a whole theoretical framework for evaluating public space, in which the main aspects contributing to public space quality are: *'good public space is accessible and open, is meaningful in its design and the activities it supports, provides a sense of safety, physical and environmental comfort and convenience, a sense of control, and sensory pleasure'* (MEHTA, 2014, p. 57).

### *Aesthetic qualities of public space*

Jan Gehl observes that some demands for quality of public space, such as the human scale, opportunities to walk, linger, meet others and express yourself have something in common – they mostly relate to physical and practical concerns (GEHL, 2012). However, working with the urban visual quality is more complex. Aesthetic quality relates to the design of all the little details and, most importantly, how are all these harmonized together. There are two extreme situations to think of. Public space could be perfect from the point of view of practical and functional requirements, but randomly combined details, materials and colors cause visual disharmony. On the other hand, the public space could be developed with prevailing respects to the aesthetic quality, but the functional aspects are neglected. In that case the space is beautiful and the details are meticulously designed, but the basic requirements for safety, climate and movement opportunities are perhaps unfulfilled (GEHL, 2012). Only if the contents and the form of a space make a whole, the space stand a chance to be successful. In other words when the design, aesthetic representation of a space is in harmony with its functional and practical needs, the quality of public space is achieved.

### *Public space interventions*

It is very important to think of what is to be considered in the endeavor of achieving high public space quality, when there is a new feature to be introduced and integrated into urban landscape. According to the British Commission for Architecture and the Built Environment, interventions require full understanding of the conditions under which decisions are made and development is delivered (COMMISSION FOR ARCHITECTURE AND THE BUILT ENVIRONMENT, 2000). Success happens rarely by chance. Factors affecting the outcome of public space intervention are several:

- A clear framework provided by development plans and supplementary guidance delivered consistently
- A sensitive response to the local context
- Judgments of what is feasible in terms of economic and market conditions
- An imaginative and appropriate design approach by those who design development and the people who manage the planning process

(COMMISSION FOR ARCHITECTURE AND THE BUILT ENVIRONMENT, 2000)

It is crucial to bring all these factors together. If policy is not set out clearly for applicants, a proposed development may conflict unwittingly with a local authority's aspirations for good design. If too little weight is given to feasibility, the development may fail commercially. If too little weight is given to the local context, the proposal may be opposed locally. If the design approach is wrong, the site's opportunities will be missed and poor or mediocre development will result. Urban planning role is to provide the means to encourage good design, not only in conservation areas but everywhere. Securing good design is central to good planning (COMMISSION FOR ARCHITECTURE AND THE BUILT ENVIRONMENT, 2000).

There are varied purposes for intervention in public space – traditional interventions like redevelopment or re-purposing of an area, building or developing entirely new area or object. Besides these, nowadays there is an increasing number of interventions available due to the advancement in technology – various data collecting sensors, Internet of Things and forthcoming usage of delivery drones. As mentioned in the beginning, a big challenge nowadays is introduction and integration of electric vehicles supply equipment (EVSE) – charging stations – into public space, while not deteriorating the public space quality.

### *Problem case*

Slovakia is one of the European Union (EU) states which support the aim of achieving carbon neutrality by 2050. Košice, being second largest Slovak city, with almost 240 000 inhabitants (ŠTATISTICKÝ ÚRAD SLOVENSKEJ REPUBLIKY, 2019), is therefore under the framework of pursuing sustainability and limiting carbon emissions generated within its area. City is aware of the societal demand for electric vehicles and therefore aims to develop environment for comfortable usage of electric vehicles.

Unfortunately, Košice is one of the cities which are not thoroughly prepared for increasing demand for EVSE. The problem is that deployment of EVSE is at the moment in the hands of private investors, who have no agreement with municipality, as there are also no guidelines developed by municipality, which could serve as a document private investors need to adhere to with their projects. The missing planning and design guidelines could be seen as a background for emergence of distinct problems. If this kind of document existed, it could be used in negotiations with private sector developers. Due to the missing framework, the whole process is uncoordinated, as different developers are using their internal regulations for deployment of charging stations for electric vehicles. This often results in paying very

little attention to the surrounding urban context, as developers are primarily focused on the functional point of view, and less so on the aesthetic one, which is especially harmful for the public space quality. Due to lack of attention towards urban context the newly developed EVSE often look like a bizarre and eccentric element in existing urban setting.

This problem requires action in developing a comprehensive document comprising information on how to deploy functional infrastructure, while paying a lot of attention to the aesthetic considerations. The latter is the main subject of this thesis.

## 1.1 Research questions

Research questions are established in order to address the problem pointed out in the previous section. The main research question for this thesis goes:

***How to integrate 'electric vehicle supply equipment' into public spaces of Košice, while ensuring that they don't negatively affect the aesthetics of existing urban-scape?***

There are 3 sub-questions devised in order to guide the research and provide more in-depth analysis to the main research question:

1. *What are the best opportunities for improving the aesthetics of public space in Košice?*
2. *What are the main aesthetic considerations when integrating 'electric vehicle supply equipment' into urban environments?*
3. *How could be the new charging stations integrated in Košice so to be in compliance with the best aesthetic opportunities for the city?*

## 1.2 Thesis objectives

Integration of any new feature into public space is a greatly intricate challenge. The intricacy grows with the scale and complexity of the project. If the object, which is to be integrated, is something unseen before, the challenge gets more difficult. In the sense of unseen before, it of course helps, if the object was already dealt with in different settings – cities, countries. EVSE is definitely not a new technology, there are guidelines for integration of EVSE into urban environment from different parts of the world and plenty of researches, on the topic of electric vehicles, have been done. However, guidelines from different cities are usually of little use somewhere else due to different socio-technical conditions. The inspiration could be taken, but the solution always needs to be customized and tailor-made in order to be successfully implemented.

Due to the great complexity of the researched topic there is a clear direction undertaken in this research work, which is focus on the aesthetic point of view of integration of EVSE into the public spaces of Košice. Local experts are inquired about the public space in Košice and subsequently principles embraced in different cities are reviewed and discussed. Based on this research the goal of the thesis is to come up with different points, regarding aesthetic qualities of EVSE, to be considered while integrating new charging stations into urbanscape of Košice, and some suggestions for doing so are drafted.

### 1.3 Structure of the research report

This master thesis starts off with an introduction, where the general background for research is introduced. The introduction also uncovers why the research is justifiable and relevant, as well as it presents research questions, which are central to the whole research. Objectives of the research are also included. Introduction is followed by '*Literature review*' section, which is carried out mostly as literature review of relevant studies. The goal of this section is to develop a vocabulary and framework to the topic, and to develop an understanding of the previous researches done within the researched area. Few topics are central, such as: *electromobility as a response to sustainability narrative, public space aesthetics, Košice as a problem case*.

A short chapter '*Framing the problem*' is included after the '*Literature review*' to conclude the most important issues raised in the literature review, to bring up the research questions addressing these issues, to set out the limitations for the thesis and to present the general problem framing. Next is the '*Methodology*' chapter, which comprises methods used in conducting the analysis and research design. Methods section specifies why and how particular methods were chosen to generate data and research design summarizes all the necessary information about how the research was carried out. Next is the theoretical chapter, which introduces theoretical background for the whole research and discusses '*staging mobilities*' model, which was used for the research.

Subsequently, the first analytical chapter contemplates the best opportunities for improvement of public space aesthetics in Košice. In the next analytical chapter, which corresponds to the second sub-question, the most important aesthetic considerations in building up a network of charging stations for electric vehicles are reviewed, based on the research of guidelines from different cities. In the third and final chapter of the analysis the aesthetic considerations are pertained to the case of Košice, trying to find out how the new charging infrastructure could contribute and be a part of the city-wide efforts for bringing more aesthetic quality into public space. These main three analytical chapters revolve around three sub-questions, which are firstly presented in the introduction. Finally, a '*Conclusion*' provides a closing statement on the research and '*Reflection*' talks about things which could have been done in a better way and about the possible topics of further research.

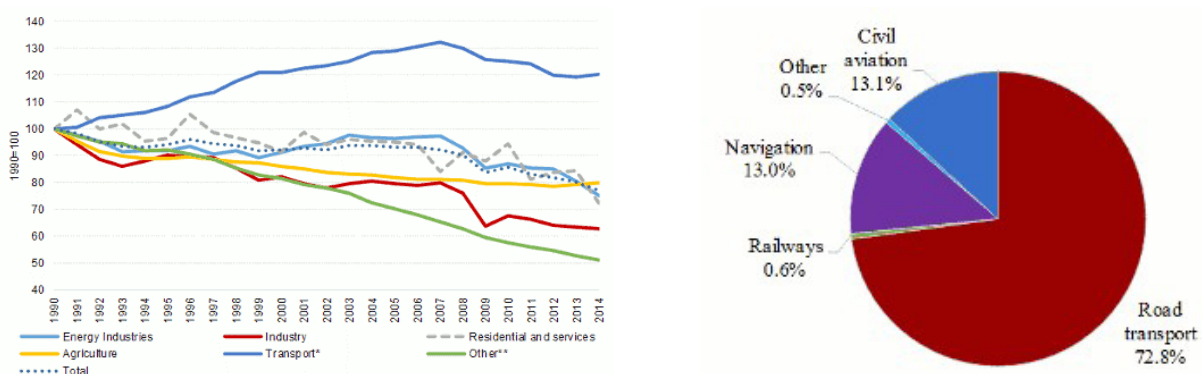
# 2 Literature review

This chapter aims to develop an understanding of previous research within the focus of this report and to develop a vocabulary for asking questions about the case. At the same time, literature review serves as a framework for the whole report, therefore the structure of this chapter could be also perceived as the framework developing towards the problem case. The purpose of this chapter is to identify and explore existing knowledge and momentary trends in electromobility and public space, as well as to introduce the city of Košice. In terms of the public space, the focus is put on quality and aesthetics. Different sub-topics are reviewed, starting with more general and gradually working the way towards more specific issues, arriving at the problem case review in the end.

## 2.1 Climate crisis in European context

By 2050, Europe aims to become the world's first climate-neutral continent. EU is well aware of the detrimental effects the climate crisis is bringing upon the economic and social wellbeing of the population, and is therefore trying to grapple the rising temperature by taking appropriate measures. One of these is limiting carbon dioxide (CO<sub>2</sub>) emission standards for vehicles.

Transportation accounts for almost a quarter of Europe's greenhouse gas (GHG) emissions and is the main cause of air pollution in cities (EUROPEAN COMMISSION, 2020). The transport sector has not seen the same gradual decline in emissions as other economy sectors – emissions only started to decrease in 2007 and still remain higher than in 1990 (see Figure 1).



**Figure 1 (LEFT)** CO<sub>2</sub> emissions within EU in different economy sectors, as they progress over time. Graph shows that emissions in all sectors but transport are systematically declining since 1990; transport is still at much higher values than it was in 1990 ([https://ec.europa.eu/clima/policies/transport\\_en](https://ec.europa.eu/clima/policies/transport_en))

**Figure 2 (RIGHT)** Pie chart shows GHG emissions produced by transportation in 2014 ([https://ec.europa.eu/clima/policies/transport\\_en](https://ec.europa.eu/clima/policies/transport_en))

Within transportation, road transport is by far the biggest emitter accounting for more than 70% of all GHG emissions from transport in 2014 (see Figure 2) (EUROPEAN COMMISSION, 2020).

In order to respond to the emission reduction challenge in the transport sector, EU advocates for an irreversible shift towards low-emission mobility. With the global shift towards a low-carbon, circular economy already underway, European Commission (EC) adopted in July 2016 a low-emission mobility strategy. Here EC suggests, that by 2050 GHG emissions from transport will need to be at least 60% lower than in 1990 and be firmly on the path towards zero. The goal of the strategy is to benefit European citizens with less-energy consuming cars, better infrastructure for alternative fuels, improvements in air quality, reduction in noise levels, lower congestion levels, improved safety, better links between modes of transport and fewer delays thanks to the roll-out of digital technologies (EUROPEAN COMMISSION, 2020).

The 2016 strategy identifies three priority areas for action:

- Increasing the efficiency of the transport system by making the most of digital technologies, smart pricing and further encouraging the shift to lower emission transport modes
- Speeding up the deployment of low-emission alternative energy for transport, such as advanced biofuels, electricity, hydrogen, renewable synthetic fuels and removing obstacles to the electrification of transport
- Moving towards zero- and low-emission vehicles (ZLEV) – while further improvements to the internal combustion engine (ICE) is acknowledged, Europe needs to accelerate the transition towards ZLEV

(EUROPEAN COMMISSION, 2020)

Furthermore, EU emphasizes the role of individual cities and local authorities in these efforts, saying that they will play a crucial role. Current local actions are pinpointed, such as implementing incentives for low-emission alternative energies and vehicles, encouraging active travel (cycling, walking), public transport and carpooling schemes to reduce congestion and pollution (EUROPEAN COMMISSION, 2020).

### **2.1.1 Reducing CO<sub>2</sub> emissions of passenger cars - before 2020**

Passenger cars are responsible for around 12% of total EU emissions of CO<sub>2</sub>, the main GHG (EUROPEAN COMMISSION, 2020). In 2009 EU brought up a regulation, which was setting mandatory emission reduction target for new cars. The target was set to 130 grams of CO<sub>2</sub> per kilometer applied for the EU fleet-wide average emission of a new passenger cars between 2015 and 2019. This means, that member states were responsible for taking record of all the new vehicles registered within their borders, knowing what car manufacturer brand it is and what are the CO<sub>2</sub> emissions for that vehicle type, and then based on these data an overview could be developed for each of the manufacturers on the EU level. The phasing-in period was between



years 2012 and 2015, being fully applied from 2015 onward. Emissions of 130 g CO<sub>2</sub>/km corresponds to a fuel consumption of around 5.6 liters per 100 km (l/100 km) of petrol or 4.9 l/100 km of diesel. This target was reached already in 2013, two years ahead of schedule. According to provisional data by European Environment Agency, the average emissions level of the new cars registered in 2018 in the EU (and Iceland) were 120.4 g CO<sub>2</sub>/km (EUROPEAN ENVIRONMENT AGENCY, 2019). Since 2010, average emissions have decreased by 20 g CO<sub>2</sub>/km (EUROPEAN COMMISSION, 2020).

## 2.1.2 Current actions for reducing CO<sub>2</sub> emissions

On 17 April 2019, the European Parliament and the Council adopted new regulation setting CO<sub>2</sub> emissions performance standards for new passenger cars and vans in the EU. This new regulation maintains the targets for 2020, which were set out in the former regulation, and it adds new targets that apply from 2025 and 2030. The new regulation started to apply as of 1 January 2020 and has replaced and repealed the old regulation from 2009. The new regulation designates 1 year for the phasing-in and is planned to be fully applied from 2021, keeping the EU fleet-wide average emission target for new cars on 95 g CO<sub>2</sub>/km, as has been set out in the regulation from 2009. This emission level corresponds to a fuel consumption of around 4.1 l/100 km of petrol or 3.6 l/100 km of diesel. Additionally, it sets new EU fleet-wide CO<sub>2</sub> emission targets for the years 2025 and 2030. These targets are defined as a percentage reduction from the 2021 starting points:

- Passenger cars – 15% reduction from 2025 on and 37.5% reduction from 2030 on
- Vans – 15% reduction from 2025 on and 31% reduction from 2030 on

(EUROPEAN COMMISSION, 2020).

This new regulation is expected to contribute to the achievement of the EU's commitments under the Paris Agreement, to reduce fuel consumption costs for consumers and to strengthen the competitiveness of EU automotive industry and stimulate employment. Expected benefits include:

- 23% reduction of GHG emissions from road transport in 2030 compared to 2005
- Positive impacts on employment across the overall economy, with around 80 000 jobs created by 2030 if batteries are produced in the EU
- A smooth and gradual transition towards zero-emission mobility allowing for sufficient time to provide for an adequate re-skilling and reallocation of workers in the automotive sector
- A signal for investors in refueling and recharging infrastructure, which will ensure that the enabling condition for deploying ZLEV are fulfilled

(EUROPEAN COMMISSION, 2020)

It is interesting to look at the penalty payments for excess emissions. If the av-

average CO<sub>2</sub> emissions of a manufacturer's fleet exceed its target in a given year, the manufacturer has to pay an excess emissions premium for each car registered. Until 2018 the premium amounted to 5€ for the first g/km of exceedance, 15€ for the second g/km, 25€ for the third g/km and 95€ for each subsequent g/km. However, since the new regulation comes into operation, the penalty is 95€ for each g/km of target exceedance. Thus, if a manufacturer sells e.g. 1 million vehicles, the premium fee would be 95€ x 1 g CO<sub>2</sub> x 1 000 000 vehicles = 95 000 000€, taking into account only 1 gram exceedance over the target (HUBINSKÝ, ET AL., 2020). Moreover, EU aims to support manufacturers in their efforts to bring more ZLEV into the market. To incentivize the uptake of ZLEV, a crediting system is to be introduced as of 2025, loosening the specific CO<sub>2</sub> emission target of a manufacturer if its share of ZLEV in a given year exceeds numbers set out in the regulation text.

## 2.2 Electric vehicles

Technological advances and societal changes have triggered a drastic evolution in mobility. All the measures taken worldwide favoring electric vehicles (EV) over dominant internal combustion engine vehicles go hand in hand with global proliferation of EVs. Alongside other trends, such as digitalization, autonomous driving and shared mobility, electric mobility is also gaining momentum. In general, cars and other vehicles are becoming increasingly efficient, cleaner, automated and connected. As demand for mobility rises, the transport network grows and becomes increasingly congested. Along with these trends, EVs are gaining popularity (EUROPEAN PARLIAMENTARY RESEARCH SERVICE, 2019).

EVs are not a new invention. They were among the first vehicles in the 1800s, and by 1900 accounted for around a third of all vehicles on the road (U.S. DEPARTMENT OF ENERGY, 2014). However, battery and electrical network weaknesses, as well as the rise of cheap oil era, together with the technological advancement of diesel and petrol vehicles, shifted interest away from EVs for many decades.

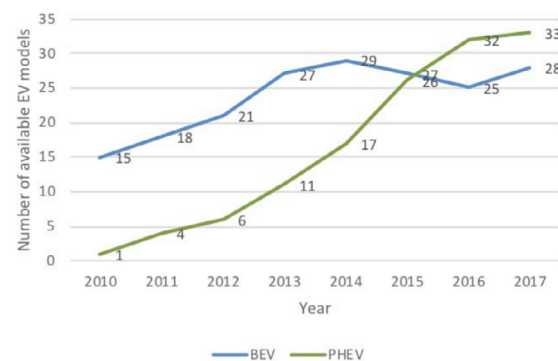
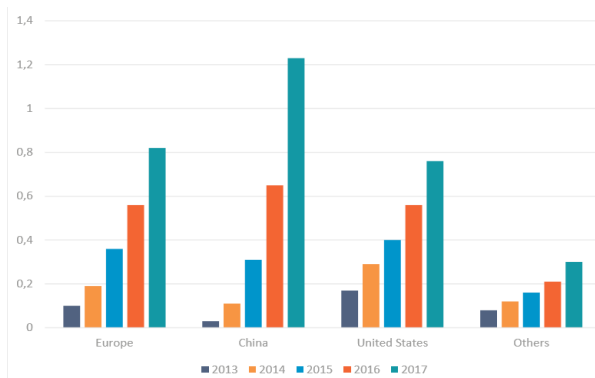
With the cheap oil era drawing to an end and climate change posing an increasingly serious threat, EVs have once again come into the spotlight. All levels of governance within the EU have recognized that EVs are needed to make transport more sustainable. However, the EU market is still in its infancy and is largely dependent on support policies. The EU still needs to address problems such as high upfront cost and limited offer of electric models compared to the conventional ones, as well as limitations of the electrical network, charging infrastructure and batteries. In broader terms, the development of the EV market also depends on the level of ambition of the EU emission regulations, mentioned earlier, the incentives offered to users of EVs, fuel prices, general travel behavior and advances in research (EUROPEAN PARLIAMENTARY RESEARCH SERVICE, 2019).

## 2.2.1 Growing market

The global market for EVs has enjoyed significant growth in recent years (see Figure 3). In 2017, there was an estimated 3.1 million electric cars in the world, which is more than 50% more than in 2016 (INTERNATIONAL ENERGY AGENCY, 2018). Some 40% of these cars were registered in China. In addition, about 250 000 electric light commercial vehicles (vans) and billions of two- and three-wheelers were in circulation globally in 2017. In the same year, Norway was a world leader in terms of the market share of electric cars (39% of sold new cars were electric) and also had the world's highest share of electric cars in its vehicle stock – 6.4%.

The EU market is still dominated by petrol and diesel vehicles, but the share of EVs is growing fast. According to the European Automobile Manufacturers' Association (ACEA), the market share of electric cars in the EU was about 2% in the third quarter of 2018, around 30% higher than in 2017 (EUROPEAN AUTOMOBILE MANUFACTURERS ASSOCIATION, 2018). While most of these cars are in use in northern and western EU states, largest sales growth in recent years has been registered in southern and eastern countries of the union. Moreover, in most member states, hybrid car sales exceed fully electric car sales (EUROPEAN PARLIAMENTARY RESEARCH SERVICE, 2019).

Major motor vehicle manufacturers are increasing their investments to offer more and more EV models in all vehicle sizes. However, the choice of EV models is still limited in comparison to conventional vehicles. According to data from the European Commission's Joint Research Centre (JRC), there were 33 plug-in hybrid electric vehicle (PHEV) models and 28 battery electric vehicle (BEV) models available in Europe in 2017 (see Figure 4) (EUROPEAN COMMISSION JOINT RESEARCH CENTRE, 2018).



**Figure 3 (LEFT)** Constant rise in the number of electric cars in circulation worldwide (in millions)

(European Parliamentary Research Service, 2019)

**Figure 4 (RIGHT)** Annual growth of available EV models at European market

(European Commission Joint Research Centre, 2018)

In addition, the waiting time for getting an EV is often very long, and vehicle configurations or options, such as additional equipment, design and engine options are limited. Moreover, the purchase price of an EV is in general still higher than

that of a comparable conventional vehicle. According to JRC, in average an EV currently costs at least 40% more than a comparable conventional car (EUROPEAN COMMISSION JOINT RESEARCH CENTRE, 2018). A study by European Consumer Organization (BEUC) shows that even if small tax breaks were to be applied, by 2024 the average four-year cost of running an EV would be expected to match that of a petrol car, and by 2030 that of a diesel one (THE EUROPEAN CONSUMER ORGANIZATION, 2016).

## 2.2.2 Different types of EVs

Vehicle manufacturers presently use four main types of EV technology. These technologies vary in the way the on-board electricity is generated and recharged, and the way internal electric motor and combustion engine are coupled. The mix of battery capacities, charging capabilities and technological complexity provides consumers with a choice of options when it comes to vehicle ranges, refueling options and price. The following section describes each of the main EV and hybrid technology types (see Figure 5).

### *Battery electric vehicle*

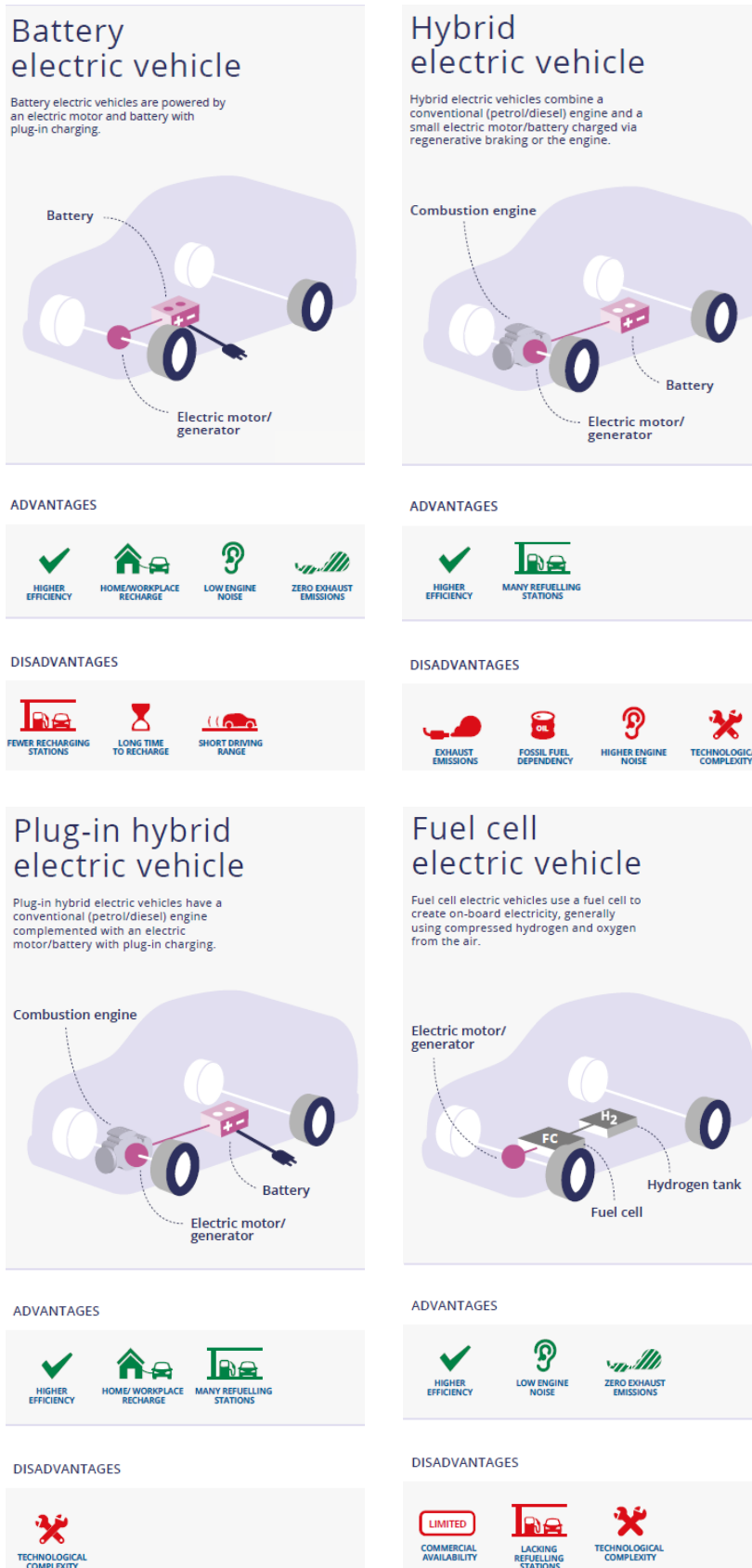
BEVs are powered solely by an electric motor, using electricity stored in the battery. The electric motor is particularly efficient and regenerative braking provides further efficiency gains. Regenerative braking systems help keep the battery in an EV charged, by converting into electricity much of the energy that would normally be lost as heat through traditional braking. Indicative electric driving range of this type of vehicle is 80-400 km (EUROPEAN ENVIRONMENT AGENCY, 2016).

### *Hybrid electric vehicle (HEV)*

HEVs have been commercially available for more than 15 years. They combine an internal combustion engine and an electric motor that assists the conventional engine during, for example, vehicle acceleration. The battery of an HEV cannot be charged from the grid but is typically charged during regenerative braking or while the vehicle is coasting. As an HEV is predominantly powered by its conventional engine, hybridization can be regarded as a technology added to conventional vehicles with the aim of increasing fuel efficiency, reducing pollutant and CO<sub>2</sub> emissions, rather than being an entirely separate type of vehicle. Driving range of the electric motor unit in this type of vehicle is 0-10 km (EUROPEAN ENVIRONMENT AGENCY, 2016).

### *Plug-in hybrid electric vehicle*

PHEVs are powered by an electric motor and an internal combustion engine designed to work either together or separately. The on-board battery can be charged from the grid, and the combustion engine supports the electric motor when higher operating power is required or when the battery's state of charge is low. Electric motor in this type of vehicle has an indicative driving range 20-85 km (EUROPEAN ENVIRONMENT AGENCY, 2016).



**Figure 5** Different types of electric vehicles (European Environment Agency, 2016)

## *Fuel cell electric vehicle (FCEV)*

FCEVs are entirely propelled by electricity. In this case, the electrical energy is not stored in a large battery system but is instead provided by a fuel cell 'stack' that uses hydrogen from an on-board tank combined with oxygen from the air. Indicative driving range of this type of vehicle is 160-500 km (EUROPEAN ENVIRONMENT AGENCY, 2016).

### **2.2.3 Charging of EVs**

The limited driving range of many EVs means that the type of technology used to charge them, and the time it takes, are very important to consumers. Nonetheless, it's only battery and fuel cell EVs that are totally reliant on charging infrastructure, as for hybrid vehicles it is not as critical due to built-in conventional ICE. Generally speaking, there are three basic ways to charge an electric vehicle: plug-in charging, battery swapping or wireless charging. This whole report is focused on the most common and wide-spread technology of plug-in charging, whereas battery swapping and especially wireless charging are left out for further research.

Plug-in charging is used by the vast majority of current BEVs and PHEVs in Europe. Vehicles are physically connected to a charging point using a cable and a plug. Plug-in charging can occur in various locations – at homes, in public street or at commercial or private lots. EVs can be charged using normal household sockets, but this way the charging is rather slow because normal domestic sockets provide only a low amount of electric current. It can thus take approximately 8 hours for typical charge. Although, this is very suitable for overnight charging. Faster plug-in charging requires specialized infrastructure (EUROPEAN ENVIRONMENT AGENCY, 2016).

There are different ways in which BEV or PHEV can be charged via plug-in charging. Four modes of charging technology are commonly available. Each of them can involve different combinations of power level supplied by the charging station (commonly expressed in kW – kilowatts), types of electric current used (alternating – AC – or direct – DC – current), and plug types (EUROPEAN ENVIRONMENT AGENCY, 2016). As electrical power grids provide AC current, and batteries can only store DC current, the electricity provided by the grid to the EV first needs to be converted. The conversion can be done either by an on-board AC/DC converter inside the EV or by a converter integrated into the charging station itself. DC fast-charging stations have integrated converters, so the charging station itself converts AC electricity from the grid into DC electricity for the EV. The power level of the charging source depends on both the voltage and the maximum current of the power supply. This determines how quickly a battery can be charged. The power level of charging points ranges widely, from 3.3 kW to 120 kW. Lower power levels are typical of residential charging points. Regarding the electricity, it can be distributed using single-phase or three-phase systems. Households commonly use single-phase power for lighting and powering appliances. It allows only a limited power load. Commercial lots commonly use a three-phase system, as it provides higher power.

### Mode 1 (slow charging)

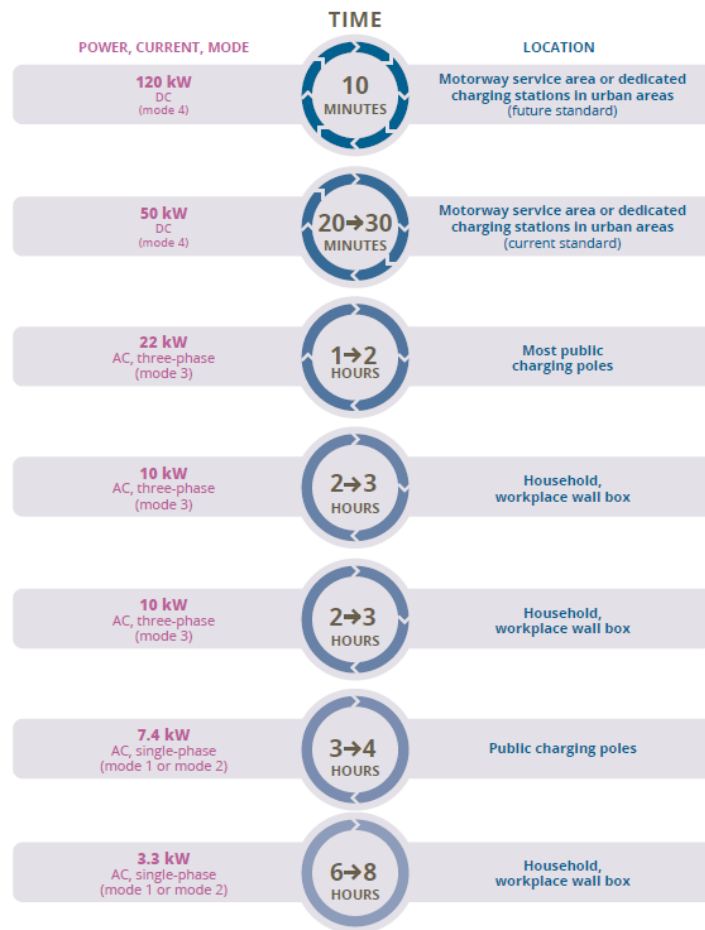
This mode allows charging using common household sockets and cables. It is commonly found in domestic or office buildings. The typical charging power level is 2.3 kW. Household sockets provide AC current (EUROPEAN ENVIRONMENT AGENCY, 2016).

### Mode 2 (slow or semi-fast charging)

Uses conventional, non-dedicated socket, but with a special charging cable provided by the car manufacturer. A protection device which is built into the cable offers protection to the electrical installations. It provides AC current (EUROPEAN ENVIRONMENT AGENCY, 2016).

### Mode 3 (slow, semi-fast or fast charging)

Charging in this mode requires to use a special plug socket and a dedicated circuit to allow charging at higher power levels. The charging can be either via a box fitted to the wall, commonly used at residential locations, or at a stand-alone pole, often seen in public locations. It uses dedicated charging equipment to ensure safe operation and provides AC current (EUROPEAN ENVIRONMENT AGENCY, 2016).



**Figure 6** Charging times to provide 100 km of battery electric vehicle driving (European Environment Agency, 2016)

## Mode 4 (fast charging)

Sometimes referred to as 'off-board charging', delivers DC current to the vehicle. An AC/DC converter is located in the charging equipment, instead of inside the vehicle. There are certain disadvantages to high-power, fast charging. For example, stronger currents mean that more electricity is lost during transfer, i.e. the efficiency is lower. Furthermore, fast charging can decrease battery lifetime, reducing the number of total charging cycles. Fast DC charging points are also around three times as expensive to install as a simple AC charger, so many users are reluctant to invest the additional costs (EUROPEAN ENVIRONMENT AGENCY, 2016).

## 2.3 Public space

Public space is a very broad concept, with a huge number of studies done on the topic. One of the most widespread definitions of public space states that public space could be understood as physical manifestation of public realm (THOMAS, 1991). However, besides being physical, the role of public space is also irreplaceable in terms of the social interactions it facilitates. Thomas identifies 4 social roles for public space:

- As an arena for public life
- As a meeting place for different social groups
- As a space for the display of symbols and images in society
- As a part of communication system between urban activities

(THOMAS, 1991)

The dominant understanding of the public realm is most often associated with the idea of citizens meeting each other in order to discuss public issues, to produce an open and free public debate, and to formulate public concern (PACHENKOV & VORONKOVA, 2013). We find such a definition of public space in the work of Hannah Arendt (1952) and Jurgen Habermas (1983, 1989), the two most influential social philosophers who formulated the idea of the public sphere (PACHENKOV & VORONKOVA, 2013). According to the Habermasian definition, Sharon Zukin (1995) described one of the core conditions for public space as the possibility to be used by many people for common purpose. Who are these 'many people' though, and to what extent is it possible to create a space where many people have a 'common purpose' to use it? As long as 'many people' are heterogeneous and follow different public interests – the essence of a heterogeneous urban environment – a public space is likely one that should not only be used by many people with one common purpose, but also by many different people with different purposes (ZUKIN, 1995).

This approach, which is more associated with 'sociability', is more culturally than politically concerned, and is most often associated with the names of Richard Sennett and Ervin Goffman (PACHENKOV & VORONKOVA, 2013). From this point of view,



the public is one broad and largely unplanned encounter (SCRUTTON, 1984). It is this understanding of 'public' that is most often meant when people speak about a public park or public place – to denote a place where people, who do not know each other, can meet and enjoy each other's company (ARIES, 1990 IN PACHENKOV & VORONKOVA, 2013). The issue of spatiality is therefore crucial to this approach, since it does not consider 'public' as separated from the place:

*'Traditionally, this [public] place could be defined in terms of physical ground, which is why discussions of the public realm have been, again traditionally, linked to cities; the public realm could be identified by the squares, major streets, theaters, cafés, lecture hall, government assemblies, or stock exchanges where strangers would be likely to meet ... The most important fact about the public realm is what happens in it. Gathering of strangers enables certain kinds of activities which cannot happen in the intimate private realm' (SENNETT, 2010, P. 260).*

### 2.3.1 Public space crisis

Public space and its quality have been heavily challenged over the course of recent decades. As Jan Gehl points out, approximately until the year 1960 the cities all over the world have been developed upon hundreds of years of experience (GEHL, 2012). It was taken for granted that cities were built for people, and thus the quality of public space was indispensable part of urban planning and design. However, with the arrival of modernism, which is paradigm emphasizing functional compartmentalization and separation, the tradition was put aside. With the advent of automobile and its proliferation a lot of previously publicly held spaces gave way to the expanding car realm. Traditional public space accommodated two overlapping realms – 'movement space' and 'social space' (CARMONA, 2010). In the pre-automobile era, the realms of movement and social space had considerably overlap. Whilst pedestrian movement is compatible with the notion of streets as social space, car-based movement is pure circulation. Over time, movement space has overwhelmed social space. With the development of new modes of transport, the realms became more separated from each other. Simultaneously, public space was colonized by the car and the street's social aspects were suppressed in favor of movement – urban streets became roads (CARMONA, 2010).

This has led to an alarming number of car crashes resulting in deaths and serious injuries, as well as unsustainable land-development patterns; a reduction of the number of transportation choices; increased noise, pollution and greenhouse gases; and a decline in social, civic, physical and economic activity on streets (NEW YORK CITY DEPARTMENT OF TRANSPORTATION, 2015). As there was substantial amount of public space devoted to transportation, the quality of urban space degraded. Public spaces didn't necessitate high-quality aesthetic considerations, as they mostly served as transport corridors. At that time there was not enough information about how physical qualities of a place affect human behavior (GEHL, 2012). Even though the times of ignorance of public space quality are gone, lack of consideration for quality of urban environment still occurs and is manifested in the insufficient empha-

sis on quality standards of public space in some places.

### 2.3.2 Aestheticization

One of the strong global trends nowadays is the aestheticization of all aspects of social life (PACHENKOV & VORONKOVA, 2013). The story is rooted in the 17th and 18th century when the coherent sphere of culture, then characterized as a unified world view of religion and metaphysics, fell apart into the three separate spheres of science, morality and art. Since that time the modern world has basically been living in three separate domains, each arranged under specific aspects of validity: those of knowledge, justice and taste. *'There appear the structures of cognitive-instrumental, of moral-practical and of aesthetic-expressive rationality'* (HABERMAS, 1983, p.9 IN PACHENKOV & VORONKOVA, 2013). The instrumental rationality, characteristic of the cognitive logic, has taken primary dominance and has underlain the social order of 'Western civilization', while the moral and expressive rationalities maintained a status that was legitimate but secondary (PACHENKOV & VORONKOVA, 2013).

The end of the project of modernity and the shift to postmodernity has been characterized by the growing significance of another domain – that of the aesthetic (PACHENKOV & VORONKOVA, 2013). As Pierre Bourdieu (1984) has shown, judgments of taste seem to determine the social order to an even greater extent than those of logic, and this trend is gaining strength nowadays. The mode of perception has moved from words to images, and everything has to have 'its face'. Moreover, things must be designed and aestheticized. State policy and social movements, city spaces, public and private places and lives, everything around us purports to be designed and aestheticized (PACHENKOV & VORONKOVA, 2013).

The process of aestheticization is multi-faceted – in regard to the urban landscape and the city's public culture, aestheticization can be understood in at least three different contexts:

- The rise of cultural and creative industries and their growing role in the political economy and space production of cities
- The implementation of the modernist ideals of order, harmony, purity and beauty into urban planning and design
- The visual 'tactics of resistance' and re-appropriation of space by marginal groups and artists as realized by means of aesthetics and the aestheticized counter-culture

(PACHENKOV & VORONKOVA, 2013)

## 2.4 Urban aesthetics

In their book 'The Aesthetics of Human Environments' the authors claim, that envi-

ronmental aesthetics 'concerns the appreciative engagement of humans as parts of total environment complexes, where intrinsic experiences of sensory qualities and immediate meanings predominate' (BERLEANT, ET AL., 2007, P. 16). To consider a city aesthetically is to not only judge its buildings and architecture, litter and noise, but also to include historical and social elements as part of its total sensory package (BERLEANT, ET AL., 2007). These authors are calling in their book for aesthetics to be integral in the planning processes of urban spaces, proposing that to do so 'is to put the city in the service of the values and goals that we associate with the full meaning of civilization' (BERLEANT, ET AL., 2007, P. 19). While some authors suggest that developing the aesthetic qualities of a city results in its appreciation, others argue that appreciation is itself a problematic notion because it is vague and difficult to define and justify. The question of what it means to appreciate a city is indeed one of the challenges of urban aesthetics (KAMINSKA, 2008).

When it comes to sensorial experiences and appreciation, the work of Peter Zumthor is greatly influential. He uses the notion of 'atmospheres' of a place to describe our different sensorial experiences. He claims that we perceive atmosphere through our emotional sensibility – a form of perception that works incredibly quickly, and which we humans evidently need to survive. 'I enter a building, see a room, and – in the fraction of a second – have this feeling about it' (ZUMTHOR, 2006, P. 12). However, not every situation grants us time to make up our minds on whether indeed we might be better heading off in the opposite direction. Something inside us tells us an enormous amount straight away. We are capable of immediate appreciation, of a spontaneous emotional response, of rejecting things in a flash (ZUMTHOR, 2006). He further provides very crisp description of a particular sensorial setting:

*'Here I am. Sitting in the sun. A grand arcade – long, tall, beautiful in the sunlight. The square offers me a panorama – the facades of houses, the church, the monuments. Behind me is the wall of the café. Just the right number of people. A flower market. Sunlight. Eleven o'clock. The opposite side of the square in the shade, pleasantly blue. Wonderful range of noises: conversations nearby, footsteps on the square, on stone, birds, a gentle murmuring from the crowd, no cars, no engine sounds, occasional noises from a building site. I imagine the start of the holidays making everybody walk more slowly. Two nuns – we're back to reality now, not just me imagining – two nuns waving their hands in the air, trip lightly across the square, their bonnets gently swaying, each with a plastic carrier bag. Temperature: pleasantly fresh and warm. I am sitting in the arcade on a pale-green upholstered sofa, while the bronze figure on its tall pedestal in the square before me has its back turned, looking across, as I am, at the twin-towered church. The helm-shaped spires of the two church towers are unequal: identical at the bottom, they gradually rise into individual shapes. One is taller, with a golden crown surrounding the peak of its spire ... So what moved me? Everything. The things themselves, the people, the air, noises, sound, colors, material presences, textures, forms too – forms I can appreciate. Forms I can try to decipher. Forms I find beautiful'* (ZUMTHOR, 2006, PP. 14-16).

It seems, that the perception of urban aesthetics is closely connected to the sensorial experiences and appreciation for a place one can make out of a partic-

ular place.

Carlson in his essay 'On Aesthetically Appreciating Human Environments' contrasts two ways of defining urban aesthetics. The first is what he calls the 'designer landscape approach,' which is primarily concerned with environments that have been purposefully designed for aesthetic contemplation. On the other hand, he offers the method of 'functional fit' as an alternative, which treats the city as a system that must be assessed on the efficiency of its different components to work together, and where the appreciation of human environments is based on the functions they perform. New elements must grow organically from the existing system, ultimately achieving an ambience of everything being and looking right or appropriate (BERLEANT, ET AL., 2007).

In her essay 'Urban Richness and the Art of Building' Pauline von Bonsdorff anchors her ideal urban aesthetic on human, natural, social, cultural, historical, and political diversity (BERLEANT, ET AL., 2007). However, at the same time she advocates for an attunement of elements so that they do not conflict aggressively – so that '*an aesthetic goal of building might be to respect variety and to create or support the overall character and individuality of the place.*' (BERLEANT, ET AL., 2007, P. 72).

A famous study 'A Walk Around the Block', carried out in 1959 by Kevin Lynch and Rivkin Malcolm, which is recording the impressions and testing the memories of 27 people, as they walked one by one around several blocks in Boston, provides some empirical information on the perceptions and attitudes of pedestrians in an urban environment (LYNCH & MALCOLM, 1959). This study suggests that on a walk people most remember the breaks or gaps in space of continuity but also that '*walkers are constantly searching for or injecting order into their surroundings so as to make sense of their disparate impressions and to join their perceptions into a coherent picture.*' (BERLEANT, ET AL., 2007, P. 112). Aleksandra Kaminska suggests, that there is perhaps a meaningful correlation to be made between our memory of the ruptures within spaces of coherence and our desire for homogeneity, uniformity, cleanliness and order (KAMINSKA, 2008). She states, that when we consider a juxtaposed, disjointed, or messy architectural environment, it is almost simplistic to dismiss this aesthetic based entirely on unjustified negative connotations of an aesthetic of incoherence. According to Kaminska, many would argue that beauty often emerges from messy urban collages and may wonder what happened to postmodern ideal if we still judge cities with the expectation of uniformity and continuity (KAMINSKA, 2008).

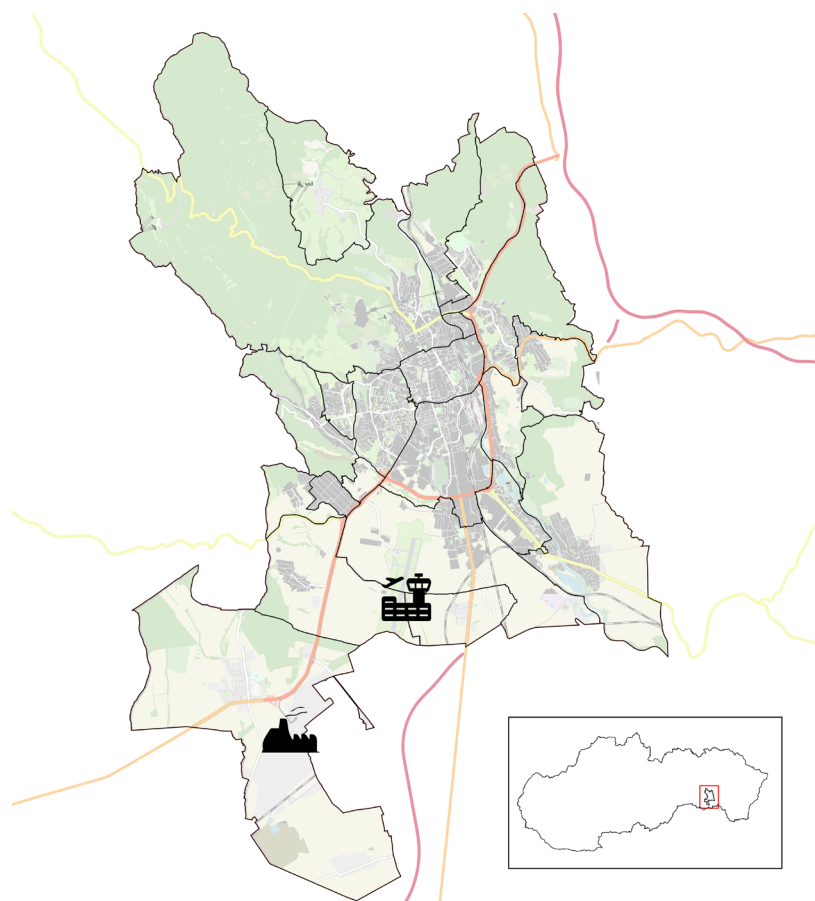
## 2.5 Košice as a problem case

Košice is the 2nd biggest city in Slovakia, with population of almost 240 000 inhabitants, and the economic and cultural center of eastern Slovakia, creating a counterpoint to the country's capital, Bratislava, which is very westerly positioned. Convenient location along with economic and social potential predetermines the city to rapid growth and intense development. Košice is a natural center of eastern Slovakia, providing employment opportunities and services for citizens and the people from

surrounding region. The city is divided into 22 self-governed city districts (see Figure 7). The city is well connected to the European transportation network by a number of roads of different hierarchy, by railway and by an international airport. The most important company and employer in the city is U.S. Steel Košice, a steel-making company, employing around 12 000 people (ŠTEINER, ET AL., 2015). In 2013, the city was named European Capital of Culture (along with Marseille in France), which brought a lot of attention to the city from all over Europe. Košice also became European City of Sport in 2016.

## 2.5.1 Environment

Košice is located in a basin, surrounded by mountains. The river of Hornád is flowing through the city, creating the vital backbone of the city (see Figure 8). The altitude ranges a lot within city's administrative borders – from 177 meters above the sea level all the way up to 819 meters above the sea level. Almost 40% of the administrative city area is occupied by agricultural land.



**Figure 7** Administrative division of the city of Košice with 22 urban districts. Depicted: the location of Košice within Slovakia, its connection to the main road infrastructure and location of 2 significant objects – airport and the biggest enterprise (U.S. Steel Košice)  
(Created by author with the basemap from [www.openstreetmap.org](http://www.openstreetmap.org))

## *Air quality issues*

As a considerable issue of the city could be seen the state of the environment. In the Košice region there is the highest production of emissions within all Slovakia (ŠTEINER, ET AL., 2015). These emissions are mostly produced by the big industrial companies based in the region. However, in recent years there is a rapid trend of decreasing the amounts of emissions, but big industrial producers still remain the main air polluters. Among the sources of air pollution, automobile transportation is strengthening its position. The increase in intensity of road transportation causes road infrastructure congestions and increase in exhaust gases emissions. There are strategies and plans devised to deal with the air pollutions, suggesting e.g. more air data collecting stations. Another possible strategy could be putting more emphasis on electric vehicles and wide-scale integration of the required infrastructure – charging stations – into the urban environment.

### **2.5.2 Urban and cultural context**

In 1983, the historical center was declared an urban conservation area, the biggest in Slovakia (85 ha). Together with the protection zone around, which indicates an area with lower, but still certain degree of protection, the area is 140 ha (see Figure 9). Perhaps the most unique architectural feature is located in the very center of the conservation area, the biggest church in Slovakia – gothic Cathedral of St Elisabeth – with capacity of around 5000 people. The historical city center is formed as typical lenticular square with preserved medieval structure and buildings (ŠTEINER, ET AL., 2015).

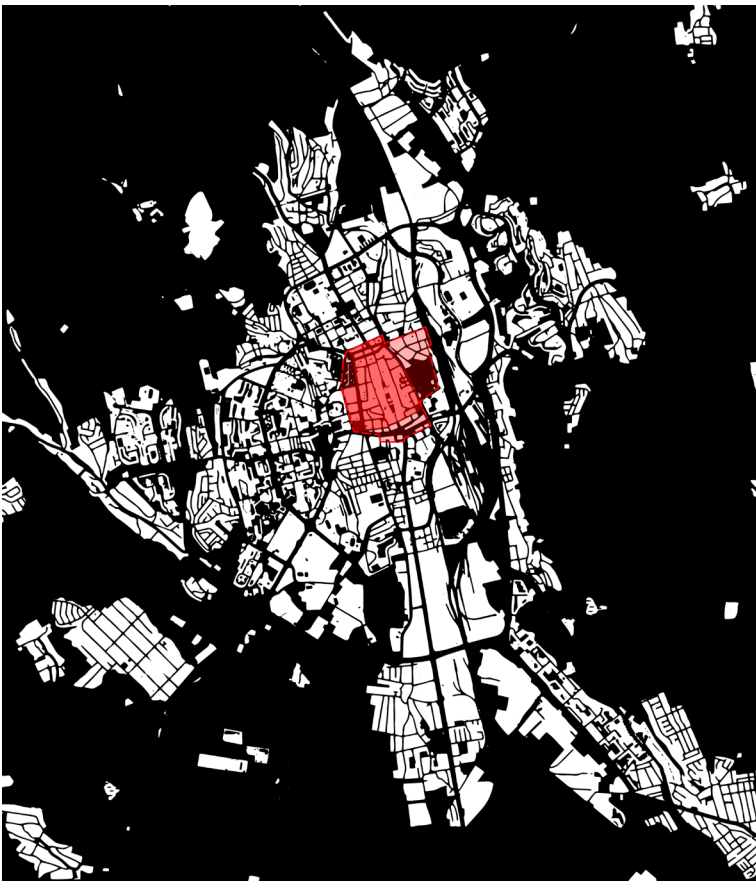
In recent years, culture starts to play crucial role in enhancement of existing architectural and urban qualities. Cultural organizations are increasingly taking part in restoration and re-purposing of existing buildings, turning them into community spaces, co-working, galleries, workshop areas etc. Since being the European Capital of Culture, the city is trying to embrace culture as indispensable aspect of urban development. The city aims to establish cultural sector as one of the core economy pillars for future, instead of focusing too much on industry as it was in the past. The city declares its goal to be transformation from postindustrial city to creative city, which could be achieved by transforming its physical and social infrastructure, by renewal of community life brought about by revitalization of parks and public spaces, or by calling for new proposals on development of creative economy (ŠTEINER, ET AL., 2015).

### **2.5.3 Population**

Population of Košice has been oscillating around the number 240 000 inhabitants in the last decades (see Figure 10). The number of citizens has been slightly decreasing since around 2010. On the contrary, number of inhabitants in the immediate surrounding region is constantly rising for around 20 years already, what is presumably a result of suburbanization trends (see Figure 11).

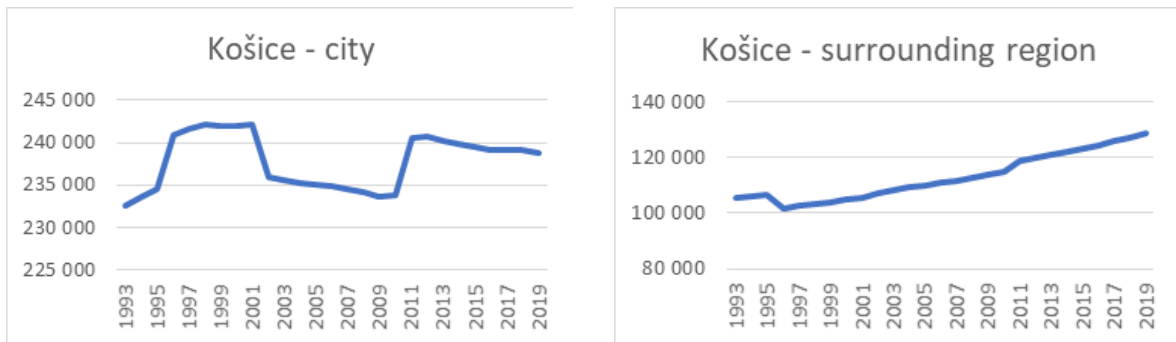


**Figure 8** Green and blue infrastructure of Košice. Most of the green spaces around the city are covered with forests, the white spaces are mostly taken up by agricultural land. Hornád river flows through the city, creating a backbone of the city.  
(Created by author with the base-map from [www.openstreetmap.org](http://www.openstreetmap.org))



**Figure 9** Inversed figure ground plan of the city, showing the built-up area, emphasizing the public spaces depicted in black. The most intense red polygon in the middle shows the urban conservation area of the historical center, with high degree of protection. It is surrounded by a less intense red buffer zone with lower level of protection. Red dashed line marks the whole protected area.  
(Created by author with the base-map from [www.openstreetmap.org](http://www.openstreetmap.org))

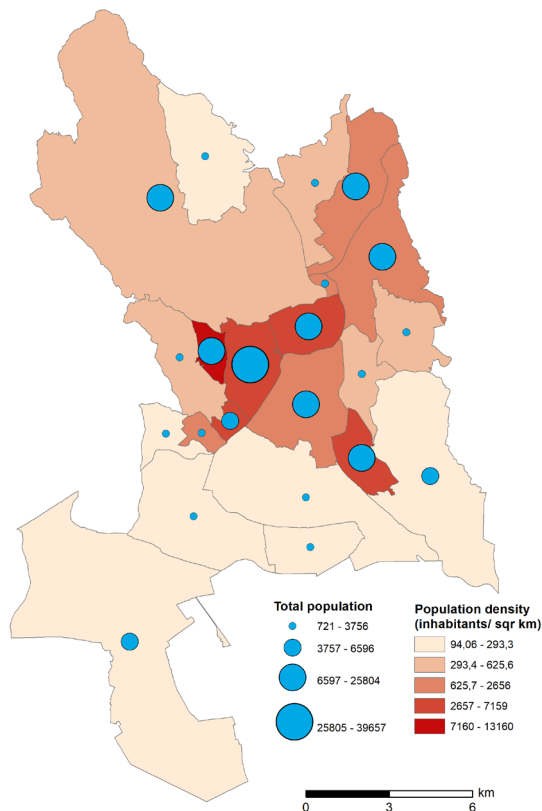
Distribution of population is closely related to the existing urban structure and it subsequently predetermines the pressures on public space in pertaining areas. Urban structure of Košice is greatly affected by the planning and construction carried out before the year 1989, during the socialist rule, which was characteristic by building grand housing estates, often at the fringe of the city. Spatial distribution of population in Košice is depicted on Figure 12 (compare with Figure 7). From the visualization it is obvious that the highest population densities are to the west of the city, and to the north- and south-east as well.



**Figure 10 (LEFT)** Fluctuation of the number of citizens residing in Košice

**Figure 11 (RIGHT)** Constant rise in the number of citizens living in the surrounding region around Košice

(Graphs created by author with data from Štatistický úrad SR)



**Figure 12** Spatial distribution of population in Košice, blue circles marking the total number of residents, shades of red marking population density

(Created by author with data from Štatistický úrad SR)



## 2.5.4 City-planning documents

There are in total 11 points included in the vision of the city of Košice for the year 2025 in the Economic and Social Development plan, describing the reality envisioned for different city sectors. However, none of them speaks directly about the aesthetics of public space and about the importance of positive visual experiences. Nonetheless, some points, 5 in total, are touching upon the problematics of public space. These are the points which are somewhat related to public space:

- Košice shall be a safe city, not only in public spaces but the city shall also protect the health and property of citizens and visitors 24 hours a day, 7 days a week.
- Košice shall be a city where parking is solved out, providing accessible parking especially for residents. New parking spaces shall not be developed at the expense of greenery and public spaces.
- Košice shall be a city where citizens prioritize alternative means of transport, such as cycling and walking, what is subsequently contributing to diminishing congestions, increasing the fluency of traffic, decreasing the dustiness in the city and minimization of city area taken up for traffic purposes.
- Košice shall be a city with minimized architectural barriers and thus supporting public life engagement for physically disabled people, elderly and parents with strollers.
- Košice shall be a green and clean city. Green and blue infrastructure in public space fulfills not only the aesthetic but also the functional criteria. Negative disruptions caused by noise, dustiness, air pollutants, allergens, illegal landfills or other health-threatening hazards shall be minimized.

(ŠTEINER, ET AL., 2015)

For the vision to get fulfilled there are in 17 objectives drafted which, if carried out and achieved, shall make the designated vision fulfilled. These objectives outline the general direction of city development. Moreover, for each of the objectives there is a set of indicators suggested, which should serve for quantifiable evaluation of the success in achieving the specific objective. Nonetheless, only one of all these objectives touches directly upon the problem of quality of public spaces – the objective of decreasing the number of architectural impediments limiting the ease of movement, adjusting to the needs of e.g. wheelchair users. Some of the other objectives have a connection to the public space as well, for example enhancing the role of non-motorized transportation or paying more attention to the natural environment, pollution and greenery within the city area.

All these points included in the city vision for 2025 and objectives, which should make the vision come true, draft the general trajectory of city development and set up the prioritization of city affairs. Unfortunately, as was found out, there is little attention paid to the quality and aesthetics of public space, as there is no mention about these. The only objective directly related to public space is about diminishing the barriers for movement in public space, which is indeed very desirable. Howev-

er, degrading the complexity of public space quality management to tackling the ease of movement could cause some problems in the future development.

Moreover, at the present moment there is no 'public space design manual', in contrast to good practice of cities from all over the globe. In Slovakia, cities are just slowly joining the efforts of devising a strategic documents dealing with the aesthetics of public spaces and providing recommended solutions for public space interventions. However, such documents are not a novelty in this region, there is some form of strategic development material for public spaces for example in smaller Slovak cities of Prešov, Hlohovec, Stupava or in the biggest Czech cities Prague and Brno. Even the Slovak capital Bratislava doesn't possess such a document, there are just pilot manuals developed for smaller neighborhoods, for example for the neighborhood around Panenská street. Even though the published documents are rarely putting forward comprehensive strategy for public space development, it's often just acupunctural template solutions, it is at least a step towards the future when more emphasis is put on public space and its aesthetics.

Another example of document guiding the public space is regulation of commercial banners and other forms of commercial signage in public space. Such documents were developed for example in Žilina (Slovakia), Brno (Czech republic) or for one of the main shopping streets in Bratislava – Obchodná street. This type of document is very valuable in terms of setting up rules for regulation of over-cluttering and could be important part of any complex strategy for public spaces. Especially resourceful and prompting for Košice could be the public space manual employed in Prešov, big city in close vicinity to Košice. All in all, Košice, being the second largest Slovak city, having almost a quarter million citizens and not having a strategic document guiding the public spaces development is a fundamental deficiency.

## **2.5.5 Repercussions of missing regulation**

Due to the lack of documents setting up the limits for development in public space, the new interventions, usually brought about by private investors, sometimes act like a disturbing element in public space, as the interventions often pay little attention to the urban context they are set in. Relatively new example of such occurrence is charging stations for electric vehicles - electric vehicle supply equipment . These are nowadays popping up all around the city, developed by different companies, following their inner directives and statutes. As a result, the public space is starting to fill up with these extraneous artifacts of different shape, size, color, type of mounting and interaction with immediate surroundings.

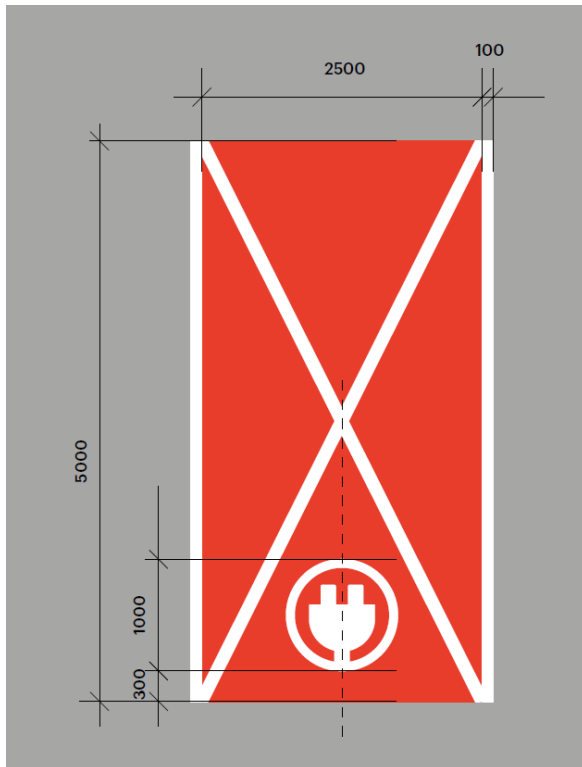
As presented at Figure 13, the appearance of newly built charging stations varies a lot. The top row in this collage are wall-mounted EVSE, the middle row are EVSE with expressive surface color painting, and the bottom row are examples of stand-alone EVSE. Remarkably unfortunate is positioning of some of them (wall-mounted), because when there are vehicles charging, they are standing in a way of pedestrians (two examples in the picture are charging stations for electric scooters, but it

conveys the approach of developers). General impression the charging station radiates is very dependent on the space it is embedded in. Industrial and commercial zones provide more variance for charging stations, as the setting is also of greater variability. On the other hand, the coherent space, for example city center, would theoretically only allow for a minimal appearance variety to preserve the coherence.



**Figure 13** Medley of existing EVSE of different visuals in the city of Košice  
 (Pictures by Martin Rybár, and from <http://nabky.com/>, [https://klient.zsedrive.sk/mapa?utm\\_source=zsedrive](https://klient.zsedrive.sk/mapa?utm_source=zsedrive))

It is insightful to look into the design guidelines of one of the main EVSE developer in Slovakia - ZSE. They pay a lot of attention to the use of red color, which could feel inadequate in some places. They argue that with the use of this color they are easily recognizable (**ZSE DRIVE**). The counterargument would be that vast majority of EV users use mobile applications to find a charging spot, thus the grand branding strategy is unnecessary. Moreover, this developer requires that at each charging spot there is a symbol of socket, in white color and at least 1 meter wide. The blueprint for surface signage of this developer is shown on Figure 14. Other developers are also following their internal principles. With no existing set of rules, the presumption could be that in the future these charging stations of varying appearance could be installed in the historical area in bigger numbers, ruining the coherence of space and the existing genius loci.



**Figure 14** *Blueprint for surface signage of an outdoor EVSE by ZSE. Measurements are in millimeters, the color is Pantone Warm Red (ZSE DRIVE)*

## 2.5.6 Electromobility in Slovak legislation

Košice is to a great extent affected by, and a part of, the global trends of increasing share of electric vehicles in the car market. Deployment of electric vehicles comes into place mostly in order to decrease the global emissions production. In these environmental efforts, EU could be seen as a world leader and Slovakia, being an integrated member of the union is following the efforts, incorporating electromobility into the current legislation. This legislation in turn affects all the cities, Košice included. Due to the worsened air quality in the Košice region, and at the same time, being an important big city, presence of people who can afford to buy electric vehicles, electromobility could play even bigger role here than elsewhere in Slovakia.

There is a new law, applicable as of March 10th, 2020, drafting the rules about number of electric vehicle charging stations at parking lots within newly constructed, or considerably reconstructed buildings. For example, new non-residential buildings with more than 10 parking spots have to have at least 1 charging station, and electric infrastructure available for at least 1 parking spot out of 5 with a purpose of ensuring possible later installation of a charging station. Moreover, new residential buildings with more than 10 parking spots have to have electric infrastructure drawn to every parking spot with the purpose of ensuring possible later installation of charging stations (NÁRODNÁ RADA SLOVENSKEJ REPUBLIKY, 2019). These laws are putting more pressure on public space, as it is clear that public space will need to accommodate more charging stations in the future. Therefore, the attention paid to the aesthetics of charging stations will gain even higher importance in the future.

# 3 Framing the problem

The aim of this chapter is to sum-up the knowledge obtained so far, so to provide a foundation for comprehensible problem formulation and meaningful research questions, which will be guiding this research.

In this 'Literature review' section few essential topics for this research have been pointed out. By first looking at the current global, and more specifically European, efforts for decreasing the environmental burden created within the last decades, the foundation and the guiding narrative is set up for the whole problem framing. Strategies about how to deal with the climate crisis are introduced, and the way EU is planning to diminish emissions within the field of transportation is drafted. Electric vehicles technology is described, as electrification of transportation is one of the core strategies EU is pushing forward in order to achieve carbon neutral economy within the forthcoming decades. However, there are still few factors holding the electromobility back from its wider proliferation. High purchasing costs, limited driving range and the issue of insufficient density of supply equipment – charging stations – especially within urban environments. In the light of all the incentives imposed upon electromobility it is expected that the quantity of EVSE in cities will be rising. This fact raises the question of the quality and aesthetics of public space, as these new objects constitute an influx of extraneous elements into often already settled urban setting. The whole electromobility topic is very complex, and for the needs of this research it is necessary to obtain the basic understanding of the technology. That is why in this 'Literature review' section the topic is described fairly superficially, so that the basic understanding and vocabulary is settled.

Public space is the cornerstone for this research, as the electromobility is just a phenomenon 'happening' there, as well as EVSE are being located within public space. In this research, the role public space is recognized as physical environment allowing for social interactions, and both these dimension - physical and social - are important. This understanding is also supported by usage of the 'staging mobilities' model, which is introduced in the next chapter. The relation between 'physicality' and 'sociality' of public space is further defined by the observation that public space is a physical manifestation of public realm (THOMAS, 1991). This physical space allows for social interactions. However, people prefer to interact in a nice environment, thus they require certain level of physical and aesthetic quality for public space.

A lot of attention is paid to the problem case, city of Košice in the eastern Slovakia, which is dealing with the installation of EVSE at the very moment. Even though the advent of EVs has been around for some time already, some cities, Košice included, didn't pay the appropriate attention to establish strategies describing how to deal with the new phenomenon. The result is that the main driving factor of electromobility in Košice is business, as there are private developers building EVSE, and only after the first ones got built the city realized, that the developers rarely pay attention to the urban context into which they are installing the new EVSE. The prob-

lem gets more salient if this practice perseveres even within the urban conservation area in the historical center of the city. And this threat is impending, as there are no guidelines talking about integration of EVSE and setting boundaries in terms of aesthetic coherence of the city. If the aesthetics of a public space is disrupted, its role as a meeting place for public is threaten, as people prefer places of higher quality to spend time in. Moreover, with less public usage the threat that a place will accommodate more criminal activities becomes real.

The following research question is established addressing this problem:

***How to integrate 'electric vehicle supply equipment' into public spaces of Košice, while ensuring that they don't negatively affect the aesthetics of existing urban-scape?***

The complexity of this question is split into several topics, which are addressed by 3 sub-question. Answering these partial research questions will, after recapitulating the main findings, give an answer to the overarching main research question. These sub-questions are:

*'What are the best opportunities for improving the aesthetics of public space in Košice?'*

*'What are the main aesthetic considerations when integrating 'electric vehicle supply equipment' into urban environments?'*

*'How could be the new charging stations integrated in Košice so to be in compliance with the best aesthetic opportunities for the city?'*

First sub-question is providing better understanding of the current state of public space in Košice and how the aesthetics is perceived by people dealing with public space professionally. More importantly, the best opportunities for improvement of public space are pointed out as well. The purpose of this question is to figure out the public space refinements, which would be the most beneficial for the general aesthetics of the public space in the city.

Second sub-question revolves around the investigation on what the common aesthetic considerations are when deploying EVSE in cities over the world. By reviewing these, the goal is to synthesize the aesthetic factors, which are usually considered, and could be important for the case of Košice as well.

Third sub-question builds upon the two previous ones and tries to investigate if the deployment of new EVSE could go hand in hand with the efforts for improving public space aesthetics in Košice. That means researching if there could be found some overlays or synergies between the two first questions, i.e. if some of the EVSE aesthetic considerations from the 2nd sub-question could be of any help or connection to the best opportunities for public space from the 1st sub-question.

# 4 Theoretical framework

In the following chapter, the main theoretical and conceptual framework for the research is introduced. Chosen framework primarily serves as a foundation, upon which the analysis is built up. Another understanding of theoretical and conceptual framework would as lenses or goggles, through which the reality of this research is being looked at.

There are plenty of concepts describing and explaining different public space aspects, mostly concerned with evaluating public space quality (MEHTA, 2013), assessing the publicness of public space (VARNA & TIESDELL, 2010), public space management (MAGALHAES & CARMONA, 2007) or mobility in public space (JENSEN, 2013). The specificity of this research, namely the focus on the EVSE, as features within public space, prompts for utilization of the model concerned with mobility. This model could at first seem inappropriate and deceiving, but after finding out that it concerns the physical setting for mobilities as well, its usage starts to make sense. This model is called 'Staging Mobilities' and is developed by Ole B. Jensen.

## 4.1 Staging mobilities model

This concepts is dealing predominantly with mobilities and mobile situations, but could be useful for related phenomena as well, as it covers quite a broad range of topics. It places the actual and practical mobile situation into the center of analysis and deals with it in three analytically separated themes – material spaces, social interactions and the human body (see Figure 15). Author himself describes the model in very comprehensive way:

*'Mobilities do not 'just happen' or simply 'take place'. According to the staging mobilities framework we should think of mobilities as carefully and meticulously designed and planned 'from above', as one might say. However, they are equally importantly acted out, performed and lived 'from below'. Mobilities are staged and people performing mobilities are engaged in social interactions of staging mobilities. Staging mobilities is therefore a process of creating lived mobility practices and the material preconditions to these. In this research, contemporary urbanism is understood as highly influenced by the staged mobilities of planning, design, architecture, governance systems, and technological networks as well as by the social interactions, cultural meanings, and the production of social order. Staging mobilities is a socio-spatio-temporal process designing mobile lifescapes 'from above' and performed mobile engagements and interactions 'from below'' (JENSEN, 2013, P. 5)*

This model, as Jensen points out, moves beyond the dichotomy of sedentary and nomad ontologies and epistemologies and shows dynamic lived mobilities as they manifest themselves in relation to already mentioned three themes:

- Physical settings, material spaces and design
- Social interactions
- Embodied performances

(JENSEN, 2013)

This division is made for operational reasons rather than as a claim to be the only and all-embracing model. Speaking about the staging from above Jensen suggest the metaphor of 'scenography', as in the sense of creating scenes within a manuscript or a play. For staging from below Jensen suggest, in similar manner, the metaphor of 'choreography'. Instead of thinking of choreography as created by a disengaged director, here the immediate embodied and sense-oriented dimension is what makes him prefer this metaphor for the bottom-up and embodied acts of self-choreography that individuals perform as they create 'mobilities in situ' (JENSEN, 2013).



**Figure 15** *The staging mobilities model*

(First published in JENSEN 2013)

The model is not to be understood as an ontological postulate but rather as a methodological devise and an analytical heuristic. Jensen is providing an example of a cyclist riding a bike in a city to illustrate how the model could be used. Hence this research is discussing electric vehicles, let's use them to see how the model encompasses all the actions and objects. If we think of a person driving an electric vehicle in a city this is a mobile situation, i.e. 'mobility in situ'. According to the model, such a situational practice may be staged from above by means of layout and design of the road, the traffic light system and general rules for traffic. Moreover, the subject driving through the city is also engaged in a practice of staging as she or he



performs mobilities by means of the car chosen, the style of driving, the attention or inattention to other fellow mobile subjects in the city. Only in analytical terms does it make sense to separate such staging from above and from below since the mobile experience is perceived as one whole stream of situations without any dissections (JENSEN, 2014).

If we zoom in on the underlying layers of the model, the mobile situation could be explored with a focus on three particular fields – physical setting, social interactions and embodied performances. Building on the previous example with a car, let's imagine the driver is driving an electric vehicle and is looking for a charging station. Being in a car is an example of staged mobility as you are present in a material artifact (the car, perhaps networked by GPS) and all the infrastructural systems supporting and sustaining automobility (e.g. roads, traffic lights, curbs, parking spaces, EVSE). The driver is inhabiting the car with his or her body and the skills invested in this body-car nexus (and representing a particular way or style of performing mobilities dependent on personal traits, individual temper, and experiences). Rarely happens that there are no more cars on the road, so the social interaction perspective becomes a vivid and important part of this (from the lane crossing on the way into town to the search for unoccupied EVSE, or possibly the EVSE by developer you subscribed to for any kind of personal benefits). During this imaginary trip into city, the driver has performed mobilities and enacted situations of mobility within frames created by someone else. This is what is understood as staging 'from above', and the defining point here is that the driver's actions are enacted and afforded (or the opposite) by systems, rules, and frameworks outside driver's control. But, for example, giving way to a pedestrian or driving swiftly in front of someone else in order to get to the EVSE first are acts of the mobile subject with a relatively free will. These autonomous and situational acts are staged 'from below' in the sense that they are expressions of the individual traits of the mobile subject. The simple act of driving a car into town looking for an EVSE contains a number of situational properties that we may describe using the staging mobilities framework and the three spheres of materiality, sociality and embodiment. Moreover, these situations are always performed within a field of tension spanning the staging from above and below (JENSEN, 2014). Widespread mobile applications designed to search for free EVSE, taking into account your immediate location, are relatively new feature coming into the picture and once again altering the behavior and way-finding through the city.

Ole B. Jensen further observes, that the staging of mobilities by means of very specific design solutions and choices not only affects contemporary urban life, but actually shapes cultures and social interaction. *'Mobility is culture, and the design of the frame conditions or mobilities therefore becomes about much more than rational organization of traffic flows'* (JENSEN, 2014, P. 16). There is a very close interrelation between the practices or performances of citizens (within mobility or any other field of activity) and the design of environment they are embedded in. Ole B. Jensen says to that: *'...the mobilities practices in the contemporary city are created, enacted, and afforded (as well as they may be obstructed, prevented, and confined) by the very layout and design of sites, systems and spaces'* (JENSEN, 2014, P. 18). This is also a way of understanding the usage of this model for this research. The realization, that all the features within public space are not solitaires but are unique parts within

the enormous socio-technical systems of cities, is fundamental. This model could be applied to a wide range situation within public space, e.g. occupation of benches on a plaza or concentration of people at the bus stops. In this research, the model is pertained to the EVSE within a city center, physical appearance of which is not only shaping the behavior of their users (EV drivers) but all the people using the public space where these objects are positioned.

As already mentioned in the chapter 3, the public space is in this research understood as physical manifestation of public realm, thus the social dimension is not less important than the physical one. That is why this model is easily applicable, as it uses for analysis both, the physical branch ('physical settings, material spaces and design' in the model), as well as the social branch ('social interactions and 'embodied performances' in the model) and these different points of view are employed to analyze mobile situations. The 'mobilities in situ', which are in the very center of the model, could be in this research pertained to public life. Public life is related to activity within public space, thus it inherently implies movement, since people don't usually reside in public space (homeless people do), therefore they firstly need to get to public space from their homes and even while being there, public space is often used for leisurely walks, recreational running and other physical activities. Therefore, centerpiece of the model - 'mobilities in situ' is through public space and public life also related to the physical quality of public space, as we learned by Jan Gehl that public life is dependent on the physical and aesthetic qualities of public space, which are central to this research.

Furthermore, the physical environment could be understood as a factor affecting daily practices and behavior of people - e.g. it's quality predetermines the level of public life which will be happening in the particular space. Thus physical setting not only allows for social interactions but also affects them and has an influence over people's behavior. In addition to that, people's satisfaction or dissatisfaction further affects the political representatives of the commune for example. If there is public pressure related to some part of public space politicians usually need to take an action. Moreover, politicians and political representatives have a direct influence over the public space and its physical appearance, finalizing this circle, when physical setting affects people, people in turn affect political decisions and these decisions affect the physical setting of public space. Therefore it is important to understand that the 'staging from above' has not only an influence over the physical setting itself, but also affects the social interactions and embodied performances and these could in turn affect the physical setting by putting pressure on decision-makers and political representatives. It is important to understand that all the actions within the public space thus have far-reaching repercussions.

# 5 Methodology

In this chapter the focus is on introducing the research design and the methods, which were used to generate research data.

## 5.1 Research design

The initial wonder for this research revolves around the aesthetic qualities of technical infrastructure, more specifically EVSE, within urban environment. These charging stations are usually looked upon in terms of their functionality, but at the same time, as they are present in public space in high numbers, they substantially account for a perception one gets in particular space. Oftentimes, they are perceived as some necessary evil, disturbing the urban coherence, but nonetheless essential for flawless operation of a city. To tackle encountered problems a research question is posed *'How to integrate 'electric vehicle supply equipment' into public space of Košice, while ensuring that they don't negatively affect the aesthetics of existing urban-scape?'* In order to answer this question a specific way of research is used, based upon the investigation of current conditions of public space in Košice. By doing so, the best opportunities for improvement are found out. Subsequently good practices in deploying EVSE from documents from around the world are investigated. In the final part of the analysis these two are juxtaposed and overlaid, as the aim is to find out which of the commonly used practices or recommendations could be utilized in Košice, to be in line with specific opportunities for public space improvement in the city.

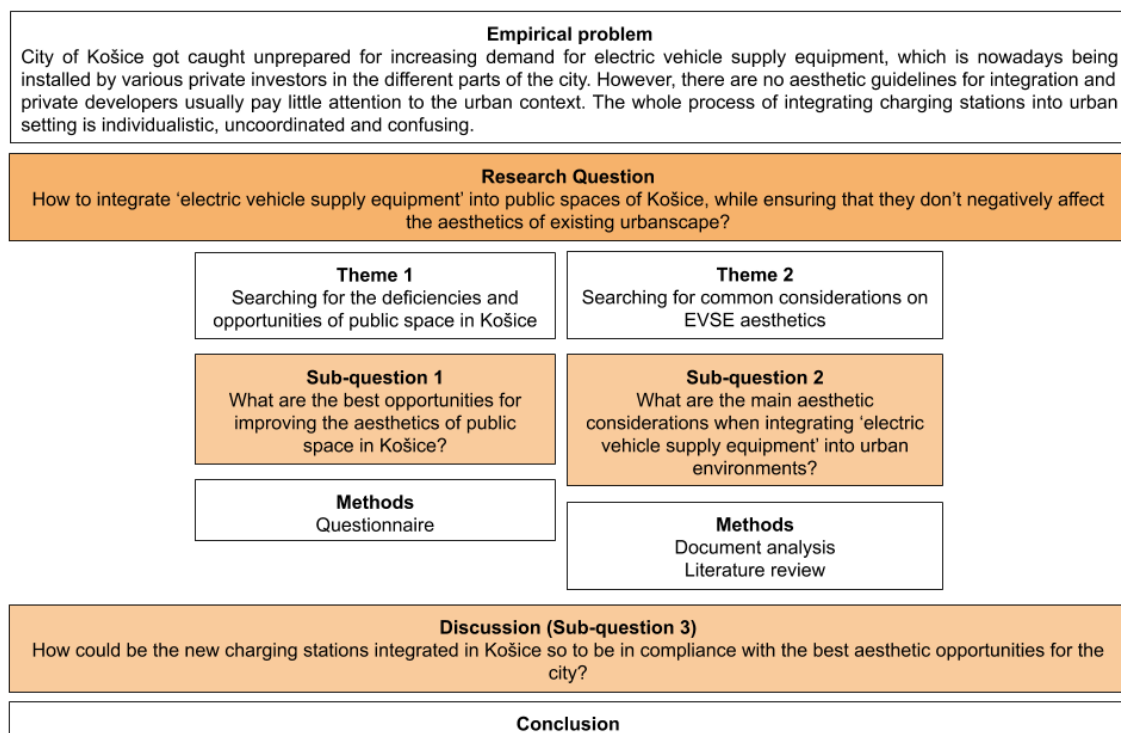
Three subquestions are used in this research to help to guide and organize the investigation. As already pointed out, first one is related to the city of Košice itself – *'What are the best opportunities for improving the aesthetics of public space in Košice?'*. The logical approach for researching this question is inductive, as the goal is to come up with an all-encompassing reality about public space, based on individual observations of qualified respondents. The aim of this subquestion is to uncover the most salient problems of public space and its aesthetics, as well as looking for solutions to these issues. The solutions to current problems could be understood as the opportunities for improvement. Questionnaires are used to generate data for this subquestion.

The second subquestion is concerned with solutions which are commonly employed in installing the EVSE – *'What are the main aesthetic considerations when integrating 'electric vehicle supply equipment' into urban environments?'*. The focus is on the aesthetic considerations, not functional. The logical approach underpinning this chapter is explorative, as it is exploration of various different aesthetic aspects, which are to be considered if the goal is an EVSE which fits well into its urban surrounding. The methods of data generation for this question are predominantly documents analysis and study, as well as literature review. Seven documents were

researched in detail in order to generate knowledge on what is worth consideration in creating an aesthetically pleasing EVSE. The aim of this subquestion is to come up with a set of general aesthetic considerations for EVSE, which fits well into its urban surrounding.

Third subquestion is trying to find the convenient setup of certain considerations from the second subquestion to fit the local conditions of public space in Košice – ‘How could be the new charging stations integrated in Košice so to be in compliance with the best aesthetic opportunities for the city?’. This chapter is built up as a discussion of the findings from previous subquestions and tries to use the findings from second subquestion and to synthesize them with the findings from first subquestion, creating an overlay of good practices which could be used in Košice in order to improve the quality of public space. The logical approach of this chapter is deductive, as already existing knowledge is used to create solutions for the unique case of the city of Košice.

It is important to note, that visualizations play a vital role in this research, as they are self-explaining elements complementing the text and often carrying important information. Therefore, the emphasis on visual features is fairly high. Many figures are adopted from different sources, however, some are created by the author. The softwares, used for creation of those figure, are ArcGIS by ESRI, Adobe Photoshop and Adobe Illustrator. This whole report has been written in Adobe InDesign, with complementary use of Microsoft Word.



**Figure 16** Research design framework

## 5.2 Methods

For the selection of methods of data generation, it is important to select methods, that will allow the researcher to answer the research question (FARTHING, 2016). A careful consideration of selected methods took place during this research, looking for the ones which would best address the issues implied by research questions. Majority of data generated for this research are of qualitative character.

### 5.2.1 Questionnaire

The objective of chapter 6 is to search for the best opportunities for public space quality improvement. The analysis based on the simple questionnaire, which was distributed to several people, who could be considered experts within the field of public space in Košice. Purpose of this questionnaire was not to encompass the wide number of respondents, but rather to find people whose opinion is qualified. People who answered the questionnaire questions are experts on public space in Košice and they are dealing with the topic on daily basis. These people are architects and public space activists from the city, people from the architectural department at the Commune and students of architecture at the Technical university in Košice. The presumption for this sort of survey has been that rather than quantity of answers, the quality is needed. Also, as the aim is to investigate the issues on city-scale, the research is not concerned about the solitaire problems of distinct neighborhoods. If the issue transcends the borders of a city district and becomes a problem for the whole city, it becomes interesting for this analysis.

Questionnaire is a method which poses questions to respondents (which could be seen as data sources) about facts, behavior, beliefs and attitudes, and their use assumes that these people are in a good position to know the answer to the posed questions (FARTHING, 2016). Purpose of this questionnaire research is not to act like casual analysis – to find out why the particular subjects are pointing out particular issues, or even why there are these issues occurring in public space of Košice at all, but rather as a descriptive analysis, where the primary interest is to actually find out what the problems are, and the weight is given to these by how many times they are mentioned by different respondents (FARTHING, 2016). It is acknowledged, that the respondents are people of different beliefs, values, attitudes and backgrounds, but it is not intended to make sense of their answers based on their beliefs and values. However, it is interesting to look at some insights provided by respondents, as for why something constitutes a problem or why the problem exists in fact.

The research seeks to find out the best opportunities for how to improve public space, and to get to that point, the biggest constraints and deficiencies are necessary to be discerned. Therefore, in the first part of the questionnaire research the emphasis was on finding out what is wrong with public spaces in Košice, what do the respondents, based on their qualified opinion, consider as the biggest obstacles in wholesome development. Subsequently, in the second part the research focuses

on finding out the opinions of experts on how to deal with those deficiencies from the first part, how to improve the public space quality in the city, what solutions to employ to make the public space a better place for people. Two questions, used in the questionnaire, are:

- What do you perceive as the biggest deficiencies of public space quality, and more specifically aesthetics in Košice?
- What do you think are the best opportunities for improving public space quality and aesthetics in Košice? In other words, what do you think would help to overcome the problems identified in the first question?

For the purposes of an analysis, the 8 respondents are divided into 3 thematic groups – experts (4 subjects), commune, and architecture students (3 subjects). The commune’s opinion is constituted by answers of 2 employees of the Architectural Department at the Commune, who agreed upon their responses and submitted them together as 1 response (see Figure 18).

| Name                           | Designation                             |
|--------------------------------|---|
| Martin Rybár<br>Miroslav Mižák | City of Košice Architectural Department |
| Atrium Architekti              | Architectural studio                    |
| Michal Hladký                  | Architect and public space expert       |
| Michal Hudák                   | Public space activist                   |
| Ondrej Vecan                   | Architect and public space expert       |
| Viktória Mravčáková            | Architect and public space expert       |
| Student 1                      | Student of architecture in Košice       |
| Student 2                      | Student of architecture in Košice       |
| Student 3                      | Student of architecture in Košice       |

**Figure 17** Respondents of a questionnaire survey

## 5.2.2 Document analysis

Document analysis can involve both quantitative and qualitative sources, which cover bills, reports, surveys, statistics or public plans. In this research primarily text-based qualitative documents are utilized (FARTHING, 2016). The choice of documents is based on their relevance and quality. The relevance of sources is based on the relation between the topic of the report and the sources contents. That means the document analysis takes into account how the sources contribute to an understanding of a given fact and problem. In this research, publicly available documents in the forms of public space development manuals and EVSE installing guidelines were analyzed as a method to comprehend the complex nature of how different documents describe the optimal way of integrating EVSE into public spaces.

In order to identify the most relevant material to this research, the following aspects were considered: relevance, authority and currency (SILVERMAN, 2006). Relevance refers to the selected literature as contributing to the development of the

issue, providing perspective that can either be used in support of or against the research. Authority refers to the credibility of the source, generally meaning that it is obtained from or recognized by experts of the field. Currency relates to whether the document is sufficiently recent to be recognized as a valid source (SILVERMAN, 2006). All the documents reviewed for this research are not more than 10 years old. In the Figure 19 the selected documents, used for researching the common aesthetic considerations regarding EVSE, are listed. For each document there is an author, name of the report and the date of publication provided.

| Document title  | Author   | Date          |
|---|--|---------------|
| <i>Electric Vehicle Charging Station Guidebook</i>                                | Vermont Energy Investment Corporation  | June 2014     |
| <i>Electric Vehicle Charging infrastructure (A Design Guide)</i>                  | <ul style="list-style-type: none"> <li>• Orkney Renewable Energy Forum</li> <li>• EV Association Scotland</li> </ul>   | July 2016     |
| <i>Guidance for implementation of electric vehicle charging infrastructure</i>    | Transport for London   | April 2010    |
| <i>Electric Vehicle Charging Infrastructure (Guidelines for Cities)</i>           | <ul style="list-style-type: none"> <li>• Greenway Infrastructure</li> <li>• CleanTechnica</li> </ul>                   | December 2017 |
| <i>Curb Enthusiasm (Deployment Guide for On-Street Electric Vehicle Charging)</i> | <ul style="list-style-type: none"> <li>• WXY architecture + urban design</li> <li>• Barretto Bay Strategies</li> </ul> | November 2018 |
| <i>Siting and Design Guidelines for Electric Vehicle Supply Equipment</i>         | WXY architecture + urban design  | November 2012 |
| <i>Site Design for Electric Vehicle Charging Stations</i>                         | Sustainable Transportation Strategies  | July 2012     |

**Figure 18** Review of documents used for the analysis of aesthetic considerations for EVSE

It is important to note, that the topic of setting up the aesthetics of EVSE within urban context is still fairly novel. There is a vast number of documents and strategic materials discussing the technicalities of EVSE and their positioning within a city context. But the topic of how to make them look coherent within urban environment is much less frequently raised. Out of all 7 documents, which were used to generate data for chapter 7, there are 3, which were the most comprehensive and insightful: *Guidance for implementation of electric vehicle charging infrastructure* by Transport for London, *Electric Vehicle Charging Infrastructure (Guidelines for Cities)* by Greenway Infrastructure and CleanTechnica, and *Curb Enthusiasm (Deployment Guide for On-Street Electric Vehicle Charging)* by WXY architecture + urban design and Barretto Bay Strategies.

It is a very specific topic, which was looked for in the reviewed documents, and that is the visual or aesthetic considerations for a newly installed EVSE. The information on this topic is often scattered over the bulk of a particular document, usually not categorized. Therefore, for the purpose of this research there is a simple categorization created, dividing the aesthetic considerations of EVSE into 10 broader topics: general considerations, localization and context, vandalization, comfort, safety, station body, colors, signage, contact details and instructions, and branding.

All of these encompass a couple of considerations which were raised in different documents.

It is important to note, that besides the primary document analysis, which served to generate data for chapter 7, there was an extensive study of different documents used to gain information on topics presented in the chapter 'Literature review'. For this purpose different documents were studied, e.g. reports, annual papers, website materials, statistical materials, strategies for the city of Košice and for the higher administrative district the city is a part of. It was mostly data about electric vehicles, current sustainability efforts and charging process of electric vehicles, which were obtained from these documents.

### **5.2.3 Literature review**

Literature review has been one of the key activities for this research. Literature review has been used predominantly in the initial part of the research but was present throughout the whole dissertation process. The point of literature review has been to provide a foundation for the further research. The aim has been to consult prior research and literature on the topics presented by the research question and also to justify why the research question presents a problem to be researched. The texts for this method were selected based on few criteria:

- Type of publication: articles from scientific journals about urban planning and design, chapters from books, academic articles
- Language: English
- Publication year: no limitation
- Certain keywords: electric vehicle charging station, EVSE, public space, quality of public space, aesthetics
- Authors known to have worked with the topics of the research, such as: Jan Gehl, Oleg Pachenkov, Peter Zumthor, Vikas Mehta, Sergio García-Doménech, Matthew Carmona and others

In terms of all the different topics reviewed for this research – sustainability efforts, electric vehicles, charging stations, public space, the city of Košice – literature review was mostly used for obtaining information regarding public space. Knowledge on electric vehicles was mostly obtained from reports of different companies or organizations, therefore through documents study.

Some of the used literature has been found by retracing citations in publications, some has been found by searching at Google Scholar according to given keywords and some has been found by exploring the archives of Aalborg University Library's online database.



# 6 Public space deficiencies and opportunities in Košice

The objective of this chapter is to search for the best opportunities for public space quality improvement. In the following analysis the findings of a questionnaire survey will be presented within the thematic groups of different designations of respondents (commune, experts, students), and in the end of this chapter a concluding remarks will be drafted, pinpointing the main public space deficiencies and opportunities, derived from answers of all the respondents.

## 6.1 Public space deficiencies

### 6.1.1 Commune

Commune employees, based on their experience, are pointing out as one of the core issues of public space aesthetics excessive visual smog. This is usually taking place in the form of banners, billboards, signs, posters etc., which are not unified in terms of design and placement rules, thus it's a huge factor cluttering the public space (as an example see Figure 16, where the building of Jumbo Centrum, which serves as a congress space, offices and a theatre, is depicted).



**Figure 19** Visual smog on the example of Jumbo Centrum in Košice

(<http://jumbocentrum.sk/wp-content/uploads/2019/07/jumbo-centrum-01.jpg>)

Another problem observed by people from commune is frequent diminution of greenery, or its vandalization, mostly by illegal parking. Furthermore, the buildings' facades are said to be in shabby, contentious state (a big number of buildings

within the center are reconstructed, the problem is rather present at a city-scale), and some other objects are said to be in generally bad condition as well. Another problem is that the street furniture is placed unsystematically into the public space, what is sometimes creating disharmony between these two. The last point raised up is concerned with road reconstructions, when the road is milled up and subsequently patched up, but the quality of materials used and the quality of patching itself is sometimes controversial.

## 6.1.2 Experts

The issue, which was pointed out most often among the experts, is a missing comprehensive strategy for public spaces in the city. The systematic approach is absent, therefore there is a lot of spaces which seem random, the patches of green, paving, sidewalks, it all looks unorganized and a bit chaotic. Big difference between a center and periphery seems to be a problem as well, as the center is at least operated by the rules of the historical preservation area, but the blocks of flats at the fringe of the city are lost in approach to public space. Furthermore, there is not enough functions coming out of the buildings, interconnecting the indoor and outdoor spaces. Examples of this could be restaurants, bars, children playgrounds etc. An important issue is that, as Michal Hladký points out, public space is often used only as transitional space, a go-through space instead of a go-to place. Or it exists *'only as a difference, as something what is left after we subtract the infrastructure from the space'* (HLADKÝ, IN QUESTIONNAIRE, 2020). This phenomenon is also connected to so-called non-places, places which miss a clear function and a purpose. These places are public, but they miss solicitude, modernization and public life itself. As Michal Hudák observes, this problem mostly occurs at the big blocks of flats at the fringe of the city. Michal Hladký labels these places as no man's land. According to Viktória Mravčáková, the biggest issue of public space in Košice is its pedestrian 'impermeability', meaning that due to different enclosed spaces, traffic and other obstacles it is difficult to walk continuously from one city district to another. Uneasiness of pedestrian movement subsequently triggers social segregation, pertaining mostly to Roma population.

Interesting observation is that approach to public space is a cultural issue, sort of a legacy of historical development under the Soviet influence in the last century (HLADKÝ, IN QUESTIONNAIRE, 2020). Perhaps this also contributes to the fact that people sometimes perceive public space as something strange, as something what is taken care of by somebody else. However, according to Mravčáková this is fortunately changing nowadays. Another often mentioned problem is insufficient maintenance of public spaces, which causes some parts of public space to become dirty and rusty. This is also connected to an issue of using low- or disputable-quality materials in public spaces, which are getting worn out and are not aging nicely (VECAN, IN QUESTIONNAIRE, 2020). One of the big problems, connected to the visual over-cluttering of public spaces, is ununified design of street furniture, for example different colors used for handrails, trash bins, benches, lighting etc. Greenery is yet another problem, mostly missing conception for development of green features and areas.

Ondrej Vecan says, that *'even though there is enough green areas, these are not maintained properly, trees are old, placement of plants and bushes seems random ...'* (VECAN, IN QUESTIONNAIRE, 2020).

### **6.1.3 Students**

Students of architecture at the Technical university of Košice seem to recognize similar problems as commune and experts. Regarding the visual smog, the advertisement banners at the buildings 's facades, as well as solitary objects (e.g. billboards, city-lights) in the close proximity to city center are pointed out. Regarding the low-quality materials, redevelopment of the urban infrastructure is recognized as an issue, including sidewalks, light rail tracks and platforms, and roads as well. Students are also drawing attention to the absence of a high-quality details. Low quality of street maintenance results in neglected state of public infrastructure, including pedestrian paths, squares and parks. One student is pointing out that regarding the number of citizens, which live in the blocks of flats, disproportionately low attention is paid to those spaces. The maintenance objection pertains mostly to grass mowing, greenery cutting, new planting, streets cleaning etc.

In addition, students are pointing out problem of insufficient lighting within the courtyards of housing blocks, which is also related to the point about non-spaces raised by experts. Interesting observation is that Košice, even though presenting itself as a cultural city, are not installing enough artworks in the public space. Big issue is also a general prioritization of motorized traffic to pedestrians, which causes that there is too much traffic, even in the city center, and that there are too many parked cars filling up the public space. Related to this issue, students discern scarcity of cycle paths and cycle lanes, which, if developed, would relieve the road infrastructure. Last but not least, an important issue recognized is that of insufficient water utilization and work with water in public space. This refers to missing water areas or flows within the city, as well as bad access to the main river flowing through the city – Hornád.

## **6.2 Public space opportunities**

### **6.2.1 Commune**

Second question in the questionnaire was concerned with the possible solutions to solve the issues which have been recognized. Commune suggests setting up clear, unambiguous and binding rules – incorporated in a manual for public spaces. However, in one breath they say, that development of such a material is extremely difficult due to the distinctiveness of spaces within the city. Next suggestion they put forward is development of comprehensive plans for different city zones. The last

point they propose is better cooperation and adherence to the rules from all the developers, specifically mentioning energy providers, as these are deploying electric and gas boxes around the city, which are sometimes seen as inappropriate.

## 6.2.2 Experts

According to the public space experts, the most important point in improving public space quality is development of a clear public spaces' strategy. Part of the strategy should be manual for street furniture design. Another opportunity is continuous education of citizens, participation and delegating more responsibility for public matters to people. Research into usage of existing public spaces would shed some more light on current trends and would be a good starting point for developing a public space strategy (HLADKÝ, IN QUESTIONNAIRE, 2020). Related to that would be drawing a 'map of potential' – map of all the non-places, which are immediately ready to accommodate a new function, for repurposing, and stimulating urban life. Legislative setup of clear responsibilities for property owners is recognized as another possibly helpful solution (HLADKÝ, IN QUESTIONNAIRE, 2020).

Experimentation, in forms of temporary solutions, mobile functions or pilot projects are suggested by Michal Hladký as a feasible solution for incremental development. Another opportunity for improvement, even though less tangible, would be considering wider variety of options when repurposing or developing public spaces or buildings, as Michal Hudák suggests. This would benefit mostly the area, which is being repurposed or redeveloped, as well as the neighboring spaces. This point is related to the call for more architectural competitions, which would bring more quality into the city. Another, much more palpable opportunity is to improve quality, timing and actual realization of public space maintenance, as well as putting more emphasis on usage of high-quality materials, which are easy to maintain. Ondrej Vecan suggest stone or wood as good materials to be used in urban context. Improving the orientation for tourists, e.g. in the form of number and quality of signage, is also suggested.

A big room for improvement is to be found in the issue of city greenery. Ondrej Vecan suggests, that first of all, a comprehensive conception for urban greenery should be developed. In this, a localization and maintenance of distinct type of greenery would be specified. New tree alleys along the roads shall be created, new water-retaining solutions adopted. Taking into account the climate change and its future effects is of great importance. That pertains to development of a shading strategy, as trees and other urban greenery could be employed to create green canopies and to keep the street temperatures during summer at bearable levels (HLADKÝ, IN QUESTIONNAIRE, 2020). Working with water in public space is also discerned as one of the big opportunities into the future.

## 6.2.3 Students

As one of the best opportunities for improvement of aesthetic qualities of public space, students recognize reduction of visual smog in the city. Related to that is legislative tightening of rules describing advertising in public spaces. Students are also suggesting wider use of digital advertisement, which could help to reduce the advertisement space throughout the city. Development of a manual of public space is an important point for students, as well as for experts and Commune. This manual should, according to the students, determine the type of surfaces, type of plantings, possibilities for localization of advertisement spaces etc.

There is quite a wide range of opportunities related to the field of transportation. Students suggest limitation of traffic intensity, especially in the city center and, more specifically, broadening of the pedestrian zone, adding the streets which lay along the main 'lens' (the center) of the city. Another opportunity is to prioritize public transportation to private automobiles. More specifically, the public transportation should be brought to the solitary city parts in higher intensities. Another suggestion for public transportation is to decrease the ticket price. Creation of new cycle paths is yet another opportunity, more specifically if these paths would connect the outer parts of the city with the center comfortably. A big number of cars parked in public space was recognized as a problem. Students suggest, that this could be solved with parking houses, built at the fringe of the city, which would conveniently accommodate cars of commuters from hinterland.

Another opportunity is to humanize the numerous inner courtyards of housing blocks, which could subsequently serve to local communities as meeting places. Potential activities for community building would be e.g. planting, occasional culture etc. These spaces could be also used for meeting of people with city representatives or activists, where the discussions about public space could take place. One student is pointing out, that an opportunity for the future is to teach people how to appreciate the space around their houses, supported by the presumption that if you invest your time and take care of something, you will appreciate it more. In addition to that, education in schools should underline the importance of ecology, waste separation and circular economy in general, so the children wouldn't take recycling as a complication but rather as an inherent part of urban life. Regarding the culture, students suggest spreading the culture, art exhibits and services out of the city center to other local centers throughout the city. Related to that is a call to create space for artists to exhibit more in the public space, outside of the galleries.

Among the more general opportunities students point out the possible re-purposing of existing brownfields, for example in the proximity of the train station and location of Malinovského kasárne or at the hill beneath the housing blocks at Ťahanovce. As for the experts, for students as well, the issue of city greenery opens up for multiple opportunities. Students call for 'greening up' the city, pursuing the deployment of green roofs and allowing more green areas into the city. Accessibility of water is perceived as a big opportunity, primarily the access to the river Hornád. The river could serve as a recreational area, if the access was more convenient. Students mention the solution, which was adopted in Wien, where the Danube oxbow serves as a recreational site for public. Opportunity is also recognized in adding more water areas into the city.

## 6.3 Concluding remarks

Research objective in this chapter is to find out what are the best opportunities for improvement of aesthetics of public space in Košice. To get to know that, it has been necessary to find out what are the existing issues, which could be worked on and improved. Therefore, in the first part of the research, the emphasis has been on finding out the public space deficiencies and in the second part on public space opportunities. Even though the questions were inquiring specifically about aesthetics, the answers of respondents are coming in a broad range of topics, not necessarily in the specific understanding of aesthetics as of the visual perception, pleasant or unpleasant. However, all the topics mentioned are eventually somewhat aesthetics-connected, e.g. parked cars in the streets are affecting the aesthetics of a street as well as insufficient courtyard lighting is. Therefore, this research also reveals a bit about how the aesthetics and visual experiences are perceived by people in a city. Different problems and opportunities were mentioned with different frequency and bringing numerousness of different answers into this research gives individual responds different weight. In Figures 20 and 21 all the public space deficiencies and opportunities, put forward by qualified respondents, are sorted out and ranked according to how many times the respondents mention them, independently of each other.

Based on this analysis, the most pressing public space deficiencies are overload of visual smog and insufficient, low-quality maintenance, which results in neglected state of some parts of public space in Košice. Another big issue raised is that there is an abundance of so called non-places – places which possess a lot of potential, but are currently unused, undefined, look like a rapture in public space continuum. Another big objection is that the processes behind the public space are chaotic, the roads overhauls are not timed properly, usage of different materials is anarchic, there is no conception for how the greenery should be taken care of, materials used in public space are seen as of low-quality and the whole public space is perceived as somewhat chaotic. This is also 'nicely' manifested in the ununified design of street furniture, and lack of attention paid to detail in public space. There is still a lot of problems connected to traffic, mostly regarding too much traffic allowed into city center, too many cars parked in the public space, scarcity of cycle paths and general prioritization of traffic to pedestrians. All the traffic issues brought about imply that there is still little effort put into the turn towards more sustainable mobility patterns, as it has been seen around other cities.

Looking at the best opportunities, which could improve the quality of public space, most of the respondents mention as a most important step to take the development of a clear public space's strategy or some sort of manual, which could guide all the future developments. This conception shall put forward unification of street furniture and set up rules, which would make public space in Košice organized and coherent, tackling the momentary state of fragmentation and clutteredness. Another widely recognized opportunities are about adding up more water areas into the city and generally using water more within public space. Reduction of visual smog is closely connected to desired decluttering of public space.

|  |   |
|--|---|
| A lot of visual smog   | 4 |
| Insufficient and low-quality maintenance of public spaces                                      | 4 |
| A lot of non-places – places where nothing goes on, nobody visits them                         | 3 |
| Chaotic road overhauling, with low-quality patching  | 2 |
| Absence of clear conception for development and public space management                        | 2 |
| Low quality of materials used in public space/ during reconstructions                          | 2 |
| Missing conception for greenery/ neglect of greenery   | 2 |
| Neglected state of pedestrian infrastructure, squares and parks                                | 2 |
| Prioritization of traffic to pedestrians   | 2 |
| Insufficient utilization of water in public spaces   | 2 |
| Ununified design of street furniture   | 1 |
| Greenery depletion/ decimation by illegal parking  | 1 |
| Shabbiness of buildings' facades (bad condition of buildings and other objects)                | 1 |
| Disharmony of street furniture with its surrounding  | 1 |
| Big difference between the center and the periphery  | 1 |
| Scarcity of functions expanding to public space – bars, restaurants, children playgrounds etc. | 1 |
| To a great extent the public space is go-through place, not a go-to place                      | 1 |
| Approach to public space is cultural problem – legacy of socialism                             | 1 |
| Scarce lighting of inner courtyards  | 1 |
| Too little artworks in the streets   | 1 |
| Scarcity of cycle paths  | 1 |
| Too much traffic within the city center  | 1 |
| Advertisements and banners of low aesthetic quality on the buildings' facades                  | 1 |
| Too many parked cars in the streets  | 1 |
| Pedestrian impermeability  | 1 |

**Figure 20** Concluding table of all the problems of public space aesthetics recognized by 8 people dealing professionally with public space in Košice. The number in the second column shows the number of respondents mentioning the specific problem, independently of each other (out of 8 respondents)

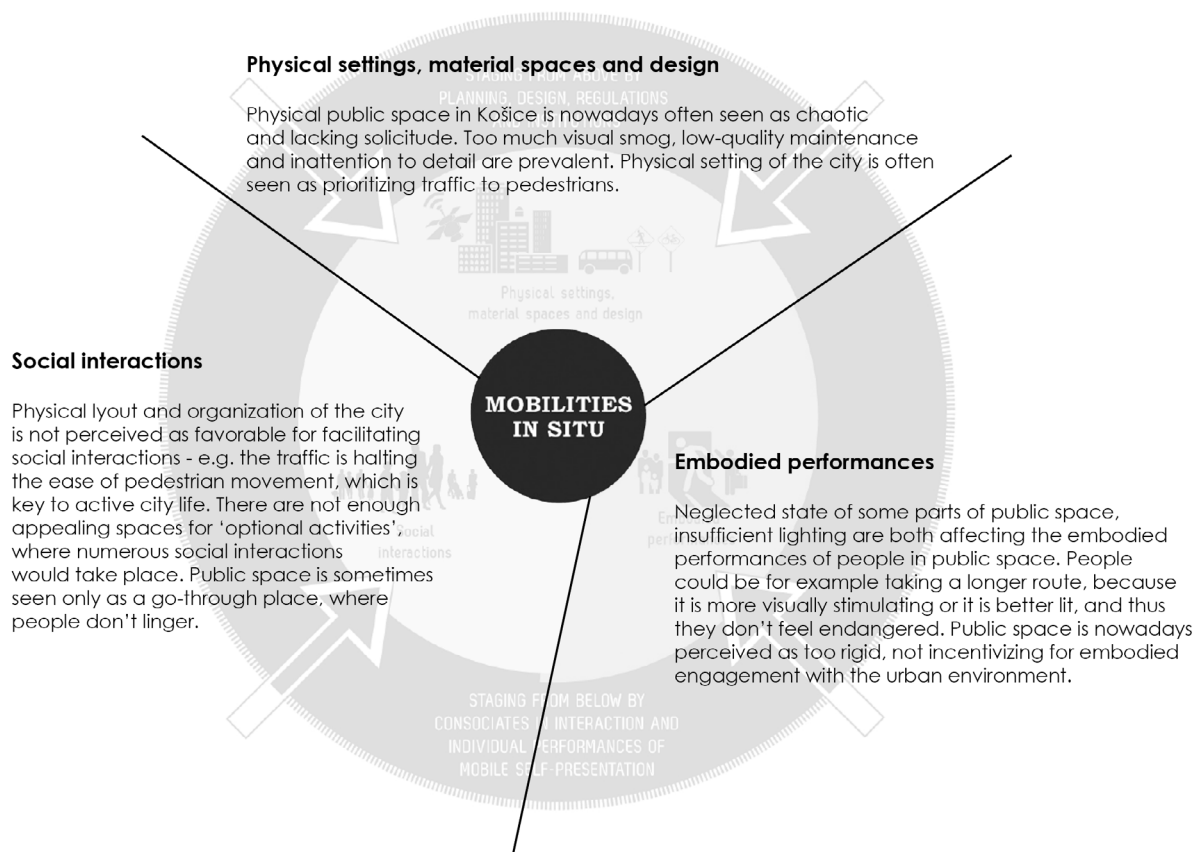
|   |   |
|---|---|
| Clear public spaces strategy/ development of a manual of public space             | 5 |
| Adding water areas/ using water better in public spaces                           | 3 |
| Reduction of visual smog  | 3 |
| Education, participation and responsibility of people for public matters          | 2 |
| More architectural competitions   | 2 |
| Developing a comprehensive conception for urban greenery                          | 2 |
| Creation of new cycle paths and lanes   | 2 |
| Humanization of inner courtyards to serve local communities                       | 2 |
| Limitation of traffic intensity especially in city center                         | 2 |
| Prioritization of public transport to personal vehicles                           | 2 |
| Providing better access to Hornád river   | 2 |
| Allowing more green areas into the city, green roofs                              | 2 |
| Development of comprehensive plans of different city zones                        | 1 |
| Cooperation and adherence to the rules, mostly from the side of energy providers  | 1 |
| Research into usage of existing public spaces                                     | 1 |
| Legislative setup – clear responsibilities of property owners                     | 1 |
| Map of potential – map of non-places  | 1 |
| Experimentation – temporary solutions, mobile functions                           | 1 |
| Considering wide variety of options when repurposing or developing public space   | 1 |
| Improving quality, timing and carrying out realization of maintenance             | 1 |
| Using high-quality materials, which are easy to maintain                          | 1 |
| Improving the orientation for tourists  | 1 |
| Legislative tightening of rules describing advertising in public spaces           | 1 |
| Usage of digital advertisement  | 1 |
| Space for artists to exhibit outside galleries, in city                           | 1 |
| Parking houses at the fringe of the city accommodating cars of commuters          | 1 |
| Spreading the culture and services out of city center also to other local centers | 1 |
| Re-purposing of brownfields   | 1 |

**Figure 21** Concluding table of the opportunities for improvement of public space aesthetics recognized by the people dealing professionally with public space in Košice. The number in the second column shows the number of respondents mentioning the specific problem, independently of each other (out of 8 respondents)

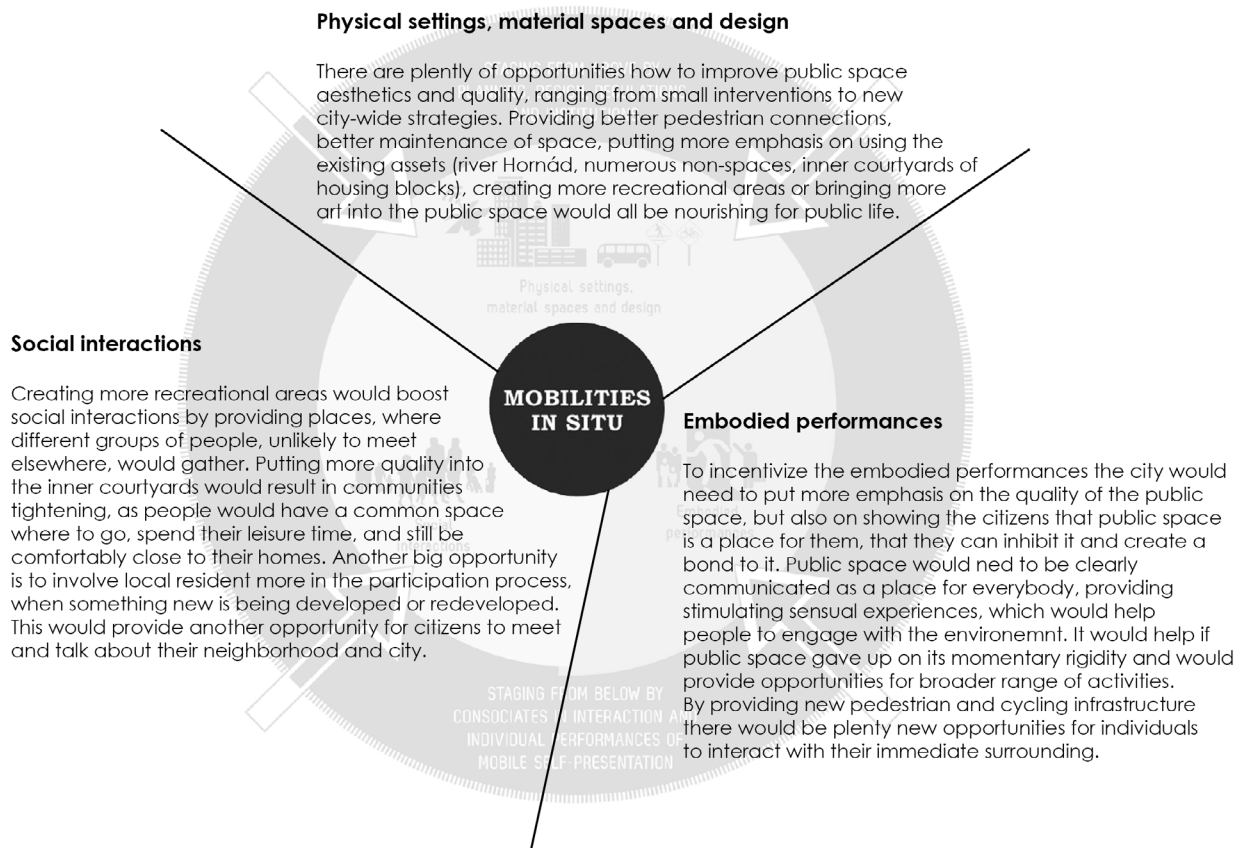


Other opportunities highlight the work with local citizens, that there could be meetings of people responsible for the city development with citizens, talking about the current matters, participation process taking place more regularly. For this purposes the humanization of inner courtyards of existing housing blocks should take place. Different efforts bringing about enhancement of public transportation, as well as cycling as a full-fledged mode of transport, are also suggested. More architectural competitions should ensure higher quality of repurposed and redeveloped spaces within the city.

More data-oriented approach is seen as an opportunity as well, for the beginning proposing to research the usage of existing public spaces or creating a map of all the non-places – places where enormous potential for development is stored. Important opportunity is to provide better access to the Hornád river, as this could be used for recreational purposes.



**Figure 22** Analysis of public space in Košice through 'staging mobilities' model, with focus on the most pressing deficiencies



**Figure 23** Analysis of public space in Košice through 'staging mobilities' model, with focus on the best opportunities for improvement

Cultural aspects appear to be important in the context of Košice, best opportunities in this field suggest the proliferation of art from the city center into other local zones throughout the city, as well as providing parts of public space for artists to exhibit outdoors, not just within the walls of galleries. Usage of more high-quality materials is yet another opportunity how to make public space more visually pleasant and proposing to pay more attention to detail goes well in line with that.

It is interesting to look at the findings through the conceptual framework of staging mobilities model. In the center of the model it is still focus on mobilities in situ, but this is closely related to this research of public space as well, since public space inherently need people inhabiting and using it to be truly public, but these people (in most cases) don't live in public space, therefore they are exerting mobilities to get there and around the space. Public life implies presence of countless mobilities in situ, therefore the model is used to contextualize the findings discussed above.

# 7 Aesthetic considerations for EVSE in documents

A lot of cities are nowadays being developed according to public space manuals, which are devised for specific locations, to ensure aesthetic and functional coherence of urban environments. Some cities have gone even further and have developed special guidelines for different features in the city, for example discussing integration of electric vehicles, and related infrastructure into the urban setting. Most discussed topics regarding EVs are usually localization of EVSE and technical aspects of its implementation. *'Where to site chargers?'* is often the main consideration for a designer (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016).

However, out of all the EV manuals, not too many pay appropriate attention to the aesthetic considerations of introducing these new features into public space of a city. Transport for London (TfL) agency admits that: *'...from a planning perspective the major impact of charging points to date is considered to be their visual appearance and street clutter in public areas'* (TRANSPORT FOR LONDON, 2010, P. 29). WXY architecture + urban design studio puts it this way: *'...potential barriers to success for curbside deployment can be segmented into four broad categories: public perception, aesthetic concerns, technological and jurisdictional challenges, and technological change'* (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018). In recent years, TfL and individual boroughs of London have placed greater importance on streetscape issues. Most boroughs have developed their own street design guides and these are complemented by numerous other good practice documents by TfL. Many of the principles of good design are generic and therefore apply to EVSE in the same way as other types of traffic management equipment and street furniture, particularly for on-street charging points.

The ultimate goal with installing EVSE into streetscapes is to maximize both utilization and community acceptance (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018). Principles, which are aimed for in the process of deploying new EVSE, as developed in the document by the WXY studio, are these:

- Reinforcing a sense of place
- Equitably distributed assets
- Attention to detail at multiple scales
- Siting to promote accessibility and support street life

(WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018)

It is important to recognize that electric vehicles are not charged in the same way as internal combustion engine cars. Fossil cars fuel up weekly or monthly in a process that takes around 5 minutes. Electric vehicles refuel daily or more often in

a process that takes between 30 minutes up to 12 hours, depending on the need and charger type. EV drivers are therefore adept at 'charging up' when the opportunity presents itself rather than only refueling when they are out of charge. Most fossil cars are refueled when they are less than 25% full. Most electric vehicles will be kept topped up for most of their time. Plausible outcome of this reality is that EV drivers will not always need to take as long as stated for a full charge. Another solution could be to adopt a policy of installing public AC charging stations as residents request them. This is a market-driven approach that has worked exceptionally well in Amsterdam (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016). It is also suggested, that in dense areas, an overarching EVSE coordination is necessary to optimally plan charging infrastructure (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016).

The goal of this chapter is to explore the common aesthetic considerations and recommendations for integrating EVSE into urban environment, as they are described in some of the available documents. The emphasis is put on the actual bodies of EVSE as well as on their immediate surrounding, and on interplay of these two. This chapter provides an overview of the solutions recommended in different EVSE guidelines, which, however, are not all necessarily ideal for adoption within the context of Košice. The discussion about which of these considerations go in line with the public space opportunities from previous chapter is to be found in the chapter 8.

## 7.1 General considerations

The key consideration for a charging station as a whole, according to TfL, is to ensure consistency with other street furniture and to design in accordance with borough and other existing streetscape guidance. Another general consideration for introducing a new EVSE is the whole-life costs assessment – how easy, or costly, will it be to maintain (TRANSPORT FOR LONDON, 2010).

Aesthetics of the whole charging space and its surrounding is important according to document developed by Greenway Infrastructure and CleanTechnica. The overall look and feel of the place can drive utilization a lot. Is it clean or is there trash everywhere? Is there a nice view or park nearby to look at, or a collapsing building? These things matter (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

## 7.2 Localization and context

There is a couple of suggestions in the document developed by joint cooperation of Greenway Infrastructure and CleanTechnica regarding localization of EVSE in public space. They suggest, that in dense areas without reserved parking, a certain percentage (10%-20%) of the space shall be allocated for EV charging. Furthermore, creation of charging hubs is suggested. These would be areas with a large number of chargers next to each other (e.g. 10-20). This could simplify grid access issues, create

construction/installation economies of scale, be much cheaper, reduce queues, and allow siting near services or apartment blocks to attract and conveniently serve users (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

It is also very important that a public charging network offers a convenience in terms of location and charging speed for those people needing a 'top up' during the day or for EV drivers who don't have home or workplace charging. According to Greenway Infrastructure and CleanTechnica, key locations for such EVSE should be medium-stay 'hot spots' such as:

- Shopping centers
- Restaurants
- Coffee shops
- City centers
- Sports/exercise facilities
- Major government administrative offices

(GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017)

According to Transport for London agency, the locations which may be suitable for introducing charging points include the following:

#### *On-street – public and shared charging bays*

- Town centers, high streets, tourist attractions
- Residential areas

#### *Off-street (car parks) – public and shared charging bays*

- Leisure centers and sports facilities
- Retail outlets
- Community facilities
- Transport nodes
- Parks and other green spaces
- Education facilities

#### *Off-street (car parks) – private and shared charging bays*

- Workspaces
- Residential apartments

#### *Off-street – private charging bays*

- Residential

(TRANSPORT FOR LONDON, 2010)

In order to select the most suitable sites for on-street and off-street public charging points a comprehensive evaluation should be undertaken and following factors should be taken into account:

- **Demand** (existing or potential) for charging points, dependent on clustering of current EV users (if known), expected future demand from new users and proximity to existing charging bays
- **Visibility/accessibility** – highly visible, accessible and busy locations are desirable. This increases public awareness and also means there is better natural surveillance (improving personal security)
- **Road space** – avoid displacing existing parking bays if at all possible (unless currently under-utilized or can be replaced nearby). Do not locate the bays too close to junctions or where they will cause disruption to the flow of traffic
- **Footway space** – consider whether introducing charging points will reduce the effective footway width to an unacceptable level
- **Green hubs** – there is a potential to create such places (for example with cycle parking, switching to public transportation etc.)

(TRANSPORT FOR LONDON, 2010)

There is couple of priorities pointed out by WXY studio in regard to localization of EVSE – charging stations should prioritize:

- Driver's side (left-hand) installations
- Installations in the first legal parking space after the intersection
- Maximum station visibility
- Proximity to institutions
- Opportunities to minimize visual clutter
- Avoid blocking views of artwork or landmarked structures
- Maintain sightlines to major parks, arcades, public plazas

(WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018)

Accessibility of the charging station, meaning the convenience and ease of getting to and from the charge points, matters a great deal. Is there road access from both directions? Are there other barriers? Is it handicap accessible? In a parking lot, having the stations near an entrance or elevator is helpful. Opportunities for recreation and relaxation – drivers spend from 20 minutes to a few hours charging their vehicles. Shopping malls, restaurants, and coffee shops which have charging facilities all benefit from these customers. Being near a park provides the opportunity

for some exercise (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

The context of surrounding around a proposed charging point matters a great deal. Prior to installing the EVSE the questions like 'Will it fit in with adjacent historically significant buildings?' need to be posed. Moreover, in selecting the type of charging point, consider how well the design (size, shape, color) will fit in with its surroundings (TRANSPORT FOR LONDON, 2010). The quality of the area surrounding the EVSE is for many drivers the most important design element of a charging station. Like a favorite café, if they have a choice, they will go to the station that they enjoy being at (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

According to the location of EVSE, whether it is positioned on- or off-street, TfL suggest slightly varied approach to its aesthetic properties. Good practice principles for designing the layout of on-street charging bays include are generally stricter, to provide aesthetic perceptions of high quality for the bulk of citizens present in the same space as these charging stations. Off-street charging points could be subjected to the same stricter approach, although, as these places are usually more 'out of sight', the regulations are sometimes loosened up (TRANSPORT FOR LONDON, 2010).

Furthermore, soliciting input on station siting from stakeholders who are positioned to promote and use the infrastructure is critical to the pilot's success. Some of the stakeholders, included in the participation, should be e.g. residents, elected officials, community boards, not-for-profits and community organizations, business improvement districts, workplaces and organized labor (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018).

## 7.3 Vandalization

It is important to take measures to reduce likelihood of the equipment, signs etc. being defaced. For this matter is suggested to use anti-graffiti paint and to locate signs at correct heights (TRANSPORT FOR LONDON, 2010).

Moreover, EVSE sometimes happen to be a subject to unintentional vandalism by being crashed by a car, during parking for example. Each charging station installation should be designed to address vehicle collision. Bollards can protect freestanding curbside units as necessary. However, protection is not recommended for pole-mounted units (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018). Parking facilities use also other kind of barriers such as curbs, wheel stops, railing, wall-mounted barriers, and bollards to protect property and equipment. These barriers also help define the separation between parking and other uses such as landscaping and pedestrian spaces (SUSTAINABLE TRANSPORTATION STRATEGIES, 2012).

## 7.4 Comfort

There is couple of considerations affecting the comfort and general pleasantness of using an EVSE. TfL suggests that the angle of an EVSE is an important factor and proposes positioning the charging point at 45 degrees to maximize accessibility. Height of control screens is another consideration. As with parking meters, the controls should be at a height which permits access by wheelchair users (TRANSPORT FOR LONDON, 2010). The height of screen is discussed by WXY studio as well. They suggest that the height of the user interface should be reachable by a person using a mobility device - preferred height is 107 cm and a maximum height is 122 cm (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018).

Another factor to consider is lighting. Lights should be included as part of the station in an elevated position designed to catch the eye and illuminate the whole space. Lights should also be included around the charging ports and control screens to help with user visibility at night and to help signal if a car is charging or not. Providing the charging cables on-spot is another important comfort consideration. Instead of just including a port for charging, stations should have the cables included, so that a driver can just get out of the car, grab the cord from the station, and plug it in. Protection from the weather is another factor to consider, as, while it is safe to charge your EV at an exposed, outdoor charging station in the rain or snow, it is far more pleasant to do so at an indoor station or under the protection of a canopy (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

## 7.5 Safety

There are multiple considerations related to safety of a charging station and physical manifestation of safety solutions are affecting the whole look of an EVSE a great deal. Questions such as *'Does the space look and feel safe? Is it safe from other cars, cyclists, and people?'* need to be discussed before installing a charging station. The best facility designs separate pedestrian activities from traffic to minimize conflict points and increase safety. Existing sidewalks, paths, and informal walking routes should be identified for protection prior to designing a charging station. Some charging stations are being installed on an existing sidewalk. This can only be safely accomplished if the sidewalk is wide enough to accommodate the equipment and safe pedestrian clearance. The equipment, the attached cables, and the signs need to be placed so that they are not unsafe obstacles or tripping hazards. Designs should never have cables across designated walkways.

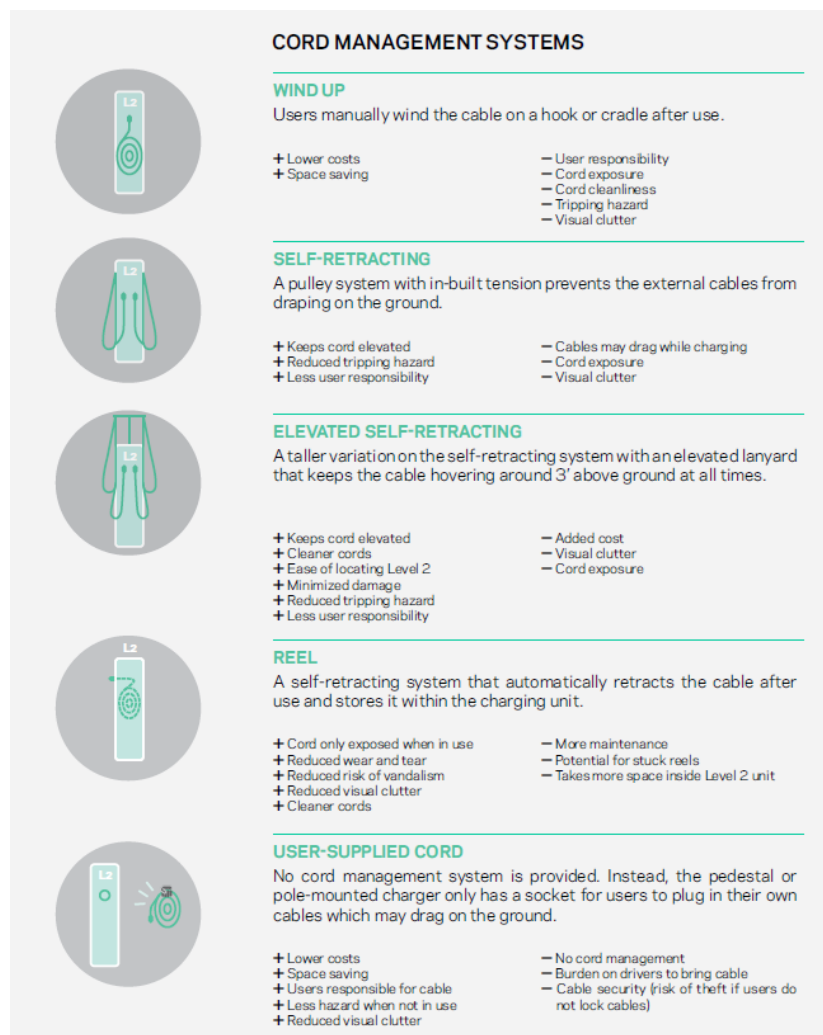
Charging point should be safe to get to (not having to cross a lot of busy traffic) and then safe to sit or leave your car at for a while (SUSTAINABLE TRANSPORTATION STRATEGIES, 2012) (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017). Stations should be designed and installed to safely break away from the sidewalk without risk of electrocution in a crash (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018).

Trip hazards are widely recognized as an important safety consideration. It is suggested to avoid wall-mounted units where there is a pathway in between the wall and parking spot (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016).



TfL suggests locating EVSE no more than 0.45 m from curb line to minimize extension of charging cable and thus limit the curbside obstructions for pedestrians (TRANSPORT FOR LONDON, 2010). The charging stations should also have integrated systems to help keep cords completely off the ground and limit tripping (see Figure 25). There should be minimal obstructions or things to trip over (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

Electric vehicles use most charge points by means of a cable carried in the vehicle. The cords, which are transferring the electrical energy from charging points into vehicles require special attention, as their precarious form is unstable element within the streetscape, often visible and adding to the visual clutter the stations cause. The cable is generally between 4 and 8 meters long and each car will have a charging socket in its bodywork, often in the bonnet or where the 'filler cap' would be. Important consideration is getting the right part of the car to within 5 m or so of the charge point so the charging can take place (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016).



**Figure 24** Overview of cord management systems

(WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018, P. 62)

Given the lack of standardization in charge port locations, cords must reach all possible connection points on an EV. Cord material should remain flexible in all weather conditions. The expected intensity of use, siting configurations, and weather conditions should all factor into decisions around which cord management system is best suited to a curbside pilot. Some points that should be considered include:

- **Cord exposure** – cables kept outside the charging unit when not in use may suffer wear and tear from the elements, can become stiff in cold weather, and have a potential risk of vandalism (exposed cables can be cut, tied, or otherwise vandalized)
- **Cord security** – most chargers have an automatic locking feature that prevents cords from being unplugged while charging
- **Damage risk** – cables and ports that drag on the ground can get caught in snow plows or be run over by vehicles
- **Cleanliness** – cables kept elevated are less likely to get dirty, improving user experience
- **Visual clutter** – small units with fewer exposed elements have a more minimal urban footprint and design impact

(WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018)

## 7.6 Station body

A sampling of charging stations available on the market today shows enormous variation in the height and scale of different products, largely variable due to the cord management system they deploy. Greenway Infrastructure and CleanTechnica propose that the tops of charging stations should stand well above the height of an average car, including an SUV (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017). This measure is probably suggested out of visibility reasons, so that the EVSE is well-visible from the approaching car.

In terms of actual design of charging stations, manufacturers offer customization options for off-shelf chargers. These are generally limited to color changes, decals, and station wrappers (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018).

It is interesting to look if the bodies of charging stations could accommodate more functions beside their primary purpose. Increasingly, charging station manufacturers have options for features that can support smart cities and urban design priorities. Modular lighting elements can aid in locating stations, enhance user experience, and minimize clutter. Stations sensor technology with cloud connectivity has capabilities to collect data on motion, parking space availability, environmental conditions (temperature etc.), and traffic (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018).

## 7.7 Colors

The question of color is from the aesthetic point of view one of the most important. However, opinions of the experts on this matter vary substantially. Some of the documents advocate for using the color – ‘As yet there is little public awareness of the importance of EV spaces to EV drivers. As a result the spaces need to be clearly marked. There is no readily understandable logo (as for example with places for disabled) and so it is necessary to be unmistakably clear as to the role of the space’ (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016, P. 15). The color, which is usually used to paint the surface, is green. Advocating for strong colors is also present in another document, stating that colors that catch the eye should be a notable element of any charging station (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

According to TfL it is important to ensure consistency in color with other street furniture. Usually the EVSE are in neutral colors, like black and silver (TRANSPORT FOR LONDON, 2010).

## 7.8 Signage

Signage can be present either in the vertical (poles, traffic signs) or horizontal (surface painting) form. The scope of signage is extremely important, as it can substantially contribute to the undesirable cluttering of public space. Where possible, it is recommended to fix signs to existing sign poles, lamp columns or mount on walls. Minimize the size of signs, while ensuring functionality (TRANSPORT FOR LONDON, 2010).

It may be necessary to provide waypoint signs within car-parks to lead drivers to the facility if it is not clear. At the charge bay it is preferable that any sign used should be so placed as to be in the eye-line of the driver parking in the space. This will help reduce the opportunity of the defence of ignorance from any inappropriate use (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016).

Parking associated with charging stations should be signed as ‘electric vehicle parking while charging only’. EVs should be prohibited from parking if the EV is not actively charging. If signage alone does not adequately enforce EV-only spaces, then street painting should be considered to further demarcate EV-only spaces (WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018).

## 7.9 Contact details and instructions

Petrol stations are generally attended, so it is clear who to speak to in the event of a problem of fault being discovered with a pump, however most EV charge points will be unsupervised. There will occasionally be problems with chargers, so a coherent policy is needed as to whom to report such faults. It is imperative that the charge point bears information to allow to be identified on a database and also bears the

contact details for help. Leaving EVSE without any contact details builds frustration and damages confidence in the infrastructure (EV ASSOCIATION SCOTLAND; ORKNEY RENEWABLE ENERGY FORUM, 2016). TfL also calls for providing basic contact information – borough and EV supplier contact details (TRANSPORT FOR LONDON, 2010).

In general, stations should have very clear, simple instructions for how to use them, ideally in a graphical or illustrated format. This is especially helpful with new drivers or those coming from abroad. This also applies to the information about pricing. People like to know what they are paying for and how much it costs. It also helps with transparency and building trust, especially as electromobility is still a young industry with differences between countries and providers. A 24/7 customer support phone number is almost essential. It is guaranteed that some drivers will have problems and you can usually make sure they are quickly and responsibly handled with a short phone call (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

## 7.10 Branding

Charging stations offer an opportunity for city placemaking, branding and public education about the benefits of using EV or renewable energy. Slogans such as 'My Warsaw' or 'I ♥ Lviv', an environment or health message about the source of the energy, a carbon offset tracker/thermometer, etc. can look nice, make people care more about their environment, and enhance community cohesiveness (GREENWAY INFRASTRUCTURE; CLEANTECHNICA, 2017).

Some boroughs of London have branded their charging points and, as well as their own logos, they make reference to the sub-regional partnership through which their programs are coordinated. In London, the EVSE should contain the following information/logos:

- Borough logo
- Pan-London EV logo
- Sub-regional partnership logo (where applicable)
- EVSE supplier contact details
- Borough contact details

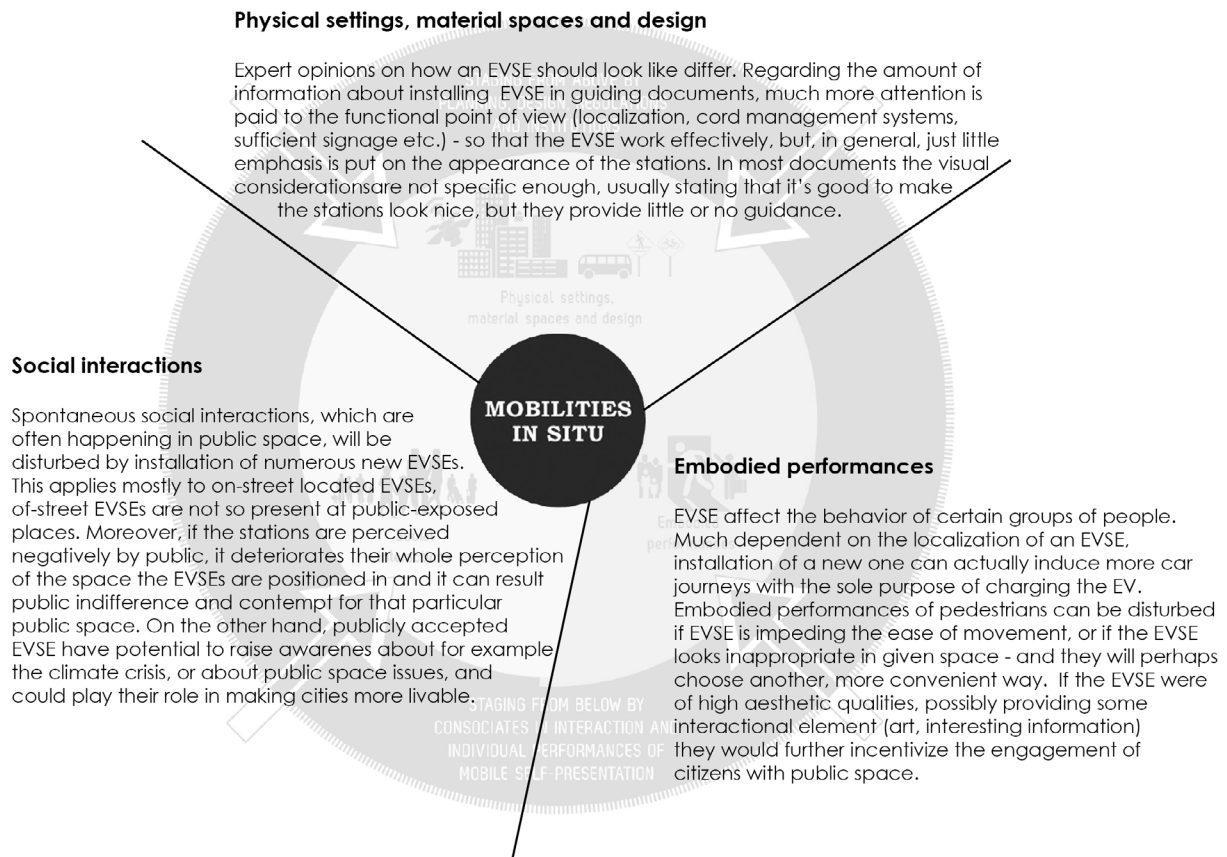
In addition, the EVSE can contain additional information/logos which include:

- Warning notes (e.g. danger of electricity supply, presence of CCTV)
- Statements/messages (e.g. 'contributes to improved environment')

Where private sponsorship is provided there are a number of conditions that need to be adhered to regarding the branding and publicity of EVSE. These include using the developer's logo and mentioning its name as a sponsor in any marketing and promotional material or activities (TRANSPORT FOR LONDON, 2010).

## 7.11 Concluding remarks

It is insightful to look at the topic of aesthetic considerations for EVSE through the 'staging mobilities' model. Using the model allows for unique view on the researched topic, when the particular aesthetics (or lack of it) is staged from above, but then it affects social interactions and individual performances of people coming to contact with the given environment.



**Figure 25** Analyzing aesthetic considerations for EVSE through 'staging mobilities' model

In general, there is still quite a little attention paid to the looks of EVSE. That is also an area, to which this research aims to contribute to. It is not enough to say that the EVSE should look nice, there needs to be some guidelines about how to achieve that. However, certain level of freedom in designing all the technical infrastructure in a city is desirable, as the intention is to create coherent urban landscape, and not a sterile one. EVSE should not impede social interactions, instead they hold a potential to create new ones, for example by presenting something people would want to see or read. Documents studied in this chapter provide a good bulk of considerations to take into account. However, some of these are not fully compatible with the urban reality of Košice, as they are adjusted to e.g. American context. In the next chapter it is going to be discussed, what would be most appropriate and suitable solutions for the urban context of Košice.

# 8 Discussion

The previous 2 chapters talked about 2 different topics, which have one thing in common, namely they are both dealing with public space aesthetics. In the chapter 6, the deficiencies of public space in the city of Košice were found out, alongside with the opportunities for improvement of public space quality, i.e. how to deal with identified deficiencies. In the chapter 7, multiple planning documents were reviewed in order to search for the common and recommended practices related to installations and integration of EVSE into urbanscapes.

This chapter is built up as a discussion, aiming to find an answer to the 3rd sub-question of this whole research – *‘How could be the new charging stations integrated in Košice so to be in compliance with the best aesthetic opportunities for the city?’* In order to find an answer to this question an overlay between first two analytical chapters needs to be done. This process brings about the findings on which of the commonly recommended practices would fit into urban setting of Košice. The underlying principle, supporting the whole analysis, is that the ultimate goal of city aesthetics is to achieve certain aesthetic coherence, where newly installed interventions wouldn't feel inappropriate in the allocated space but would rather contribute to the aesthetic qualities of public space and coalesce with the given urban landscape, creating a harmonic environment.

That is also a reason why to relativize and customize the reviewed considerations and recommendations from chapter 7 to the case of Košice. Applying the generic rules into an already developed urban landscape, without further consideration of local conditions, holds the risk of failing in the task of improving the quality of public space, as the new interventions could disturb the existing context. Local conditions are important to be taken into account, even in the case when their amendment is desirable. It is important to search for the local realities, and to think of these while putting forward new developments, in order to keep and cherish the continuity of development of a particular place.

As was found out in the chapter 6, the current perception of public space in Košice is that it is somewhat chaotic, unorganized, developed in an unsystematic way. Being aware of this, the task to implement new elements, the EVSE, is getting more challenging, as these will account for further filling of the already cluttered public space. Therefore, the new EVSE need to be a part of broader strategy of systematization of public space, starting with determining clear competences for all the agendas within the city, unification of street furniture and raising the awareness of local citizens about the public space matters. By putting up a strategic guidelines for public space development a framework would be created, describing a realm charging stations would be a part of and would contribute to its accomplishment. Charging stations are just little pieces of puzzle, however, helping to shape the overall image of a city.

Opportunities from chapter 6, which could be directly addressed by a new

framework for installation of EVSE, are these:

- **Reduction of visual smog** - this point is two folded. It can be associated with the advertisements, which are chaotic, omnipresent and could be perceived as somewhat aggressive features in public space nowadays. EVSE could be a good example by providing no space for advertisements and staying clear, or they could provide some little space for advertisement, which would need to be strictly regulated, visually pleasant and positively contributing to the charging station and its surrounding (for example it could be posters presenting cultural events, which are about to happen in the city). Reduction of visual smog could be also seen from the perspective of the other elements of street furniture, which are still to a great extent unified and thus contributing to general visual unpleasantness. EVSE could contribute to the reduction of visual smog by being a part of overarching strategy for unification of all the street furniture.
- **Educating citizens** - EVSE could be used as lucrative spots all over the city to provide some information about climate crisis, to raise the public awareness about the environmental issues in general, or perhaps provide some information on public space in Košice, or on specific public space the EVSE is located in.
- **Research into usage of existing public space** - with different data collecting sensors, the EVSE could be seen as an opportunity to gather data from various locations within the city. Stations sensor technology with cloud connectivity has capabilities to collect data on motion, parking space availability, environmental conditions (temperature etc.), and traffic ([WXY ARCHITECTURE + URBAN DESIGN; BARRETO BAY STRATEGIES, 2018](#)).
- **Experimentation/temporary solutions** - EVSE could serve well for city experimentation, e.g. in regards to the deployment of data collecting sensors, providing information on public space or different matters for citizens, or regarding proliferation of art throughout the city.
- **Using high-quality materials** - materials used in EVSE should be of high-quality and manufactured with high attention to detail, so they could contribute to the overall quality of public space they will be located in.
- **Space for artists to exhibit outside galleries** - EVSE would provide unique and ideal space to proliferate the culture in the form of art throughout the city. Professional artists could be commissioned, as well as local art or drawing schools. By doing this Košice would get another step closer to become real cultural hub.

## 8.1 EVSE considerations in the light of Košice

In this section the universal considerations from chapter 7 are reviewed with regards to the local conditions and demands of the city of Košice.

### *General considerations*

Documents are suggesting consistency with other street furniture and to design in

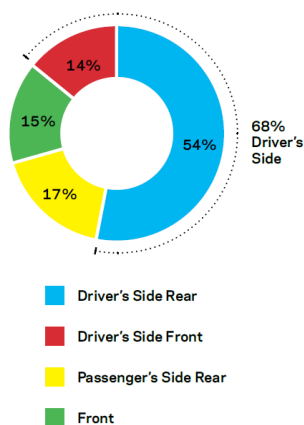
accordance with other valid planning documents dealing with public space development. This proposal is legitimate, however, since in Košice there is lack of other documents guiding the interventions in public space, there is not much to design in accordance with. This issue is a manifestation of the prompt for systematization of public space development in the city. Life-cost assessment of new EVSE is yet another suggestion, which there is no point arguing against.

The immediate surrounding of an EVSE should be clean, devoid of litter, perhaps offering nice views. All these things matters for drivers of EVs, if there is an option to choose between various EVSE, and some of them offer more pleasant ambience, drivers are naturally attracted to these. However, it seems that the localization plays the biggest role in decision process of EVs drivers.

### Localization and context

Localization of EVSE in Košice is subject to a Slovak legislation (see chapter 2.5.6). However, there is still a substantial freedom for municipality to think about the strategy for EVSE positioning. Chapter 7 provides couple of examples as where to locate new EVSE. As an off-street hot spots are recognized e.g. shopping centers, restaurants, leisure and sports facilities, major administrative offices or education facilities. On-street charging is more precarious because it needs to take place alongside the traffic flows. For on-street parking town centers, residential areas and busy streets are suggested.

Perhaps even trickier challenge is to position an EVSE within a particular street. It seems reasonable to look for one-way streets, where there is a possibility to build the EVSE on the left side of a road. This is due to the fact, that majority of EVs seem to have the charging port on the driver's side (see Figure 26).



**Figure 26** Port location for battery electric vehicles sold in the USA in 2016-2017

(WXY ARCHITECTURE + URBAN DESIGN; BARRETTO BAY STRATEGIES, 2018, P. 52)

Building the EVSE on the left side of a road therefore makes sense because of the charging port location, but also the driver's security. It is safer for the driver to open the door and to get out of the vehicle right toward the sidewalk, or to a space where there is no traffic, which is a case of EVSE and on-street parking positioned toward the left side of a road.



Good station visibility could be achieved by freeing up the surrounding space, not necessarily by using bright, eye-catching colors and a lot of signage. Many considerations raised in the chapter 7.2 are applicable to the case of Košice, there are no substantial discrepancies between the local conditions and identified recommendations.

### *Vandalization*

It is important to think about the features of an EVSE which could be potentially subject to a vandalization. Here we could count the graffiti tagging of an EVSE itself or the related signage, cutting or other damage of exposed charging cables or crashing the body of an EVSE itself with a car or something else. To avoid such an occurrence it seems reasonable to use anti-graffiti paint, to keep the charging cables hidden when not in use (or to prompt drivers to use their own cables, even though this point goes against the comfort consideration, described in the following section).

In order to protect the bodies of EVSE from accidental crashes bollards should be used. However, in order not to add up to the clutteredness of the place, these should be solely focused on functionality, meaning that their physical manifestation can be minimized to only fulfill their protective role.

### *Comfort*

It is suggested by Transport for London that twisting the EVSE at 45 degrees against the curb makes it easier for drivers to access. It is also important to think about the height of the control screen, so it is easily accessible for people of different heights or for people with a physical impairment. The ideal height of the user interface is set to 107 cm above the ground.

There is a lot of opportunities how to play around with lighting of the EVSE, for example usage of different colors of light to indicate that the vehicle is being charged. Essential for comfortable usage is sufficient street lighting in the surrounding area. Another consideration concerning comfort is that stations should be equipped with the charging cables, so that drivers don't have to use their own all the time. However, as discussed above, if the cords are already part of the station and they are exposed, they could become a subject to vandalization. Although if the cables are retractable, this is no longer problem. The issue with retractable cables is that the system is more costly, and since the cables are stored within the station body, it becomes bigger in size. More on cables in the section on safety. Weather protection (e.g. canopy, roof) for the EVSE seems to be unnecessary in the urban context, as drivers are provided with an opportunity to get indoors, whether it is a café, driver's workplace or any other facility in proximity.

### *Safety*

Most of the safety concerns regarding the EVSE are based on a fact, that they create an impediment for movement in public space, the cables could pose a tripping hazard and inattentive pedestrian can easily hit the sign pole for example. There-

fore the tripping hazards must be minimized by locating the body of an EVSE close to the curb and road edge, and providing only minimal space for pedestrians, so they are discouraged of walking in between the EVSE and a curb. It is important not to install the wall-mounted EVSE in places where there is a pathway in between the wall and a parking space, so that the tripping hazard is minimized.

As already mentioned, there is couple of distinct cord management systems, providing different safety concerns. If the charging station with built-in, but exposed cables is used, then the cables create visual clutter and are also a subject to vandalism. If a charging station with built-in, but retractable cables is used, then the visual clutter is minimized and vandalism risk is limited as well. In this case the body of a charging station needs to be bigger to provide the space for storing the charging cable. This cord management system is also more costly. If the strategy is to prompt drivers to use their own cables, which are always included when buying an EV, the charging station can be smaller, cheaper and fitting better into the urban environment. It is just not that comfortable for drivers. All the safety considerations from chapter 7.5 should be taken into account in Košice, as the safety is top priority for integration of EVSE.

### *Station body*

The proposals for how the stations body could look like are discussed in the chapter 8.2. The important thing is to keep the pedestals of EVSE simple, as there is already a problem with visual smog recognized in Košice, and current efforts should lead to its mediation. Therefore the size of new EVSE should be kept at minimal requirements for flawless functionality. It is important with state-of-the-art technologies to think about ways of how to broaden the purpose of an EVSE. One of the possibilities is incorporating data collecting sensors into station's body, which could gather information for e.g. traffic, environmental conditions or other aspects allowed for by technology advancement.

### *Colors*

In terms of the colors used to designate the EV parking spot, documents often propose to use strong, eye-catching colors. The color, suggested for usage, is green, as it indicates the environmental implication. Usage of colors is supported by the argument that the awareness about EV is still insufficient, and the ICE vehicles drivers would often stop at the spots reserved for EVs because they have little knowledge about the rules for EVSE charging. It also helps to raise general awareness of citizens when they see the bright colors, that the space is designated for EV charging. Another argument is that using eye-catching colors makes it easier for EV drivers to navigate to the EVSE itself. However, nowadays the EV drivers are searching for the charging stations mostly via mobile applications, which can lead them to the nearest charging station. The usage of mobile applications is so wide-spread that the necessity for bright colors to catch the driver's attention ceases.

Common practice in the city of Košice shows that the color, if used, is usually red (see chapter 2.5.5). Red color is known for its aggressive feeling and can feel substantially disturbing within the urban environment. Therefore, usage of color to

designate the charging spot for an EV is strongly recommended to be reconsidered, and more subtle approach is advocated for in this research.

### *Contact details and instructions*

It is essential to provide some sort of information label, where instructions on how to use the charging point would be described, favorably in graphical or illustrated format, so it is easy to understand. Also usage of local language and at least English as the other language is necessary to provide favorable user interface for everybody. Contact details to customer support for calling in case that the station is out of order, or in case that customer needs to figure something out, shall be provided as well. Although, all these information labels need to provide only the necessary text, nothing abundant, not to create useless visual clutter.

### *Branding*

EVSE provide an excellent opportunity, throughout the whole city and also in the very lucrative city center areas, to put forward city branding. In the case of Košice different ideas are worth considering – decorating the EVSE with city skyline, promoting significant city features, perhaps providing concise information about some city characteristic (if this is accompanied by an QR code, there is no need for lengthy texts). It is also an opportunity to raise an awareness about the environmental effect of using EV.

## **8.2 So how could the EVSE in Košice look like?**

In this section few possible ways of designing an EVSE are proposed. The local conditions of the city of Košice are taken into account. By no means these should be taken as complete proposals, but rather as suggestions towards what the EVSE could look like if more attention was paid to the aesthetic point of view. To this day, there was not enough emphasis on the aesthetics of charging stations, and electromobility in general in Košice. Municipality acknowledges the problem, but it didn't come up with a viable solution yet. Citizens seem to be quite indifferent towards public space. This is an issue which can have many causes. Even though the public activism is coming to life and becomes more present, its voice is still too weak, as not enough people are interested in public matters. One possible way of activation of public would be putting forward purposefully low-quality proposal for EVSE in the city. When a public intervention strategy is of low-quality, it usually sparks public discussion and activates the community. Currently there is a number of charging stations of low aesthetic quality in Košice, but the public discussion about them is relatively weak. Therefore stronger input from the municipality is perhaps necessary to bring the topic closer to people.

EVSE throughout the city doesn't need to look the same, even though the unification is recommended. In the city center for example the appearance and presence of the stations should be regulated more strictly, as this is highly exposed area. On the other hand, EVSE at the shopping malls located at the fringe of the city

doesn't necessarily need to hold the same parameters as the ones in the center, since due to their remoteness only a fraction of people gets to see them. Therefore, low-quality design is not that much of a problem in marginalized, sparsely inhabited areas, where public life is muted or non-existing. However, unified design for all the street furniture, including EVSE, is absolutely vital, as it brings order into chaotic city life and, in addition, strengthens the sense of a place in residents if it is of unique, or customized design. Good examples from cities all over the world show that unification of design for street furniture is key in creating a coherent and visually pleasant urban environment.

The key issue with installing charging stations of high aesthetic value is financial profitability. According to Jan Gehl, every element in public space has two sides – functional and aesthetic. The ideal is to pay attention to both of them. If a feature is developed with emphasis on its aesthetic properties, it looks nice, but perhaps is of little or no use. If emphasis is put solely on functionality, it works perfectly and fulfills its role, but could look inappropriate or even ugly. If the attention is to be paid to both, it is more costly than prioritizing one of the two sides. This gets salient especially with private investors, which are not bounded by any sort of aesthetic regulation, and therefore deploy the cheapest and easiest solution – in the case of Košice it is ugly charging stations for electric vehicles. EVSE which have already been installed are working perfectly, fulfilling its purpose of providing electricity for charging, but little attention was paid to their aesthetic properties, to making them coalesce with their urban surroundings.

Based on the investigation carried out in this research, the author comes up with some recommendations for EVSE in the specific conditions of the city of Košice. However, similar approach could be used for other cities dealing with the same issues. The overarching idea behind these recommendations is to maximize the aesthetic value of EVSE by minimizing its form. Its physical appearance in public space should be minimized, thus the size should be kept at minimal requirements for flawless functionality. This is the fundamental presupposition, from which there are 3 different approaches arising:

- Further minimization
- Normalization
- Maximization

### **8.2.1 Minimization**

As already mentioned, the underlying premise is minimizing the form of EVSE in public spaces. This applies mostly to the actual size of the EVSE pedestal, cutting out unnecessary signage, painted either on surface or on vertical poles.

Further minimization approach embraces the opportunity to make the EVSE almost 'invisible'. Besides making the pedestal as small as possible, this approach

advocates for using reflective materials for bodies of EVSE (see Figure 27). This proposal builds upon the reflective properties of such materials and brings forward the fact, that most of the public life happens at the street level where people are present. Thus reflecting the public life off the EVSE would create an illusion of even livelier space, and at the same time the reflective materials would make the charging stations much less visible.



**Figure 27** There are multiple options of how reflective materials could be processed ([https://boxshot.com/support/boxshot-help/mtl\\_reflection\\_3.jpg](https://boxshot.com/support/boxshot-help/mtl_reflection_3.jpg))

The issue with this approach is safety, namely there would need to be some sort of barrier surrounding the charging point and communicating to the unaware pedestrians that there is an obstacle in the way. The barrier could take a form of some sort of railing or bollards encircling the charging point from the side where most of the pedestrian flow happens.

This approach is inspired by the EVSE proposal by the industrial designer Ignacio Ciocchini for New York City Fire Department, depicted on Figure 29. The proposal counts on very little graphic work on the pedestal, prioritizes plain, empty surface made of reflective metallic material. Some of the materials to be used could be e.g. aluminum or polished stainless steel. Perfectly polished stainless steel could make a similar effect as encountered at the famous artwork 'Cloud Gate' by Anish Kapoor, which is located in Chicago (see Figure 28). This is obviously an extreme example, the solution should be also financially viable, therefore more accessible materials shall be used. Smoothly polished metallic materials seem like a feasible solution.



**Figure 28** Artistic usage of stainless steel at the 'Cloud Gate' piece by Anish Kapoor in Chicago

([https://cdn.vox-cdn.com/thumbor/saCT-a5pnMNGETrEG2uhAf8ZHJdl=/0x0:7360x-4912/920x613/filters:focal\(3208x2597:4384x-3773\):format\(webp\)/cdn.vox-cdn.com/uploads/chorus\\_image/image/60127725/shutterstock\\_1109460509.0.jpg](https://cdn.vox-cdn.com/thumbor/saCT-a5pnMNGETrEG2uhAf8ZHJdl=/0x0:7360x-4912/920x613/filters:focal(3208x2597:4384x-3773):format(webp)/cdn.vox-cdn.com/uploads/chorus_image/image/60127725/shutterstock_1109460509.0.jpg))



**Figure 29** Ignacio Ciocchini's proposal for the looks of an EVSE

DESIGN BY IGNACIO CIOCCHINI (<https://pbs.twimg.com/media/CXo6JAUWQAAVYQo?format=jpg&name=large>)

## 8.2.2 Normalization

The normalization approach brings forward the best compromise between the aesthetics and functionality of an EVSE. This approach is inspired by charging stations in Vienna (see Figure 30), where they create a subtle addition to the urban environment, but at the same time provide some space for branding of a city and a developer. Regarding the colors, very subtle metallic shade of gray is used and the signage on the ground is kept at minimum as well, using two lines – green and white, around the EVSE itself. As protection against the crash the bollards are used, as visible on pictures it is either two separate upright bollards to the left and right of the EVSE or it is railing-like protection from the roadside. Protection against being hit by a vehicle is in the same color as the body of the EVSE. Due to its fair size, non-disturbing colors used for the logos and surface painting, the charging point feels to be a part of the urban environment, but at the same time provides some space for branding of a developer and a city, provides necessary information on payment/usage and QR codes for further information.

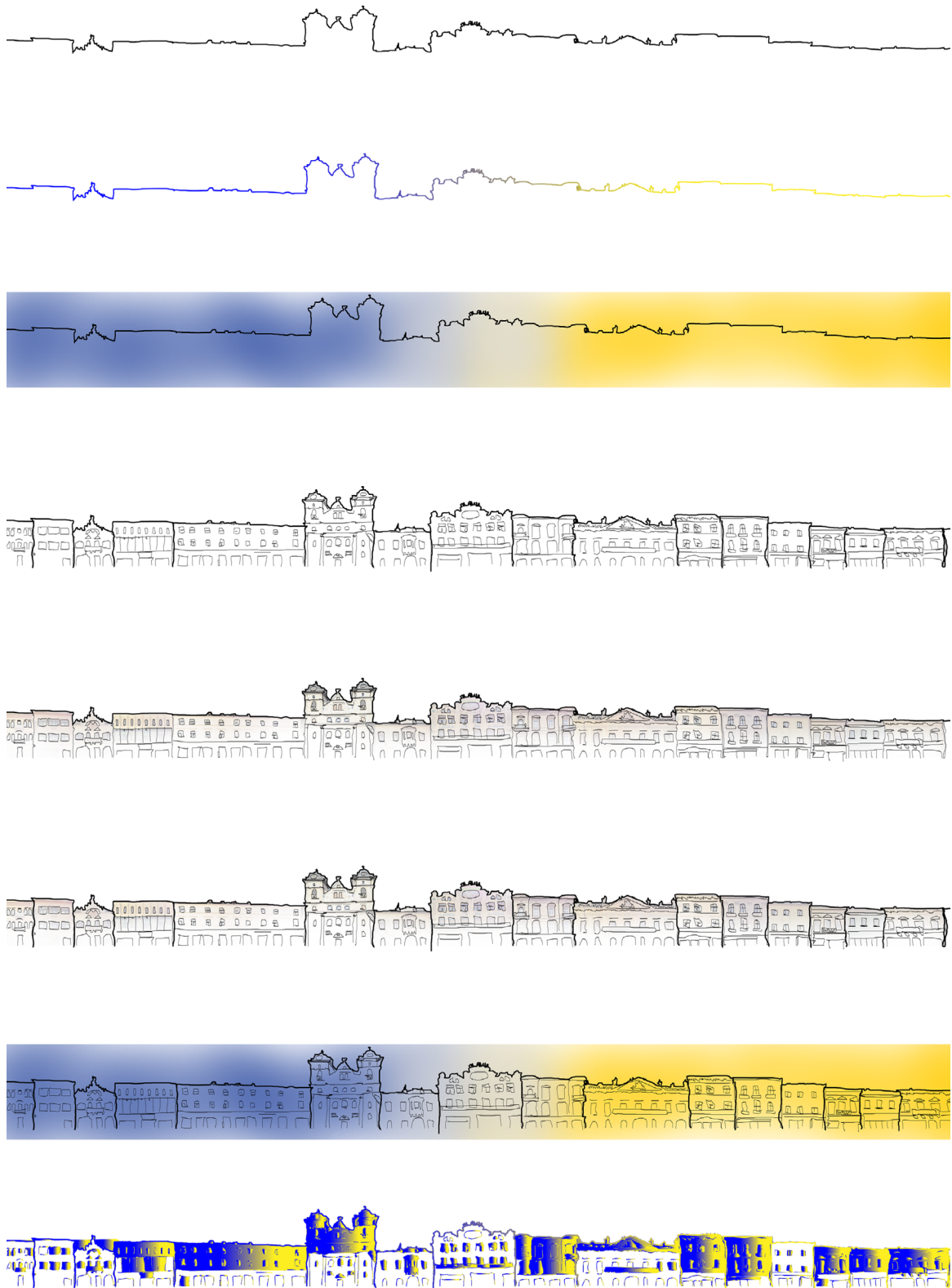
Normalizing approach advocates for smart usage of the space the pedestal provides, for example to put forward city branding in the form of city logo, city coat of arms, skyline or other subtle city designs. In this way the requirements of developers and investors could be fulfilled, as it would be possible for them to brand themselves, even though the branding should be fairly proportioned to the body of an EVSE, like at the case of Vienna.



**Figure 30** EVSE design in the context of broader city center in the city of Vienna  
(Photos by Miroslav Hudák)

The color for the body of a station should be the same one as the color municipality is trying to use for all the street furniture – in the case of Košice this is black or dark olive green (RAL 6006). The charging stations should be unified in terms of color, either using the dark green olive color which is already a part of city urban scape or using a neutral, non-invasive neutral metallic color, like in Vienna. The horizontal signage on the surface, designating the spot for charging of electric vehicles, should by no means use disturbing colors, like red, which is currently used by some developers in Košice, but rather use just white or possibly green linework the same way it is utilized in Vienna.

There is a great variety of motives the city could use to customize the charging stations. Good practice from different cities bring forward the usage of city skylines for example, as sort of subtle artistic customization of public features. For instance in Copenhagen the white skyline is used on all the bus stops (see Figure 32). In Košice skylines could be used as well as a feature to customize street furniture, including EVSE. Since blue and yellow are the colors of the city, these could be employed as well. At the Figure 31 there are multiple variations of the skyline of one of the main streets in Košice, and such skylines could be developed for different city districts. This is just an example of how skylines could be utilized more in the city.



**Figure 31** Different variations of city skyline, depicting one of the main streets in Košice (Artwork by Miroslav Hudák)





**Figure 32** City skyline used at the bus stops in Copenhagen  
(Photo by Miroslav Hudák)

### 8.2.3 Maximization

Maximization approach doesn't mean to maximize the form of an EVSE within an urban environment, the form is still recommended to be kept at minimal functional requirements, but rather to maximize the presence of the EVSE in the urbanscape, to put more emphasis on the interplay between the charging point itself and surrounding public space and to provide incentives for better interaction of charging stations and public life.

Maximizing the presence of charging stations in public space could be done in multiple ways. Košice presents itself as cultural center of the region and even the whole country. Simultaneously, some respondents in chapter 6 pointed out that the art is often confined in galleries, or only within the city center. Thus, one solution would be to use charging stations as carriers of art throughout the whole city. By doing this, the city would reestablish its position as cultural center and at the same time it would bring the culture closer to the citizens. Moreover, if some of the local artists (could be professional graphic designers as well as children from kindergarten) were commissioned by the municipality (or private investors), their artworks could contribute to better place attachment feeling by citizens. Similar art project has been carried out in the city of Takoma Park in the USA, where graphic designer Jay Shogo was commissioned to create new designs for 2 charging stations (see Figure 33). He used vinyl wraps to create beautiful designs, which were part of the city's public art programs designed to get art into the streets where everyone can enjoy it.



**Figure 33** Jay Shogo's design for EVSE in the city of Takoma Park, Maryland, USA  
 (<https://takomaparkmd.gov/department/makeover-for-electric-vehicle-charging-stations/>)

Another artistic approach could be to use designs to raise awareness of the importance of addressing climate crisis. An inspiration could be the city of Takoma Park again, where graphic designer Cindy Herrera designed a wrapping for an EVSE depicting windmills and electric cars, while being toned in green (see Figure 34).



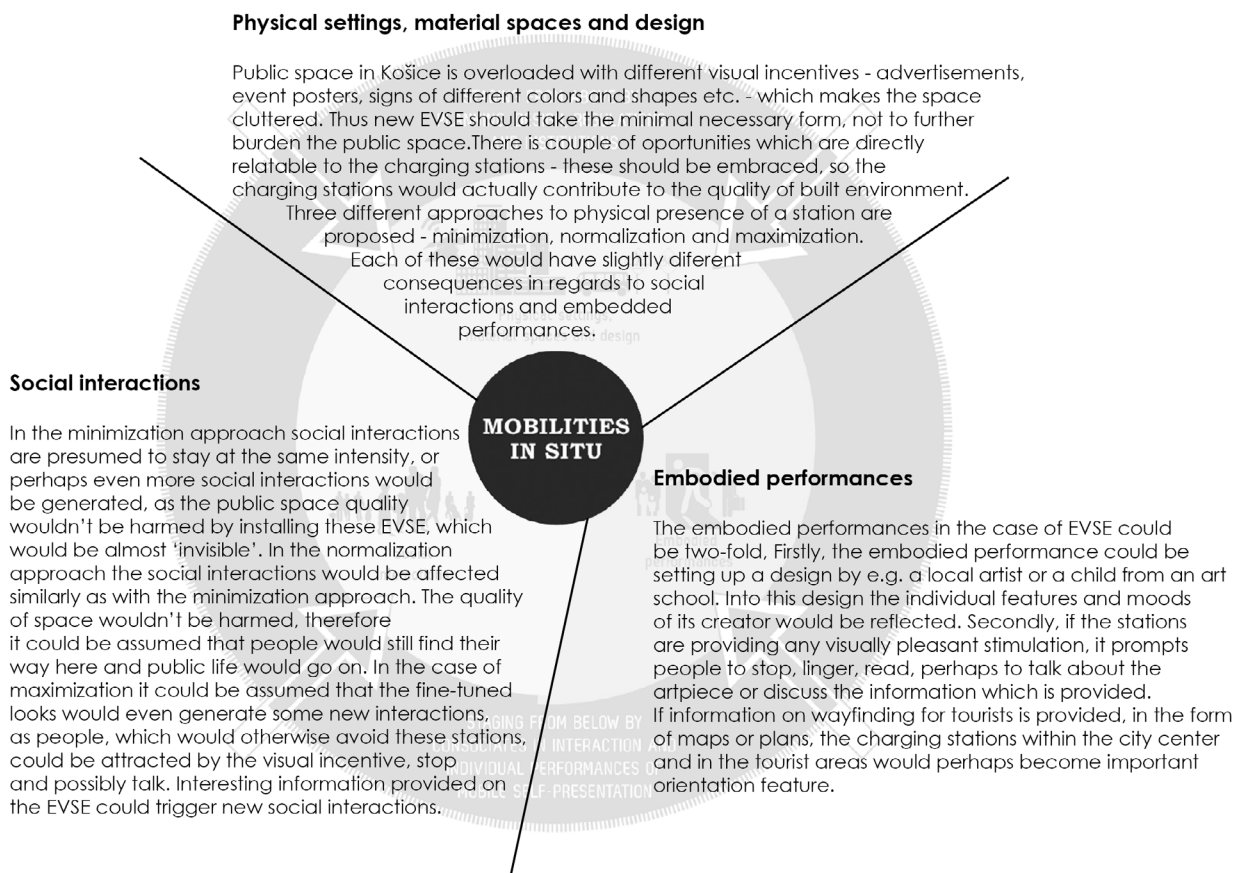
**Figure 34** Cindy Herrera's design for EVSE in the city of Takoma Park, Maryland, USA  
 (<https://takomaparkmd.gov/department/makeover-for-electric-vehicle-charging-stations/>)

Culture and art have an important role in the development of Košice and this fact could be nicely projected in the looks of EVSE. However, there are other ways how to strengthen the interrelationship between citizens and charging stations. This could be done by using the space the EVSE offer to provide some information on various topics – about the city, processes in the city, about the neighborhood the EVSE is located in, about environmental crisis etc. QR codes could be a part of the label as well, as it is a good way to provide some more information on the topic for

those citizens, who would find the information on the EVSE interesting.

## 8.3 Concluding remarks

There are different ways of approaching the design of an EVSE. In the case of Košice it seems necessary to keep the form, meaning size, shape, color, as subtle as possible, because anything else would burden up already cluttered public space. Besides the actual form of an EVSE, its presence in public space could be further minimized or articulated. There are three different approaches proposed in this chapter, each of them suggesting different appearance of a charging station. All of them are, however, under the framework of staging 'from above', they are manifestation of setting up the physical setting by those in charge. Different approaches in physical appearance would have different consequences in the way how these elements are being experienced 'from below'. Nonetheless, in regards to the fact that all the three styles are aiming for considerate approach towards urban environment, none of them should be downright harmful for the intensity and quality of social interactions and embodied performances.



**Figure 35** Staging the appearance of EVSE from above and experiencing different station designs 'from below', according to the 'staging mobilities' model

## 9 Conclusion

This research has attempted to understand what are the best ways of installing and integrating of technical infrastructure, more specifically charging stations for electric vehicles, into the urban environment of the city of Košice, which is located in the eastern part of Slovakia. The research began with the empirical problem, which was encountered in Košice, where there are multiple private developers deploying charging stations for electric vehicles all over the city, but since there are no design and planning guidelines, this is being done in a chaotic manner. Private investors are rarely paying attention to the urban context into which the stations are being installed, thus these often seem inappropriate and unsuitable. Issues are mostly concerning the size of the stations, as they are too big, occupying too much public space, but also the abundant use of bright colors, which could be perceived as disturbing the urban setting, or big, eye-catching branding signs, which are often depicted on the charging stations' bodies.

Several topics were reviewed and utilized as a framework for the research, beginning with the rise in numbers of sold electric vehicles and their general proliferation, through public space quality and aesthetics, to introducing the case of Košice with its natural and socio-economic parameters. A theoretical framework of 'mobilities in situ' was adopted to help in explaining the relations between the physical and social aspect of public space, between staging the urban environments 'from above' and experiencing them 'from below'.

To generate data which could be analyzed, few methods were chosen – questionnaire, document analysis and literature review. Questionnaire was used to find out about current deficiencies of public space in Košice and about possible opportunities for improvement of public space in the city. Eight respondents were inquired about their qualified opinions on aforementioned matters. As the most salient deficiency the respondents recognized abundance of visual smog, meaning unregulated branding in public places, clutteredness and disharmonious visual properties of public space in general. Among other problems were recognized low-quality maintenance of public spaces and redundancy of 'non-places' – places where nothing goes on and nobody visits them. These deficiencies serve as a presupposition and foundation for the opportunities for improvement of public space. Majority of respondents recognized as the best opportunity the development and adoption of clear public spaces strategy, or some sort of a manual for public spaces. This is a clear indication that what is really needed in Košice is to bring some order and system into the process of public space development. For this research the opportunities which could be related specifically to the charging stations are interesting – and these are reduction of visual smog, educating citizens, research into usage of existing public spaces, experimentation, using high-quality materials, and providing space for artists to exhibit outside galleries, a point which could be connected to the opportunity of spreading the culture out of the city center into other local centers. All these observations from chapter 6 could be seen as an answer to the first subquestion – *'What are the best opportunities for improving the aesthetics of public*

space in Košice?’

In the document analysis the focus was on finding out the considerations for charging stations which would be related to their looks, to their aesthetic properties. It is important to state, that documents discussing the charging stations are usually mostly concerned with the functional point of view. The considerations toward their aesthetic properties are rather exceptional, even though presented in detail in some documents. The aesthetic properties of technical infrastructure located in urban contexts is more often discussed in different public space strategies and manuals, which are cities adopting in order to regulate the development of public space. Seven documents were analyzed for what they say about the looks of charging stations. The considerations, which were found out, were categorized into 10 overarching groups – general considerations, localization and context, vandalization, comfort, safety, station body, colors, signage, contact details and instructions, and branding. The considerations and recommendations raised here are not necessarily the most suitable for the context of Košice, since they are coming from various backgrounds, where the urban reality is perhaps a whole different. These findings from chapter 7 build up an answer to the second subquestion of this research – *‘What are the main aesthetic considerations when integrating ‘electric vehicle supply equipment’ into urban environments?’*

These two chapters, one about public space opportunities and the other about common considerations for charging stations, serve as a foundation for the discussion of how could the charging stations in the specific context of Košice contribute to the general improvement of quality of public space. It has been found out that there are multiple ways, in which newly installed charging stations would not deteriorate the coherence of public space, but would, on contrary, affect the given space positively. Regarding the reduction of visual smog the charging stations could contribute by setting up a good example, if they are unified in design and used colors. The bodies of charging stations should be only subtle additions to the urban environment, they shouldn't hold too much branding and advertisement, even though if this is done in considerate way, charging stations could also set up a good example in public advertising. Regarding educating of citizens, EVSE could carry some information on e.g. climate crisis and benefits of electric cars, or information on some distinct city topics, such as information on the specific neighborhood or urban processes which are usually unknown to the general public. A point, which is not really connected to the aesthetics, but could be resourceful, is to use the installed EVSE to generate some data. Station sensor technology allows to collect data on e.g. motion, parking space availability, air temperature or traffic. Another point is to use high-quality materials, which would fit into given urbanscape and contribute to the quality of a particular space. A big opportunity for charging stations is related to the proliferation of art out of galleries and out of the city center. Košice presents itself as a cultural hub and embracing the charging stations as another opportunity to showcase local art would be yet another step towards becoming a real cultural center. Other than these opportunities, which were raised in chapter 6 and discussed in the beginning of chapter 8, there are another opportunities, raised in chapter 7, namely it is the opportunity to create a better sense of place by putting forward distinct city branding, which could be depicted on the bodies of EVSE. There are various

ways how to achieve this discussed in chapter 8, some examples are usage of city skylines, city logos or coat of arms. Also, charging stations, if spread all around the city, could provide some information on wayfinding, e.g. little maps or plans of the city, arrows pointing to the most exposed tourist attractions or other city landmarks. This service would serve mostly the tourists and it is in line with the observation of one of the respondents from the questionnaire, when the problem of insufficient wayfinding signage for tourists has been pointed out. All these findings could be interpreted as an answer to the third subquestion of this research – *'How could be the new charging stations integrated in Košice so to be in compliance with the best aesthetic opportunities for the city?'*

The answer to the main research question of this thesis – *'How to integrate 'electric vehicle supply equipment' into public space of Košice, while ensuring that they don't negatively affect the aesthetics of existing urbanscape?'* would be fairly similar to that one answering the third subquestion. The difference is that while the third subquestion already takes into account the opportunities for public space, in the main research question this approach is yet not determined, thus the answer to the main research question would be to take into consideration the local conditions and aim to contribute to their improvement, while exerting all the findings from subquestion 3. By adjusting to the local conditions and reality, the new interventions wouldn't break the continuity of public space development but would rather become a part of coherent urban space.

# 10 Reflections

This research provided me with a valuable opportunity to delve into the topic of aesthetics of public space, which I find especially interesting since I took a semester in Urban Design at Aalborg University. Nevertheless, it was quite alarming to find out, that development of public space in Košice is not guided by any formal strategy or manual. At the same time, coming from Slovakia, I sort of expected that. The fact is that cities in countries, which were denied their democratic rights under the oppression and power influence of socialist Soviet regime, are operated in a bit chaotic manner and still too little emphasis is put on creation of strategic materials, which could be directing future development. Nevertheless, public space in Košice has a huge potential, mainly due to passionate and active people which are nowadays trying to revive the public life. This activist underground, and cultural hub direction the city undertook, is fairly promising for the further development of public life and public space.

Regarding the future research on the topic, it is extremely interesting to look at the technology of inductive charging or magnetic resonance charging. Both these technologies hold a promise of charging electric vehicles with no need to use the charging cables. Wireless charging doesn't require any charging station in the current understanding of a pedestal located by the curb. Instead, the technology would be built-in the ground, thus it is enough for the car to stop at the designated spot and charging process can begin. At this point the technology is only available to achieve the transfer speed of 11 kW, which corresponds to slow charging. However, the future development of this technology promises higher power-transferring speeds. The advantage of this technology is that its impact on urbanscapes would be minimal, as the technology is built-in the ground. Another technology which could become more utilized in the future is battery swapping, which would shorten the process of charging to just couple of minutes. That is how much it would take to swap the dead battery from a vehicle and insert a fully-charged one.

Regarding the methodology of this research, it would be a good idea to get more respondents answering the questionnaire, and possibly even having some interviews, where the topic would be discussed more in-depth. Also, given more time, it would make sense to search for other documents which are discussing the integration of EVSE and visual considerations related to them. With more data the results of this research would become more sound, legitimate and reliable. Other than that, it could be interesting to contact some of the developers and interview them about their opinions on the aesthetics of charging stations they are installing into public space, if they are even aware of the problem and if they have some internal regulations in regards to the looks of these charging stations.

# Bibliography

- Ateliér URBAN.** (2019). MANUÁL VEREJNÝCH PRIESTOROV PRE PANENSKÚ ULICU A OKOLIE. Bratislava.
- Atrium Architekti.** (2018). MANUÁL TVORBY VEREJNÝCH PRIESTRANSTIEV MESTA PREŠOV. Prešov.
- Bailey, S.** (2015). Academic Writing (A Handbook for International Students). Abingdon: Routledge.
- Bautz, G., Bistricky, D., Leydet, Z., Rode, J., & Rode, P.** (2016). Identität und Raum. Vienna: Stadtentwicklung Wien.
- Berleant, A., Carlson, A., Banskoff, P. v., Sepänmaa, Y., Macauley, D., Brotzman, M., . . . Andrews, M.** (2007). The Aesthetics of Human Environments. broadview press.
- Carmona, M.** (2010). Contemporary Public Space, Part Two: Classification. Journal of Urban Design, 15(2), 157-173.
- Carmona, M.** (2010, January 18). Contemporary Public Space: Critique and Classification, Part One: Critique. Journal of Urban Design, pp. 123-148.
- Carmona, M., Tiesdell, S., Heath, T., & Oc, T.** (2010). Public Places - Urban Spaces. Oxford: Elsevier.
- Carr, S., Francis, M., Rivlin, L. G., & Stone, A. W.** (1992). Public Space. Cambridge University Press.
- Commision for Architecture and the Built Environment.** (2000). By Design (Urban design in the planning system: towards better practice). London: Department of the Environment, Transport and the Regions.
- Čišková, L., Drobný, M., Hubinský, R., Kabát, L., & Lacko, Ľ.** (2018). ROČENKA 2019 ELEKTROMOBILITA V SR. Bratislava: Digital Visions, s. r. o.
- European Automobile Manufacturers Association.** (2018). New Passenger Car Registrations by Fuel Type in the European Union.
- European Commision.** (2020). Reducing CO2 emissions from passenger cars - before 2020. Retrieved March 26, 2020, from [https://ec.europa.eu/clima/policies/transport/vehicles/cars\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/cars_en)



- European Commission.** (2020). A European Strategy for low-emission mobility. Retrieved March 25, 2020, from [https://ec.europa.eu/clima/policies/transport\\_en](https://ec.europa.eu/clima/policies/transport_en)
- European Commission.** (2020). CO2 emission performance standards for cars and vans (2020 onwards). Retrieved March 26, 2020, from [https://ec.europa.eu/clima/policies/transport/vehicles/regulation\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en)
- European Commission Joint Research Centre .** (2018). Electric vehicles in Europe from 2010 to 2017: is full-scale commercialization beginning?
- European Environment Agency.** (2016). Electric vehicles in Europe. Luxembourg: Publications Office of the European Union.
- European Environment Agency.** (2019). Monitoring of CO2 emissions from passenger cars – Regulation (EC) No 443/2009 . Retrieved March 26, 2020, from <https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-16>
- European Parliamentary Research Service.** (2019). Electric road vehicles in the European Union.
- EV Association Scotland; Orkney Renewable Energy Forum.** (2016). Electric Vehicle Charging Infrastructure (A Design Guide).
- Farthing, S.** (2016). Research Design in Urban Planning. London: SAGE Publications Ltd.
- Freudendal-Pedersen, M., Kesselring, S., & Servou, E.** (2019). What is Smart for the Future City? Mobilities and Automation. *Sustainability*, 11(1).
- García-Doménech, S.** (2015). URBAN AESTHETICS AND SOCIAL FUNCTION OF ACTUAL PUBLIC SPACE:: A DESIRABLE BALANCE. *Theoretical and Empirical Researches in Urban Management*, 10(4), 54-65.
- Gehl, J.** (2012). *Města pro lidi (Cities for People)*. Brno: Partnerství, o.p.s.
- Global Designing Cities Initiative.** (2016). *Global Street Design Guide*. Island Press.
- Greener, I.** (2013). *Introduction to Social Research Design – or What Are You Talking About?* London: SAGE Publications Ltd.
- Greenway Infrastructure; CleanTechnica.** (2017). *Electric Vehicle Charging Infrastructure (Guidelines for Cities)*. Warsaw.
- Hasselgreen, J., Norgaard, L. S., Hudák, M., & Petersen, M. K.** (2019). *A multi-level perspective analysis of a transition towards sustainable development in Aalborg Municipality*. Aalborg.

- Hatton, C., Beella, S. K., Brezet, H., & Wijnia, Y.** (2009). Charging Stations for Urban Settings the design of a product platform for electric vehicle infrastructure in Dutch cities. *World Electric Vehicle Journal*.
- Hubinský, R., Drobny, M., Ferenc, V., Pecho, F., Kabát, L., Badík, P., . . . Pinkoš, P.** (2020). *Elektromobilita 2020*. Bratislava: Digital Visions, s. r. o.
- Hudák, M., Lundmark, T., Malveira, S., Mericskai, D., & Potihonins, M.** (2019). Helsinki-Tallinn Tunnel Leading Narrative (A Vision for a Cross-border Region). Aalborg.
- Institut plánování a rozvoje hlavního města Prahy.** (2014). *Manuál tvorby veřejných prostranství hlavního města Prahy*. Prague.
- Institut plánování a rozvoje hlavního města Prahy.** (2014). *Strategie rozvoje veřejných prostranství hlavního města Prahy*. Prague.
- International Energy Agency.** (2018). *Global EV Outlook 2018*.
- Jensen, O. B.** (2013). *Staging Mobilities*. New York: Routledge.
- Jensen, O. B.** (2014). *Designing Mobilities (Art and Urbanism ed.)*. Aalborg: Aalborg University Press.
- Kaminska, A.** (2008). *Towards an Urban Aesthetics*. *Public*(37).
- Kancelář architekta města Brna.** (2019). *Principy tvorby veřejných prostranství*. Brno: Kancelář architekta města Brna, p. o.
- Leddy, T.** (1995). Everyday Surface Aesthetic Qualities: "Neat," "Messy," "Clean," "Dirty". *The Journal of Aesthetics and Art Criticism*, 53(3), 259-268.
- Logios for the Transportation and Climate Initiative.** (2013). *LESSONS FROM EARLY DEPLOYMENTS OF ELECTRIC VEHICLE CHARGING STATIONS (Case Studies from the Northeast and Mid-Atlantic Regions)*. Washington, D.C.
- Lukačovič, A., Nižňanský, V., Gero, P., Urminský, J., Drgoň, M., Kollár, M., & Kováčová, M.** (2016). *Verejné priestory*. Hlohovec: Mesto Hlohovec.
- Lygh, B. N.** (2015). *Urban Planning – Handling an increasingly diversified and multi-cultural Copenhagen*. Aalborg.
- Lynch, K., & Malcolm, R.** (1959). A Walk Around the Block. *Landscape*(8), 24-34.
- Magalhaes, C. d., & Carmona, M.** (2007). Dimensions and models of contemporary public space management in England. *Journal of Environmental Planning and Management*, 52(1), 111-129.

- Mehta, V.** (2014). Evaluating Public Space. *Journal of Urban Design*, pp. 53-88.
- Message, M.** (n.d.). Life Cycle Analysis of the Climate Impact of Electric Vehicles.
- Nádaská, Z., Kubišová, M., & Pilař, P.** (2017). VEREJNÝ PRIESTOR STUPAVA 2017. Stupava: Mesto Stupava.
- Národná rada Slovenskej republiky.** (2019). Zákon 378/2019 Z.z. ktorým sa mení a dopĺňa zákon č. 555/2005 Z.z. o energetickej hospodárnosti budov a o zmene a doplnení niektorých zákonov v znení neskorších predpisov.
- New York City Department of Transportation.** (2015). Street Design Manual.
- Pachenkov, O., & Voronkova, L.** (2013). Urban Public Space (Facing the Challenges of Mobility and Aestheticization). Frankfurt am Mein: PL Academic Research.
- Pallasmaa, J.** (1994). An Architecture of the Seven Senses. *ARCHITECTURE AND URBANISM*, 27-38.
- Scrutton, R.** (1984). Public space and the classical vernacular. *The Public Interest*, 74(5).
- Sennett, R.** (2010). The Public Realm. In *The Blackwell city reader* (pp. 261-272).
- Sidorová, M., Skorkovská, G. V., Ulahelová, A., Ružiak, T., Štassel, I., Konrad, I., . . . Varga, I.** (2018). *Nová Obchodná*. Bratislava: Obchodná ulica a okolie, o.z.
- Silverman, D.** (2006). *Interpreting Qualitative Data*. SAGE Publications Ltd.
- Silvester, S., Beella, S. K., Timmeren, A. v., Bauer, P., Quist, J., & Dijk, S. v.** (2013). Exploring design scenarios for large-scale implementation of electric vehicles; the Amsterdam Airport Schiphol case. *Journal of Cleaner Production*, pp. 211-219.
- Stanilov, K.** (2007). *The Post-Socialist City*. Dordrecht: Springer.
- Šted'anská, L., Dudáš, M., & Magová, M.** (2019). *MANUÁL REKLAMY MESTSKEJ PAMiatkovej REZERVÁCIE ŽILINA*. Žilina: Krajský pamiatkový úrad Žilina.
- Sustainable Transportation Strategies.** (2012). *Site Design for Electric Vehicle Charging Stations*.
- Štatistický úrad Slovenskej republiky.** (2019). DATA cube. Retrieved 3 23, 2020, from [http://datacube.statistics.sk/#!/view/sk/VBD\\_DEM/om7102qr/v\\_om7102qr\\_00\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_DEM/om7102qr/v_om7102qr_00_00_00_sk)

- Šteiner, A., Záborská, Z., Knežová, J., & Hanušovská, M.** (2015). Program rozvoja mesta Košice 2015-2020 (2025). Košice.
- The European Consumer Organization.** (2016). Low carbon cars in the 2020s.
- Thomas, M.** (1991). The Demise of Public Space. *Town Planning Responses to City Change*, pp. 209-224.
- Transport & Environment.** (2017). Electric vehicle life cycle analysis and raw material availability.
- Transport & Environment.** (2018). Electric Vehicles: The Truth.
- Transport for London.** (2010). Guidance for implementation of electric vehicle charging infrastructure. Transport for London.
- Tsuruta, M.** (2019). Planning in the Face of Technological Innovation: A Case Study of the San Francisco Bay Area's Handling of Autonomous Vehicles. Aalborg.
- U.S. Department of Energy.** (2014). The History of the Electric Car. Retrieved March 28, 2020, from <https://www.energy.gov/articles/history-electric-car>
- United Nations.** (2019). The Sustainable Development Goals Report 2019. New York.
- Varna, G., & Tiesdell, S.** (2010). Assessing the Publicness of Public Space: The Star Model of Publicness. *Journal of Urban Design*, 15(4), 575-598.
- Vermont Energy Investment Corporation.** (2014). Electric Vehicle Charging Station Guidebook. U.S. Department of Transportation.
- Vienna Municipal Administration.** (2019). Smart City Wien Framework Strategy 2019 – 2050. Vienna: Vienna Municipal Administration.
- Wallace, M., & Wray, A.** (2011). *Critical Reading and Writing for Postgraduates*. London: SAGE Study Skills.
- WXY architecture + urban design.** (2012 ). ASSESSMENT OF CURRENT EVSE AND EV DEPLOYMENT.
- WXY architecture + urban design.** (2012). CREATING EV-READY TOWNS AND CITIES: A GUIDE TO PLANNING AND POLICY TOOLS (ELECTRIC VEHICLE SUPPLY EQUIPMENT SUPPORT STUDY).
- WXY architecture + urban design.** (2012). EV-READY CODES FOR THE BUILT ENVIRONMENT (ELECTRIC VEHICLE SUPPLY EQUIPMENT SUPPORT STUDY).
- WXY architecture + urban design.** (2012). Siting and Design Guidelines for Electric Vehicle Supply Equipment.

**WXY architecture + urban design.** (2013). EVSE CLUSTER ANALYSIS (Electric Vehicle Supply Equipment Support Study).

**WXY architecture + urban design.** (2015). ACCOMMODATING GARAGE ORPHANS (in Boston, Cambridge, and Somerville).

**WXY architecture + urban design; Barretto Bay Strategies.** (2018). Curb Enthusiasm (Deployment Guide for On-Street Electric Vehicle Charging). New York.

**ZSE DRIVE.** (n.d.). Základné princípy brandovania nabíjacích miest.

**Zukin, S.** (1995). The Cultures of Cities. Oxford: Blackwell.

**Zumthor, P.** (2006). Atmospheres: Architectural Environments. Surrounding Objects. Birkhäuser.