

An Atlas of Brno City Centre for Wheelchair Users: Concept, Production and Beyond

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Abstract

This paper deals with the accessibility mapping of Brno city centre for wheelchair users, which resulted in the production of an accessibility atlas printed in 2012. User requirements, the concept of the atlas, and its production as well evaluation are the main subjects of this paper.

The primary motivation for conducting accessibility mapping in Brno arose from the fact that there was a lack of information on accessibility for people with impaired mobility. First, the target group of users of the accessibility atlas had to be defined. Among people with impaired mobility, wheelchair users have the most demanding requirements. Those requirements were based on discussions with potential users.

The atlas consists of two sections – a map section and a text section with additional information on accessibility at the selected locations. This allows the incorporation of additional explanations that could not be placed on the map, but which are of fundamental importance for wheelchair users.

The main goal of our work was to identify locations of everyday life in the city centre of Brno that are accessible to wheelchair users. Public institutions and cultural institutions such as museums and theatres were mapped completely, even those which are not barrier-free.

We collaborated with several institutions to propose standardized map symbols that may be re-used in maps and atlases for wheelchair users. Two kinds of information were assigned to each individual symbol: qualitative information, i.e. the type of object; and quantitative information, i.e. the degree of accessibility. The results of the accessibility mapping of Brno city

centre are stored in a geodatabase. This contains geographical coordinates and all attributes related to accessibility. Detailed accessibility data presented in the text section extends the information given by the map.

Masaryk University, Brno City Municipality, and two organisations representing the interests of wheelchair users contributed to the creation of the atlas. Masaryk University and Brno City Municipality prepared the map and text parts, while the organisations for wheelchair users provided feedback from the users. The printed atlas reflects the work undertaken by the above-mentioned organisations over the last three years. It is available to all wheelchair users free of charge through Brno City Municipality contact points.

Discussion on the advantages and disadvantages of the created atlas can be found at the end of this paper.

Keywords: Accessibility, wheelchair user, map, map sign, atlas

1. Introduction

Nowadays, the topic of disability is very common and a strong effort for integrating physically disabled people into society of “normal people” is being made. Various tools for people with impaired mobility are created. Accessibility mapping is one way how to help them do the same activities as healthy people do. There are lots of possibilities in the cities but not all of them are suitable for physically disabled people. Accessibility mapping is the first step for analysing the accessibility that can be presented to the people with impaired mobility.

One of the basic questions related to the accessibility mapping is how the concept of space should be presented to the people with impaired mobility. We should bear in mind that the orientation in space through maps originates from the cultural concept. As such it differs between various societies as well as within societies, e.g. determined with limited mobility. Discussions on these issues are only partly in the scope of this paper since are thoroughly described in other scientific papers, for instance Matthews, Vujakovic 1995.

This paper focuses on the main aspects of accessibility mapping and making maps for people with impaired mobility. It covers the definition of people with impaired mobility and their requirements for accessibility maps, then the possibilities of accessibility mapping and finally, map making itself. It is important to specify the proper map signs and take into consideration map

communication between the cartographer and map users. As a result, the Accessibility Guide of Brno City Centre for people with Limited Mobility was published in December 2012.

2. Users and user requirements

2.1. Definition of people with impaired mobility

According to the World Health Organization (WHO), impairment is a problem in body function or structure while disability is defined as an umbrella term for any kinds of impairments and is any restriction or lack of ability to perform an activity within the range considered normal for a human being (*Disabled world, 2009*).

It is possible to say that people with impaired mobility is a wide group of people that has a lack of ability to move. In Czech Notice n. 398/2009 Sb. which is obligatory to follow in the field of accessibility in the Czech Republic, the people with impaired mobility are:

- People with motoric handicap
- Elder people
- Pregnant women
- People with babies in prams or with children under 3 years old.

These people can count up to 30 % of population.

2.2. Users of an atlas and their requirements

As it was said in the definition above, people with impaired mobility are a large group of inhabitants who use different tools for their movements. Among the people with impaired mobility, people using an electric wheelchair have the highest requirements for accessibility. It is possible to say that the location which is accessible to a person using a wheelchair is accessible to everyone. For that reason, the aspects of accessibility were evaluated according to the needs of people using an electric wheelchair.

While making a map, it is important to know the target group of users very well. Jaňura (2011) held discussions with wheelchair users for the purpose of accessibility guide of Brno. As a result, the target group of users was defined as various people with different education, family background, hobbies and experience. It was found out that many of them are not good at map orientation and some of them are using the towers of churches as an important orientation points.

3. Accessibility data

Accessibility mapping is an important period of making an accessibility map. During this time, all information about accessibility that is presented in the map is gained. The main goal of our work was to identify the locations of everyday life in the city centre that are suitable for wheelchair users. Public institutions and cultural institutions such as museums and theatres were mapped completely, even those which are not barrier-free. While the other locations, i.e. pharmacies, hotels, ATMs, banks, restaurants, cafés and post offices were covered only if there is an access for people on wheelchair.

It is important to develop methodology for mapping of locations in Brno city centre. It was cooperated with Prague Organization of Wheelchair Users and other specialists in the area of barrier that set the rules¹ for classification of locations into three major groups. It is accessible location, partially accessible location and inaccessible location.

- Accessibility mapping started in 2009 by students of cartography and ended in summer 2012 when Brno city municipality updated all information presented in the atlas. Following parameters were examined parameters as: Geographical locations and the type of location
- An access to the building
- Accessibility possibilities inside the building
- Barrier-free toilets and reserved parking places.

3.1. Results of mapping

As a result of mapping, the geodatabase of accessible locations was made. It contains the geographical position and attributes of accessibility which corresponds with the methodology mentioned above.

The geodatabase contains 160 locations in total, 105 are accessible, 36 accessible with assistance and 19 inaccessible.

The graphs at Figure 1 and 2 show some results of accessibility mapping. The percentages of accessible, accessible with assistance and inaccessible locations follow the main aim of our work – to present locations which are barrier-free. Inaccessible locations are covered only in case of public institutions, cultural locations, tourist information centres and churches.

¹ Official methodology for accessibility mapping in the Czech republic can be found at: http://www.presbariery.cz/prilohy/metodika_mapovani_pristupnosti.pdf [in Czech]

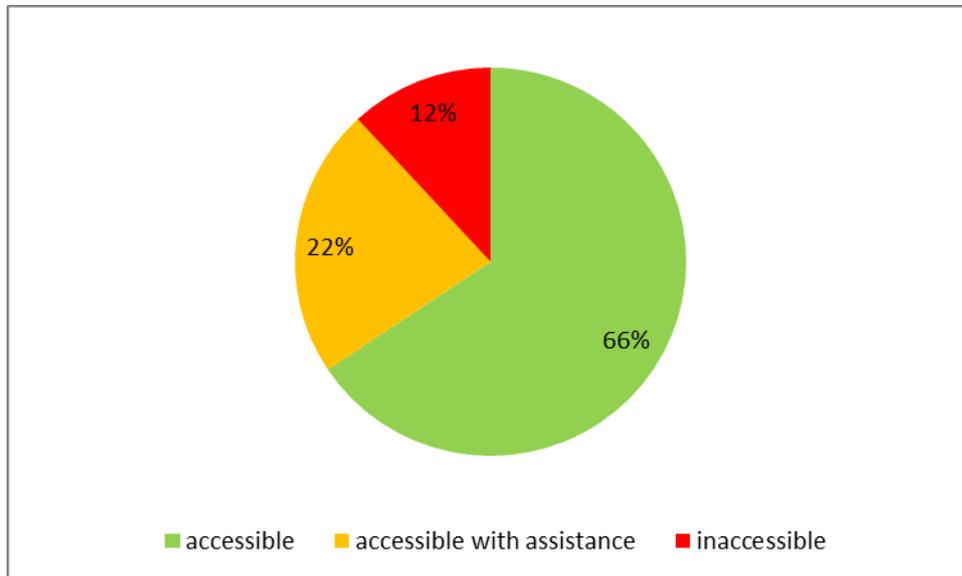


Figure 1 The percentages of accessible, accessible with assistance and inaccessible locations in the accessible map.

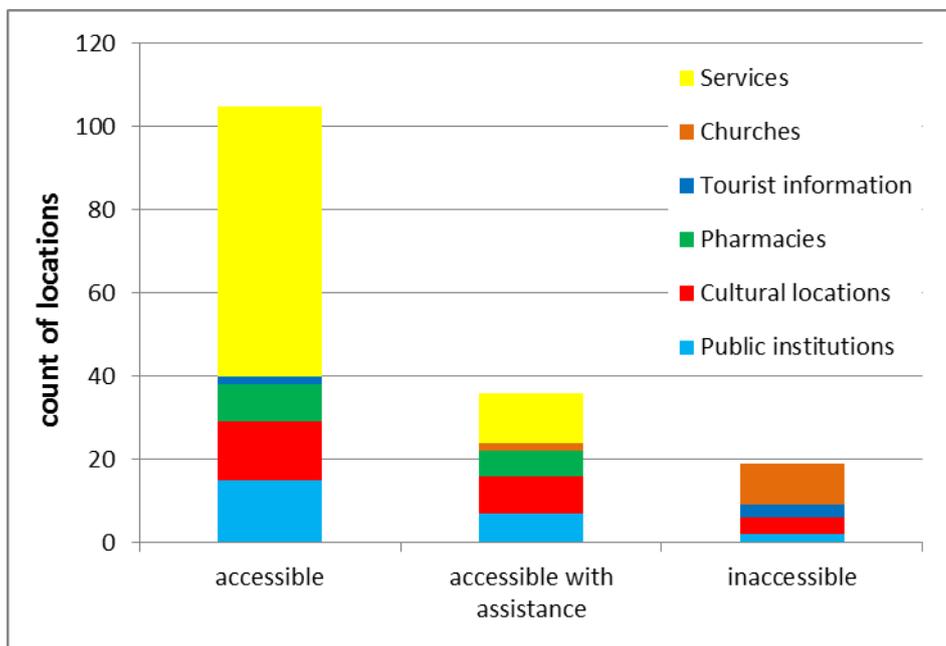


Figure 2 The count of locations divided by its type.

4. Concept of an Atlas

Data about accessibility are spatial data. Thinking about the information on the type of location, it is qualitative data, referring to the degree of accessibility, it is quantitative data. "A picture may be worth a thousand words, but a map can represent millions of data points." (*Pickle L, 2003*) Taking it into consideration, a map is a suitable kind of presentation of accessibility data.

The atlas is divided into two sections, a map part and a text part.

4.1. The map section

The map section of the atlas consists of 19 pages of accessibility map of Brno city centre. First of all, it is important to realise that a map is not only the presentation of spatial data but especially the way of communication between cartographer and map user. The process of map communication was described by MacEachren (1979) and is shown at Figure 3.

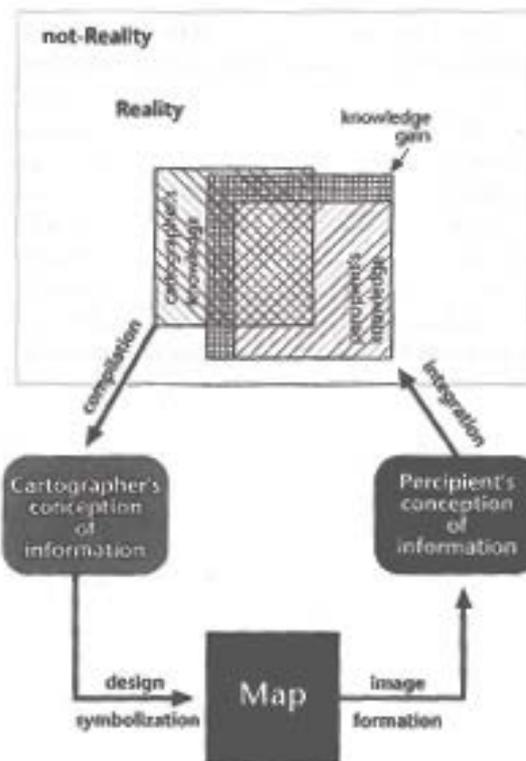


Figure 3 A process of graphic communication according to MacEachren (1979, Fig. 1.3, pp. 10-11).

According to the Figure 3, cartographer try to communicate all the information covered in the map via map symbolization. Bertin (1967) distinguish 6 variables of map sign. It can vary in size, value, texture, colour, orientation and shape. Moreover, it should correspond with the low experience of people with impaired mobility with orientation in the map described at 2.2 Users and user requirements.

Each map symbol should represent the type of object (qualitative information) and the degree of accessibility (quantitative information). This leads to using two of the variables of map sign mentioned above. Furthermore, Pravda (1997) says that map symbols should be conventional and associative so that it is easy to understand the meaning of symbols.

Following the publisher of Accessibility Guide of Brno City Centre for People with Limited Mobility, Brno City Municipality, map symbols were

unified with the guidelines for displaying information on accessibility presented by Prague Organisation for Wheelchair Users.

The level of accessibility is delegated by a colour which is in the background of a pictogram. While the shape of a small picture inside the picture represents the type of location. The general square shape of symbol is given by Prague Organisation for Wheelchair Users.



Figure 4 An example of map signs - accessible theatre, theatre accessible with assistance and inaccessible theatre.

Figure 4 shows the example of map sign for an accessible theatre, theatre accessible with assistance and inaccessible theatre. The accessibility is presented by a different colour. The colour scheme corresponds with traffic light's colours used in the Czech Republic and the green and red colour world-wide. For that reason, the presented colour scheme is very intuitive and easy to understand. Green, orange and red are colours that are used for displaying accessibility most often in analysed maps.

The picture of a face mask is a pictogram which represents theatre world-wide. All pictograms used for different locations were chosen with respect to the type of location and generally known symbol which is connected to the location. Pictograms are associative and it is possible to guess their meaning without using the legend.

Layers of buildings, streets, parks, water sources, railways and roads were used as a base map. The base map was provided by Brno City Municipality and Institute of Computer Science of the Masaryk University. All layers of the base map were visualised by bright colours so that the thematic content is expressive enough. Churches and culture locations were highlighted among buildings. Churches are the important orientation points for many wheelchair users as it was said at 2.2 Users and user requirements. Culture locations are very often a desired destination, so it is useful to find them quickly in the map.

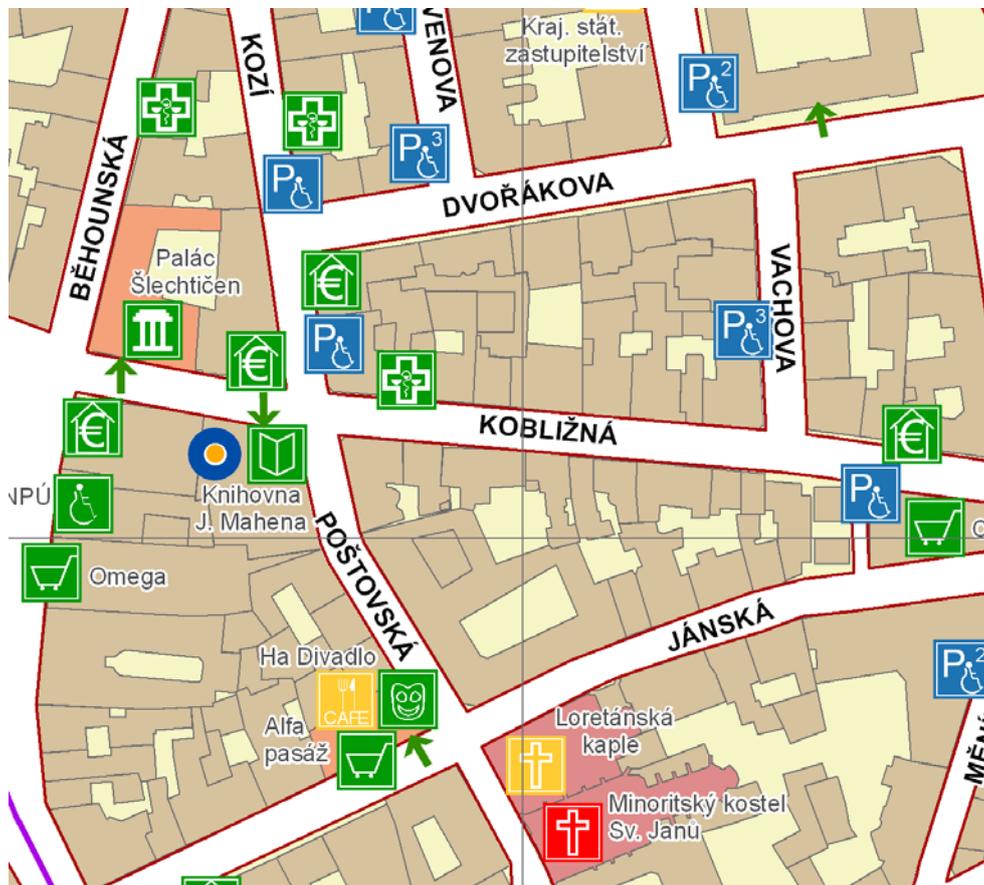


Figure 5 A part of the accessibility map published at Accessibility Guide of Brno City Centre for People with Limited Mobility (2012).

The labels were added to the final map. They were placed with an effort to show hierarchies and follow the rules set by Kraak (2003):

- They should be able to convey hierarchies (differentiating between more and less important objects)
- They should be able to show nominal differences (between different data categories)
- It should be possible to use them for relating to both point, line, and area objects.

Streets, public transport stops and important locations of city centre were labelled. Figure 5 shows a part of the final map presented at Accessibility guide of Brno City Centre for people with Limited Mobility.

4.2. The text section

The text section provides additional information about accessibility that cannot be displayed in the map. Each location is described by address and information about the entrance to the building, possibilities to move inside the building, reserved parking places and barrier-free toilets.

These data are presented by special pictograms which were created and supplied by Prague Organization for Wheelchair Users. Pictograms are used in accessibility atlas of Prague, the capital of Czech Republic.



Figure 6 Pictograms representing accessibility at the text section of the atlas, from the left side: uneven surface, difficult slope, barrier-free main entrance, barrier-free side entrance, staircase, spiral staircase, lift, platform or lift for people with physical disabilities, rails or ramps, narrow doors or passages, accessible WC – WC I., partially accessible WC – WC II., standard WC (Prague Heritage Reservation Accessibility Atlas for People with Impaired Mobility, 2010).

Figure 6 shows pictograms that indicate accessibility in the text part of the atlas. They were used in both Prague Heritage Reservation, Accessibility Atlas for People with Impaired Mobility and Accessibility Guide of Brno City Centre for People with Limited Mobility.

Using the same symbols at both atlases has the specific meaning – physically disabled people need to learn just one way of presenting accessibility in the maps. There is a high probability that these pictograms as well as map signs are to be used in other accessibility maps in the Czech Republic. It tends to be the official way how to express accessibility for people with impaired mobility.

The map section and the text section together consist of 88 pages. It is overall information about accessibility of Brno city centre and Brno City Municipality plans to publish new issue every year.

5. Conclusions and discussion

Development and production of the Accessibility Guide of Brno City Centre for People with Limited Mobility took over 3 years. Several steps of work had to be done to achieve printed atlas in 4000 copies distributed free of charge to wheelchair users. As a first step, accessibility maps were analysed from the following countries: Czech Republic, Italy, Germany, Norway, Slovakia, Australia and New Zealand.

According to the results of this analysis, the map content was set and the methodology of presenting cartographic information was developed. Using the special maps signs is rather common way how to express accessibility among the analysed maps. The created map symbols cover both the qualitative information, i.e. type of the location and quantitative information, i.e. the level of accessibility.

Even though map provides the information about the general accessibility of the location, the further information on accessibility is needed. Additional data about accessibility are presented by special pictograms in the text part of the guide. These pictograms are used in the accessibility atlas of Prague and tend to be the official way of presenting accessibility in Czech Republic.

The accessibility map was published as an accessibility atlas because the booklet is considered to be easy to manipulate for people on wheelchair. The style of the atlas corresponds with the accessibility atlas of Prague that is considered as an advantage. Wheelchair users need to learn the meaning of symbols only once but understand the map in two biggest cities in the Czech Republic. Furthermore, we have initiated negotiations with other cities in the Czech Republic to develop “cartographical interoperability” in accessibility mapping and thus to ease reading of such atlases to the wheelchair users.

Information on accessibility significantly varies in cities with about 500000 inhabitants in time. Our more than three years experience shows that circa 15 – 20% accessibility locations were changed a year. For that reason, Brno City Municipality together with the Department of Geography of Masaryk University plans to publish a new issue of the guide every year. The following issue(s) will be improved according to the feedback of wheelchair users that are collected to the first edition of this guide.

This research has been supported by funding from the project of Masaryk University under the grant agreement No. MUNI/A/0902/2012, which is called ‘Expression of Global Environmental Change in Component Earth’s Spheres’.

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