Outline of Conceptual Framework

Report D1.1 WalkUrban

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1. Introduction

The overall goal of the WalkUrban project is to come to a better understanding of local accessibility and urban walkability in order to free up the potential for walking. The project combines quantitative and qualitative methods through innovative analyses of walkability. This report outlines the main results from work package 1 (WP 1) “Conceptual framework /state-of-the art” and presents results from policy and literature reviews in order to establish the conceptual framework for the further course of the project.

During the course of the last century, new transport means and infrastructure changed the fabric of cities and – together with other transformations – had a significant impact on shaping the life of the people. After World War 2, a rapid rise in car use – especially in Western countries – has changed the outlook of our cities even further. Many households moved to the outskirts of the city to live in low-density suburbs while commuting on a daily basis (mainly by car) to the city. Ample car infrastructure and car parking was developed and only a modest share of the road space was allocated to cyclists and pedestrians. Transport planners focused on maximizing car traffic flows, thereby largely ignoring the safety, health and well-being of other travellers (non-car users) and residents. Due to the negative externalities of car use, such as air and noise pollution, congestion, and traffic accidents, many cities are now (mainly since the beginning of this century) trying to reduce car use and promoting shifts to public transport and active travel. Besides financially discouraging car use (e.g., by road pricing such as in London, Stockholm and Singapore) cities also try to make changes to the design of roads, making car use less attractive and walking and cycling more pleasant. Planning for cars has shifted towards planning for people. Many (mainly European) cities have developed Sustainable Urban Mobility Plans (SUMPs) which try to make changes to the design of the built environment in addition to supplementary actions to discourage car use. These plans often include traffic calming principles (e.g., lowering travel speeds, road humps), banning cars in parts of city centres (e.g., main shopping areas), creating low-traffic neighbourhoods, reducing parking spaces, and an improvement of infrastructure for cyclists and pedestrians. Doing so, these plans try to create a modal shift away from cars and a more pleasant living environment for residents. Only recently, many cities reacted to mitigate the COVID-19 related health risks and dedicated more road space for pedestrians or other activities, both in city centres and in local neighbourhoods, where many residents faced strong restrictions of movements due to full or partial lockdowns.

Focusing on walking, cities may both concentrate on macro and micro scale elements of the built environment. Compact and mixed-use neighbourhoods enable people to walk to destinations since a high density and diversity result in low average distances. In low-density and single-use neighbourhoods, walking is mostly not an option as distances to most destinations are too long. Thereby, cities are now trying to create neighbourhoods where most destinations (e.g., schools, supermarkets) are accessible within 15 minutes, either by walking (or cycling), or in combination with public transport (for more centralised destinations). This concept of a “15-minutes-city” was recently adopted by several cities, such as Paris. However, also micro-scale elements are important. Many neighbourhoods (especially in the suburbs) often do not have sidewalks at all, or they are in poor condition. Limited or low-quality infrastructure for pedestrians may discourage people from walking. In order to stimulate walking and increase its modal share, broad, well-lit sidewalks are needed, ideally well-separated from motorized traffic (e.g., by creating low-traffic areas). Frequent and safe crossings support a dense pedestrian network and avoid detours. In case of bigger or more busy roads or with regards to vulnerable groups, dedicated pedestrian crossings such as zebra crossings or pedestrian traffic lights should be provided in close proximity of important destinations. Short waiting times and adapted crossing timeslots for slow walkers such as children or elderly are helpful as well. Additional elements which can encourage walking are: the presence of benches, aesthetic appeal of the area through arts and the presence of green elements (e.g., trees, flower beds, hanging baskets). All these elements can make walking more convenient and pleasant and therefore result in an increased share of walking.

For the WP 1 state-of-the-art analysis and the corresponding literature review, the WalkUrban project-team analysed examples of dedicated pedestrian policies and existing guidelines as well as the existing pedestrian transport policies in the three case study cities. During the course of WP 1, we decided to shift the focus of the research slightly and the original outlined topics of objective, subjective and perceived accessibilities have been integrated into the analysis of perceived walkability. Therefore, the main focus of the literature review was placed on the emerging research field "perceived walkability", as it is very relevant in the WalkUrban project context. Perceived walkability was analysed in the literature review in combination with objective walkability, walking-related attitudes and walking satisfaction and health outcomes and resulted in a journal paper which is currently under review.[1]

In the remainder of this report, we will give an overview of walkability guidelines and pedestrian policies on different governmental levels by using the example of Germany as well as general guidelines published by different bodies such as NGO and research institutions (chapter 2). Then, chapter 3 discusses the transport policies in our three European case study cities, with a focus on walking. First, an overview of policy measures is given for Dortmund (Germany). Second, transport policies in Gothenburg (Sweden) will be discussed, while we end by providing a summary of concrete policy measures in Genoa (Italy). In chapter 4 we give an overview of the literature review, and we summarise the state-of-the-art in our conceptual framework in chapter 5, while references are presented in chapter 6.

1 Working title of the paper: "Determinants and effects of perceived walkability: A literature review, conceptual model and research agenda"

2. Overview of existing walkability guidelines

This section reviews several guidelines for improving the walkability in policy and practice. The review starts with presenting guidelines introduced by different levels of government, using Germany, UK and US as example countries. Then, we will provide a review of guidelines published by NGOs, transport related associations or agencies within the EU and beyond as well as a relevant Horizon 2020 project (SUNRISE).

2.1 Governmental initiatives and guidelines on different levels

In national transport policies, walking has no real recognition in Germany. Therefore, an outline of a pedestrian strategy was published in 2018 by the German Environmental Agency (UBA). It includes recommendations on how to support walking throughout the governmental levels. In order to support walking as a transport mode and to free up its potential benefits for individuals, the society and the environment, coordinated action is required. As some existing regulations constrain the local level – where the actual walking takes place – the national level is needed for changing overall rules and regulations and make them favourable for walking. Also, existing minimum quality standards should be made mandatory via national regulations. Funding and support need to be increased in order to finance improvements for pedestrian traffic (UBA, 2018). In order to raise awareness for the importance of walking, coordinated actions should be put in place as has recently been done for cycling within a national cycling plan. Currently, the national Transport Ministry (BMVI) intends to develop a pedestrian strategy.

The local level is of great importance for a good walkability and a group of municipalities (which want to promote active transport in the federal state of North-Rhine-Westphalia) developed a guideline for improving walkability and pedestrian traffic conditions (AGFS NRW, 2018). They identify five areas for actions for cities which refer 1) to awareness raising among politicians and administrative staff; 2) to the position of pedestrians in transport planning; 3) to the availability of dedicated staff and financial resources; 4) to (minimum) standards within the municipality (e.g., for planning and design, for traffic control) and for third parties; and 5) to communication and participation.

Cities, which want to improve their walkability and improve conditions for pedestrians are supported financially for doing walkability-assessments in some of the federal states in Germany, the so called Fußverkehrs-Checks (pedestrian traffic assessments). The relevant guidelines for those assessments include information on the participatory process where citizens, politicians, interest groups and associations and planners/staff from relevant administrative departments meet and discuss the situation for pedestrians in an opening workshop. The core action is a 2-hours site inspection where people walk together and assess selected routes and places and discuss important improvements with regards to comfort, safety and attractiveness. Sometimes, priority is given to barrier-free and safe sidewalks and crossings and to especially vulnerable groups (like visually impaired people, or children). A second workshop will summarise results and a documentation of results supports future improvements both for strategic and systematic support within the city as well as specific (physical) improvements and measures to enhance the walkability along the assed routes (MVBW, 2016; Zukunftsnetz Mobilität NRW, 2018).

Transport for London (TfL), as the main transport services operator of London's public transport, launched the Walking Action Plan in order to realise the Mayor's Transport Strategy to create healthy streets and healthy people. The key policy supporting the action plan is to reduce Londoner's dependency on cars by setting a target for 80 per cent of all journeys to be made on foot, by bike or public transport by 2041. TfL acknowledges walking as undervalued in policy and transport terms and thus their mission is to make walking the most obvious, enjoyable and attractive means of transport for all short trips. To achieve this vision, a three step approach is introduced: 1) to understand the current walking in London including hindering and promoting factors and target groups who are most likely to walk more; 2) to introduce a new approach to support walking by setting ambitious targets, addressing the differences between central, inner and outer London areas, and adopting an evidence-based action plan; and 3) to launch an action plan concerning street design and management, the integration with PT, and leading a cultural change (TfL, 2018).

Subsequently, to assist those responsible for making London's streets more pedestrian friendly, TfL published the guidance Pedestrian Comfort Guidance for London to improve the planning and design of the pedestrian environments and encourage walking at the street level. A Pedestrian Comfort Level (PCL) is considered based on the assessment of both footways and pedestrian crossing points. Firstly, sites and locations for the assessments are selected and categorised into different area types, i.e., High Street, Office and Retail, Residential, Tourist Attraction, and Transport Interchange. Pedestrian activity data (i.e., pedestrian flow data, a survey to record the reduction in space available for walking in relation to different activities) are collected and analysed, and the results for each location are presented with summary information, PCL during the peak hour flow and average of maximum activity, and the impact of the PCL at each location and recommendations for mitigation measures (TfL, 2019).

Walk Friendly Communities is a U.S. wide recognition programme developed to encourage towns and cities to place a high priority for supporting safer walking environments. The Community Assessment Tool has been developed and provides evaluation criteria to recognise existing walkable communities which are committed to improve walkability and pedestrian safety through comprehensive programmes, plans and policies. It also aims to provide a framework for those seeking the improvement areas of walkability of their towns and cities. Using the tool, online applications can be made through the homepage, and four cities (New York City, San Francisco, Portland and Seattle) have currently been recognised at platinum level of walkability. The status of walking is primarily assessed by the number of walkers and the number of pedestrian casualties. The tool starts with question on the percentage of residents used in different transport modes for their commuting, and data can be sourced from the US Census on American Community Survey and National Household Travel Survey as well as local authorities' travel data. The number of pedestrian and motor vehicle crashes are reported referring to injuries and fatalities. Subsequently, the tool probes how pedestrian issues are addressed at different levels of planning, ranging from top levels (federal, state) to city and neighbourhood levels. Five Es (education, encouragement, enforcement, engineering and evaluation) are identified as key components for a comprehensive pedestrian plan along with public involvement. There are detailed and lengthy survey questions for applying the recognition programme: for example, asking the level of public input, policy and funding support for sidewalks, connectivity regarding pedestrian-friendly block length, walking trail plan(s), the connection with public transport, and parking space capacity and quality (Walk Friendly Communities, n/d).

2.2 Non-Governmental guidelines and initiatives

The Institute of Public Works Engineering Australia (IPWEA) is the peak association for the professionals in public works and engineering services in Australia and New Zealand. With the Street Design Manual, IPWEA (2020) created guidelines on the urban design of neighbourhoods, in close connection with community design and movement network plan of a neighbourhood referring to the layout of roads, streets and open spaces. One of their key missions is to create safe, comfortable and convenient active transport environments. To develop a pedestrian movement network plan that encourages walking for transport, leisure, recreation and exercise, the following four strategies are established: 1) to identify movement desire lines for pedestrians in relation to land uses, their external neighbourhood connections and open space corridors in order to estimate approximate demand volumes for each desire line; 2) to identify three hierarchies of pedestrian pathways: principal pedestrian route, local pedestrian route and active place (main street providing access to commercial, retail and employment); 3) to make walking trips more desirable than car trips, a network of pathways with more direct, more route options and footpaths on at least one side of local roads to be provided; and 4) to estimate the likely demands for pedestrian use of each desired line with reference to volume of users, types of users (e.g. children, disabled person), purpose of walking and hierarchy (level of importance). Furthermore, detailed design guidelines were set out to clarify the hierarchy of street users ensuring all user's safety and to design safe systems for creating walkable neighbourhoods. Like TfL's approach, IPWEA throws light into pedestrian pathways (the term footways used by TfL) and crossing arrangements. Strategies were drawn in respect of eleven key points: pedestrian network, separate pedestrian from vehicles, (dedicated) pathways for pedestrians, path widths, pathway gradients and crossfalls, pathway surfacing, pedestrian facilities, street trees, safe crossing for pedestrians, safe system for crossings, and safe crossing facilities.

The institute for Transportation and Development Policy (ITDP) is a non-government and non-profit organisation based in New York City, U.S. and focuses on promoting cycling, walking, and non-motorised transport. With the guidelines Pedestrian First, ITDP (2018) developed a tool for measuring and understanding features that promote walkability in cities. It includes a set of metrics that measure the walkability at three different spatial levels: metropolitan urban area (city wide); neighbourhood; and block (street-level). Each of the levels has a different focus, target population, purpose and type of intervention. The Citywide Walkability Comparison is concerned with high-level and easy-to-measure indicator solely based on block density (blocks per km^2), and ITDP collected and analysed the data from many cities around the world. Secondly the Neighbourhood Walkability Assessment introduces eleven walkability metrics related to safety, convenience and accessibility elements drawing on field data collection. Those eleven metrics are walkways, crosswalks, visually active frontage, physically permeable frontage, shade and shelter, small blocks (length), prioritised connectivity, complementary uses (mixed-use), access to local services, (reduce) driveway density, and (reduce) roadway area. The metrics are derived from the assessment of TOD Transit-oriented developments (TOD). Finally, the Street-Level Walkability

Design Checklist is created based on best-practice walkability documents from a variety of NGOs around the world. Using the Walkability Hierarchy of Needs Pyramid (ITDP, 2018, p.14) as the framework for selecting suitable metrics, features representing good urban design and creating a pedestrian friendly environment were categorised under the pyramid criteria (passable, accessible, safe, convenient, comfortable and enjoyable). ITDP maintains that these components at the three different levels can be utilised by practitioners, consultants, government officials and advocates and they can form as a basis of developing and enacting policies that create more walkable urban areas.

The German pedestrian association, FUSS e.V. provides ample and diverse information on walkability assessments (in German) and describes several different methods, guidelines and projects for walking route assessments on its webpage (FUSS e. V, 2018).

SUNRISE, a Horizon 2020 funded project has just published a relevant topic guide for identifying the synergies between city-wide sustainable mobility plans (SUMP) and neighbourhood-based planning. The Sustainable Neighbourhood Mobility Planning at the neighbourhood level is strongly related to short distance travel that are conducive to active transport modes, thus neighbourhood is the key to changing people's mobility. This spatial scale allows to facilitate more opportunities to involve stakeholders and residents in identifying problems with walking, developing new walkability measures, applying them for local contexts and discussing improvement areas with concrete solutions. While co-creation can be the nexus to tackle problems in a neighbourhood unit, there is usually a lack of manpower and specialist expertise, poor quality of data and small influence on decision making in infrastructure. This topic guide emphasises the importance of aligning neighbourhood-based and city-wide SUMP planning. Key characteristics of neighbourhood mobility planning is that residents normally share common interests in improving their immediate surroundings. The accessibility to amenities like shops and schools, the walkability of area, security and traffic safety of local streets are of paramount importance in their daily life. Poor quality of walking routes and public spaces, noise pollution and low accessibility for certain groups are all tangible problems and recognisable by the residents. Finally, the necessity of updating the SUMP concept is highlighted together with the potential for including more geographical scales (SUNRISE project, 2021).

To sum up, the above guidelines discussed the walkability at different spatial levels, ranging from macro (metropolitan or city-wide) to micro level (urban block or street-level). They have developed new walkability assessment methods or adopted existing walkability indices which were often applied to concrete case studies. They have also addressed the walking needs of different target groups, especially those of vulnerable people. For Walk Urban we will focus on two smaller spatial levels (neighbourhoods and street-levels) and are planning to examine the walkability needs of three vulnerable groups: school children, the elderly and disabled (hearing and visually impaired) in addition to the overall perspectives from the residents who reside within urban neighbourhoods selected for our case studies.

3. Overview of policies from three case study cities

3.1 Dortmund, Germany

Dortmund is a city with about 600,000 inhabitants. It is located in the western part of Germany, in the Ruhr region, which is a former heavily industrialised area. For years, urban planning in Dortmund was rather car-oriented, the city has a high motorisation rate and the car is used extensively. However, the city of Dortmund wants to transform its mobility culture and is initiating a mobility transition with the current development of the Mobility 2030 Master Plan (City of Dortmund 2021a).

The Mobility 2030 Master Plan aims for increasing the attractiveness and the city's quality of life in a sustainable way. The overarching goal is to strengthen walking and cycling as well as public transport and to lower the modal split of private motorised transport. It is the framework for future transport policy and contains eight guiding principles. The master plan identifies perspectives, potentials and measures as well as concrete steps in which the goals can be achieved and measurements for monitoring and evaluation. Dortmund wants to become a city of short distances and in addition to hard, location-based factors such as improving accessibility and revitalizing and increasing the attractiveness of streets and squares, it focuses on reducing the negative environmental impact of traffic. The city promotes walking, cycling and public transport and wants to increase road safety and safety perceptions of the population. With regard to the promotion of walking, a pedestrian-friendly mobility culture is regarded as a key factor in addition to a safe and attractive infrastructure. Pedestrians should be given priority in the inner area of the city (City of Dortmund 2021a).

Closely linked to such a mobility transition is the energy transition within the transport sector: a higher rate of electrification and low-emission vehicles shall reduce the negative effects which are caused by motorized traffic (City of Dortmund 2018). In recent years, Germany and also Dortmund experienced a general increase of volumes in motorized traffic (individual and road freight transport) which are in conflict with sustainability and clean air requirements. Because Dortmund was exceeding the EU-wide annual average limit values for nitrogen dioxide (NO2) of 40 µg/m3, one of the sub-concepts of the Mobility 2030 Master Plan is elaborated for implementing mobility related measures for air pollution control (road traffic is one of the main (local) causes for these violations). This sub-concept brings together existing, planned and complementary strategies and measures for reducing NO_2-emissions and for improving air quality. It also includes further applications for funding at the Federal Ministry of Transport and Digital Infrastructure (BMVI) with a focus on funding for digitization in the transport sector and the electrification of buses (City of Dortmund 2018). With its implementation strategy "City air is (emission) free - Dortmund's entry into an emission-free city centre", Dortmund is realising projects and actions to reduce greenhouse gas emissions from road traffic. The aim is to achieve significant positive effects for climate protection (City of Dortmund 2021b). The basic idea behind the integrated approach is to reduce greenhouse gas emissions in road traffic (by 16 individual measures, such as strengthening pedestrians' main routes which access the city centre or increasing bicycle parking in the city). It aims for creating offers and incentives to refrain people from using cars or other vehicles with internal combustion engines in order to prevent future traffic bans or other hard restrictions for reducing air pollution (City of Dortmund 2021b).

Indicators for walking attractiveness and walking habits

Information on mobility and travel behaviour in Dortmund is collected via household travel surveys. The survey included a household and a personal questionnaire and a trip diary. Thus, the collected data includes e.g., the number of persons per household and their socio-economic background, the availability of transport means, travel time to the next public transport stop and the personal use of different transport means as well as reasons for non-use of the bicycle. Details of walking conditions are not included, for example no promoting or hindering factors or attitudes and perceptions are examined. In the trip diary, the number of trips, utilised transport means and trip purpose are recorded. The most recent mobility surveys in Dortmund were conducted in 2005, 2013 and 2019. Unfortunately, the results of the surveys are hardly comparable due to different survey methods. According to the most recent survey, walking accounts for 19.2% of the trips in Dortmund and cycling for about 10%. These mode shares for walking and cycling are similar to overall North Rhine-Westphalia (MiD - Mobility in Germany, 2017), but significantly more trips in Dortmund are made by public transport and the private car is used for fewer trips.

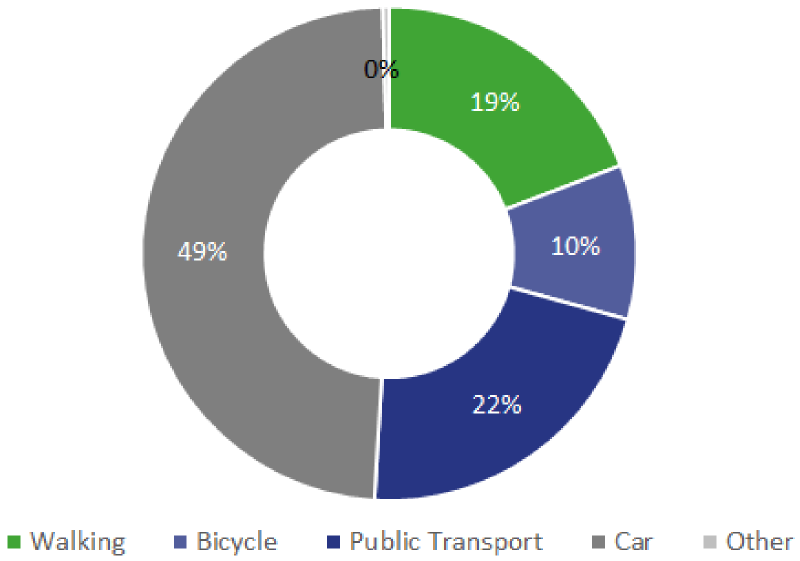

Figure 1: Modal split in Dortmund 2019 (illustration: ILS, source: City of Dortmund, 2019: 51 - corrected estimates)

3.2 Gothenburg, Sweden

The City of Gothenburg has expressed a vision of becoming a green, sustainable, attractive and coherent city, with a reduction in CO_2 emissions by 80% in 2030 compared to 2010, through increasing the share of public transport and active modes in daily travel, such as walking. A number of planning and policy documents state that transport planning in the city should prioritize walking, bicycling, and public transport, and the current Gothenburg Transport Policy (City of Gothenburg, 2014) has set a goal of 55% of motorized travel being made by public transport, and a minimum of 35% of all trips being made by foot or bicycle by the year of 2035, whereof 23% by foot (City of Gothenburg, 2020). As the Gothenburg Transport Policy (2014) focuses on travel and on urban space, another explicit goal is that by 2035 at least 85% of the residents in Gothenburg will consider walking the most attractive way of travel in urban environments. A related planning document is the environmental and climate change program (City of Gothenburg, 2021) which comprises planning strategies for increasing accessibility to green areas and decreasing pollution and noise from traffic in urban areas, with a particular focus on children’s living environments. Moreover, this program aims at increasing the share of sustainable travel through prioritizing walking, public transport, and bicycling in urban planning activities. Other interrelated documents include 1) the “planning support for a walkable Gothenburg”, which explicitly expresses a focus on the key role of pedestrians and walkability in sustainable cities, and promote strategies based on research findings and knowledge (City of Gothenburg, 2019a); and 2) the governing document “program for an equal city” and subsequent planning documents “planning for an equal city” (City of Gothenburg, 2018a, b) which employ strategies for achieving sustainable and equal living conditions (particularly for children) and working conditions, based on knowledge, collaboration, and the continuous evaluation of needs for different (groups of) urban residents. The planning support for a walkable Gothenburg (City of Gothenburg, 2019a) further extends the goal of equality related to walking by emphasizing planning for an equal distribution of walkability throughout the city, based on the objective standard, as well as perceptions of the physical environment. Moreover, a focus on the needs of children, elderly, and individuals with disabilities is clearly stated, alongside the importance of addressing these topics in collaboration with external stake-holders, such as school representatives, researchers and, not least, the residents themselves.

Indicators for walking attractiveness and walking habits

In Gothenburg, travel habits are measured annually in order to follow up the Transport Policy (2014). Indicators used are travel habit surveys (walking and other modes), and measurements of the flow of different modes at measurement points (cars, bikes, other electrical modes), as well as the number of passengers using public transport (City of Gothenburg, 2020). Since 2015 the City of Gothenburg also conducts an annual evaluation of the attractiveness of walking and “living” in Gothenburg, and includes indicators such as the perception of walk-friendliness, coherence in walking-spaces, and safety-indicators, on city district level (City of Gothenburg, 2019b). In the most recent report, 65% of the participants found walking in Gothenburg attractive (a decrease from 68% in 2018). Moreover, Gothenburg Region (GR) has, as a way to increase the proportion of sustainable travel through urban planning, explored the potential of a number of location indicators (related to the 5D´s: distance, density, diversity, destination and design) and their association with travel data from the West Swedish Agreement (which includes Gothenburg) on a macro level (Gothenburg Region, 2019). The results are meant to be used for assisting planners in understanding consequences of specific investments in the region on sustainable travel, including walking. Although some location indicators proved useful for predicting walking habits (local crossing density, function mix, and proximity to regional centre), Gothenburg Region concluded that studies targeting location (and other) indicators on a micro-level have yet to be conducted and evaluated.

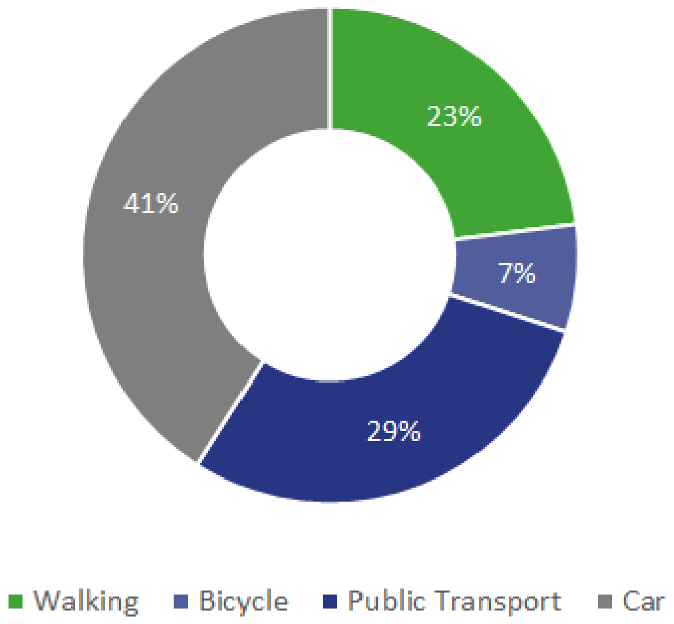

Figure 2: Modal split in Gothenburg 2017 (illustration: ILS, source: City of Gothenburg, 2017)

3.3 Genoa, Italy

Pedestrian mobility in the Urban Sustainable Mobility Plan (SUMP)

The system of pedestrian areas in Genoa follows a double characteristic: on the one hand, there are areas that are defined as pedestrian areas in full compliance with the law and established with a specific administrative act; on the other hand, there are many city areas to be considered pedestrian "de facto". Their existence is connected with the typical settlement structure of the Genoa area; the large historical centre and other secondary historical urban areas are dominated by high level of motorized traffic. The situation for pedestrians is typically regulated by the ban of motorized traffic, which actually determines an almost exclusively pedestrian usability of the spaces, as seen in Via Sestri. Given this situation, the officially pedestrianized areas are limited in number and location, with some exceptions, in the central city area, as shown in Figure 3.

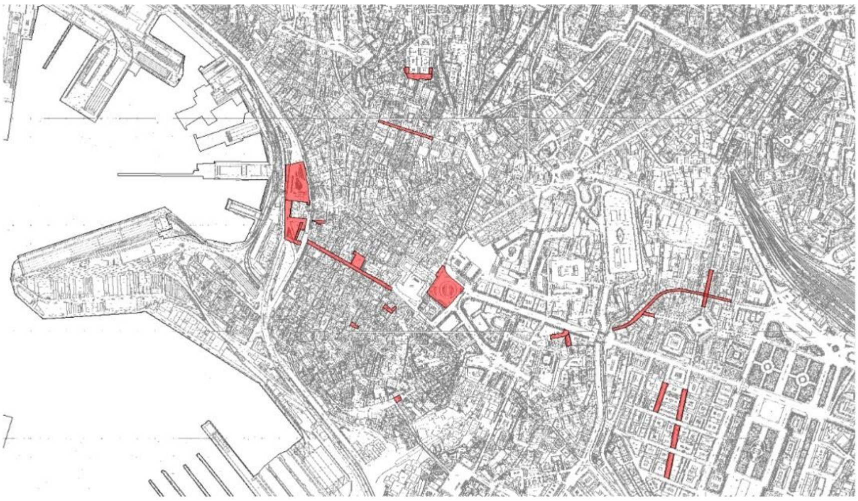

Figure 3: Pedestrianized area in Genoa (illustration/source: Municipality of Genoa)

The general objectives of the SUMP (Metropolitan City of Genoa, 2019) are focused on the following themes:

- To improve the accessibility to urban and peri-urban areas, through sustainable and high-quality mobility and transport systems, also from an environmental, economic and social point of view, and the improvement of the usability of public space;
- To propose, that the mobility infrastructures must help to reduce the negative impacts on health and should be accompanied by urban projects to increase the aesthetic, functional and formal quality of the places;
- To provide residents and city visitors with a clear orientation to their mobility so that they can walk, cycle, use public transport or use private vehicles with low environmental impact and to create the infrastructures that allow a sustainable transport use inside the urban and peri-urban areas.

An increase in walking contributes to greater energy saving and environmentally friendly mobility and sustainability. Strategy no. 3 of the SUMP "Integrating all kind of sustainable mobility with other transport systems as road safety, pedestrian areas and environmental islands" provides for the integration of pedestrian and cycling mobility networks in wider urban redevelopment/ regeneration actions (Metropolitan City of Genoa, 2019). This includes the creation of 'green infrastructure' with the aim of safeguarding the natural capital, creating ecological-functional connections and rediscovering the values of places, in harmony with the consolidated model of "greenway". The issue of road safety is concerned with both urban and extra-urban areas of the metropolitan city. The measures to achieve sustainability goals also from a safety point of view are as follows:

- **Speed limits**: increase the "zones 30" in urban areas; impose speed limits on metropolitan roads, but also encourage the prevention of potentially harmful behaviours when driving vehicles mainly through the area where people are walking. Also, information and training activities related to control measures on metropolitan roads; adopt dissuasion and slowdown systems are required;
- **Physical characteristics of the roads**: improvement of the surface conditions of the carriageways, maintenance and requalification of the pavements, and automatic lighting of sections of the carriageways;
- **Pedestrian crossings**: interventions on traffic light systems in order to improve their usability, with particular attention to vulnerable users;
- **Public transport stops**: increase safety conditions, improve aesthetic quality, and provide additional services at the terminal stops;
- **Codes of conduct**: education in various types of schools, use of ICT, reporting of specific critical issues, dissemination of knowledge.

According to the SUMP, pedestrianised areas perform a plurality of functions, in addition to the ecological aspects of reducing pollution and noise in urban areas, which also have a positive impact on increasing social interactions and attractiveness of the place. A further increase walking of pedestrianised areas in the urban centre can contribute to improved safety, health and quality of life, especially for the vulnerable groups as well as a greater use of public transport. Pedestrian areas should also be seen as a mobility system, which in turn is integrated with the other systems.

For historic centres and commercial areas different measures need to be considered. It is necessary:

- to pay adequate attention to the access areas and the boundary of the pedestrianised areas with reference to public transport stops, bollards, controls and limitations to gates, close circuit webcams, etc.;
- to create pedestrian paths integrated with valuable services and facilities, such as places of culture and public parks;
- to impose access limits at certain times on areas close to primary and secondary schools (example of good practice: via Galata area in Genoa);
- to increase the quality and safety of pedestrian areas through the inclusion of leisure areas with benches, greenery and webcam controls, in order to increase the liveability of these areas;

A section of the SUMP is therefore dedicated to the pedestrianization of urban areas, identifying new pedestrian areas (either full time or partially), in order to seek the capability of creating complete pedestrian and cycle paths, and graduality allows to evaluate effects and repercussions on the more general mobility system. In addition, pedestrian paths equipped for jogging and other sports activities can be identified in areas of particular environmental value or tourist interest.

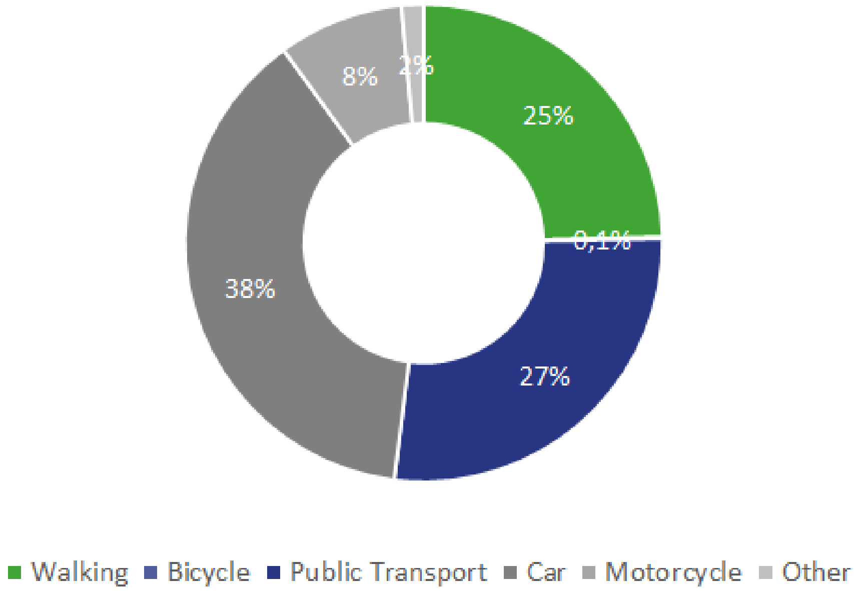

Figure 4: Modal split in Genoa 2016 (illustration: ILS, source: Municipality of Genoa, n/d)

Pedestrian mobility in the Genoa Plans for the Elimination of Architectural Barriers (P.E.B.A.)

In addition, to support the SUMP, the Municipality of Genoa is adopting the P.E.B.A. - Plans for the Elimination of Architectural Barriers. This plan analyses the elimination of architectural barriers in detail to walking barriers present on the city's territory. In the following, P.E.B.A is explained.

Introduced as a tool by the Italian national government through the specific legislative discipline[2], the Plans for the Elimination of Architectural Barriers (P.E.B.A.) aim at identifying, planning and monitoring interventions for the removal of architectural barriers to walking in urban public spaces and in public buildings. With a particular reference to the identification and creation of accessible routes, the installation of acoustic traffic lights for the blind was introduced as well as the removal of signs which hindered the movement of disabled people. In the national law, with the specific indication of the acoustic traffic lights, better accessibility is introduced by interventions that are also suitable for sensory disabilities, in particular visual disabilities. The provisions provide the technical requirements for accessible design mainly inside buildings.

2 Law NO. 104/1992

The legislative definition of the concept of "architectural barriers" is as follows:

a) physical obstacles that are a source of discomfort for the mobility of anyone and in particular of those who, for whatever reason, have a permanent or temporary reduced or impeded movement capacity;
b) obstacles that limit or prevent anyone from comfortable and safe use of spaces, equipment or components;
c) the lack of precautions and signals that allow the orientation and recognition of places and sources of danger for anyone and in particular for the blind, the visually impaired and the hearing impaired.

At the regional level, the "architectural barriers" are the subject of specific legislation in the R.L. n. 15/1989 "Elimination of architectural and location barriers", which contains measures for the financing of the elimination of barriers. The Resolution of the Municipal Council of 14/07/2016 n. 143” Guidelines for the preparation of the PEBA” approved, the aforementioned guidelines.

The municipal P.E.B.A. articulated in four main phases:

1. Collect the information necessary to acquire an exhaustive picture of the issues relating to the accessibility of urban spaces and public buildings;
2. Establish the lines of action in accordance with the relevant regulations in force;
3. Create a framework of intervention priorities, with reference to points observed in the P.E.B.A. of Genoa;
4. Create information supports which allow easy and immediate consultation of information on the state of usability of public spaces and buildings. The P.E.B.A. information can be consulted through the municipal geoportal (in GIS format).

The SUMP of the Metropolitan City of Genoa (2019) is a strategic plan aimed at satisfying the mobility demand of people and businesses to improve the quality of life. The objective of the SUMP refers to the transport networks, while the P.E.B.A. for urban spaces, in particular, include waiting areas for local public transport. Thus, the two plans are complementary in terms of improving the pedestrian accessibility to public transport.

4. Insights from literature review

Since the end of the 1950s, many empirical studies have focused on accessibility, i.e., the ease of reaching certain destinations. Providing people with access to various out-of-home activities has long been recognised as the ultimate goal of transport systems, often with a focus on access by car and – to a lesser extent – by public transport. Consequently, accessibility has been an essential ingredient in transport planning and evaluation. Many studies have analysed accessibility, resulting in a wide range of accessibility measures evaluating different dimensions of accessibility. Accessibility is, among others, influenced by the built environment (e.g., the density, design and diversity of neighbourhoods), and transport networks and infrastructure (e.g., access to travel modes) (see, e.g., Geurs & van Wee, 2004; Handy, 2020). Since the 1990s, studies have also focused on how accessible destinations are on foot, often referred to as walkability. This walkability can be influenced by distances to destinations (e.g., affected by street connectivity, and neighbourhood density/diversity), but walkability is also influenced by other factors such as micro-scale elements, such as street furniture, quality of sidewalks and the presence of safe street crossings (e.g., Ewing & Handy, 2009; Otsuka et al., 2021).

Mainly since the past decade, transport studies are no longer solely focusing on objective accessibility, but also on how people experience and evaluate their accessibility. This perceived accessibility, or how easy people find it to reach destinations or interact in activities, is not only affected by the built environment and available transport options, but also by people’s travel attitudes, past experiences, and personal limitations (Lättman et al., 2019; van der Vlugt et al., 2019). As a specific type of perceived accessibility, perceived walkability refers to how walk-friendly people find a certain area or how easy they find it to reach a certain destination or pursue an activity on foot, such as how comfortable and enjoyable they find walking in a specific neighbourhood. Most studies focusing on perceived walkability indicate that perceived walkability has strong positive effects on walking and physical activity, often stronger effects than objective walkability (e.g., Arvidsson et al., 2012; Hinckson et al., 2017). Other studies found that perceived walkability can positively influence people’s well-being and quality of life, since it can improve access to (healthy) food, essential urban amenities, social interaction with neighbours, and even overall satisfaction with life (e.g., Chen et al., 2016; Jun & Hur, 2015). However, studies on perceived walkability are still limited and the determinants and effects of perceived walkability are still underexplored.

5. Outline of conceptual framework

General guidelines, policy and planning documents in the three case study cities introduced various walkability assessments tools, planning processes and dissemination activities to promote walking. In some cases, citizens have been engaged in developing walkability assessment frameworks, and the walkability has been discussed from the perspectives of different types of street users, especially vulnerable groups. However, perceived walkability of specific user groups has not yet been taken into account in the debate among practitioners. Furthermore, perceived walkability studies have not accounted for travel attitudes, although these may impact how people perceive walkability. For instance, a person residing in an objectively walkable neighbourhood may not consider the environment as walk friendly due to negative walking attitudes. In contrast, a neighbourhood being perceived as walkable may also enhance walking attitudes and consequently encourage walking. Perceived walkability may also impact the experience of the walking trip. A person perceiving his/her neighbourhood as walkable (e.g., finding it easy or comfortable to walk) will probably be more satisfied with walking trips compared to someone finding his/her neighbourhood difficult to walk in. It is likely that the effect of perceived walkability on well-being is mainly indirect, through walking satisfaction.

Figure 5 presents a conceptual model for WalkUrban understanding of walkability and for further research activities. It shows the proposed determinants and effects of perceived walkability. We argue that perceived walkability is affected by both the objective walkability and walking attitudes, while perceived walkability also influences walking frequency/duration and satisfaction with walking trips. Walking attitudes and objective walkability can also directly influence walking propensity, while walking attitudes and walking satisfaction may influence each other (positive walking attitudes increase the chance of satisfying walking trips, and vice versa). Finally, satisfaction with walking trips may also result in an increased intention of choosing to walk for future trips.

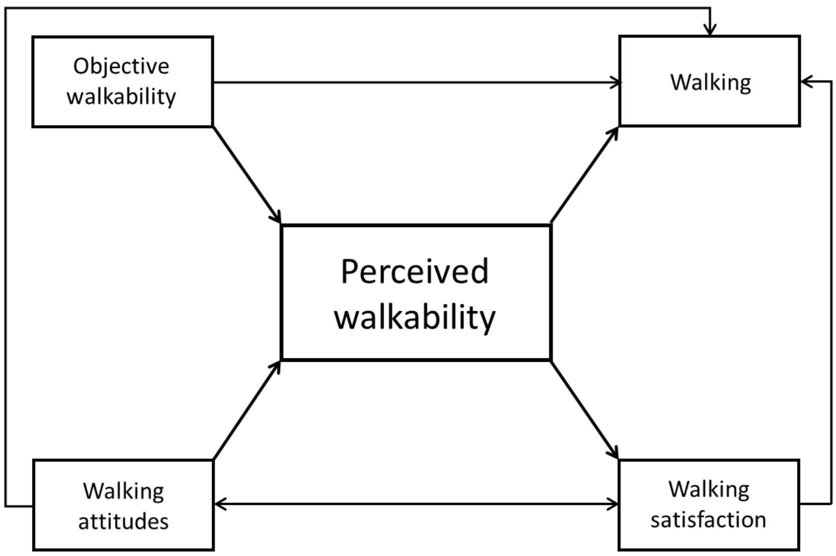

Figure 5. WalkUrban's conceptual model of the determinants and effects of perceived walkability.

In order to examine the model shown in Figure 5, WalkUrban sets out to (1) create more compact scales to measure perceived walkability (as existing ones are often very long), (2) focus on the perceived walkability of residential neighbourhoods, (3) collect data by a mixed method approach which includes walk-along interviews (in addition to quantitative data collection), and (4) take into account indirect effects (e.g. of objective walkability on walking (satisfaction) through perceived walkability), using data analysing methods such as structural equation modelling.

In doing so, WalkUrban will provide new insights into perceived walkability and its determinants and outcomes. The results of the project will not solely create academic impact, but will also provide policy makers and urban planners with recommendations to increase the share of walking and make walking trips more pleasant.

6. References

AGFS NRW – Arbeitsgemeinschaft fußgänger- und fahrradfreundlicher Städte in NRW e.V. (2018). Handlungsleitfaden zur Förderung des Fußverkehrs in den Kommunen. Krefeld. https://www.agfs-nrw.de/fileadmin/user_upload/Handlungsleitfaden_Fussverkehr_RZ_WEB. pdf

Arvidsson, D., Kawakami, N., Ohlsson, H., Sundquist, K. (2012). Physical Activity and Concordance between Objective and Perceived Walkability. Medicine and Science in Sports and Exercise 44(2), 280-287.

Chen, Y.Y., Wong, G.H.Y., Lum, T.Y., Lou, V.W.Q., Ho, A.H.Y., Luo, H., Tong, T.L.W. (2016). Neighborhood support network, perceived proximity to community facilities and depressive symptoms among low socioeconomic status Chinese elders. Aging & Mental Health 20(4), 423-431.

City of Dortmund (2018). Masterplan Nachhaltige Mobilität für die Stadt dem Masterplan Mobilität 2030 zugehörig. https://www.bmvi.de/SharedDocs/DE/Anlage/K/Masterplaene-Green-City/dortmund.pdf.

City of Dortmund (2019). Dortmunder Mobilitätsbefragung 2019. Dortmund. Mobilitätsbefragung der Dortmunder Bevölkerung Wege. https://opendata.dortmund.de.

City of Dortmund (2021a). Zielkonzept des Masterplans Mobilität. https://www.dortmund.de/de/leben_in_dortmund/verkehr/masterplan_mobilitaet_2030/zielkonzept/index.html

City of Dortmund (2021b). Emissionsfreie Innenstadt. https://www.dortmund.de/de/leben_in_dortmund/verkehr/emissionsfreie_innenstadt/index.html.

City of Gothenburg (2014). Trafikstrategi för en nära storstad 2035 (Transport Policy for 2035). dnr 0894/11 ISSN 1103-1530.

City of Gothenburg (2017). Teknisk Handbok Göteborg. https://tekniskhandbok.goteborg.se/Arkiv/2017-2/__site/__3f%C3%B6ruts%C3%A4ttningar__3eplaneringsf%C3%B6ruts%C3%A4ttningar__3eftrafikdata__3ef4f%C3%A4rdmedelsf%C3%B6rdelningenligttrafikstrategin.html.

City of Gothenburg (2018a). Program för en jämlik stad 2018-2026 (Program for an equal city 2018-2026).

City of Gothenburg (2018b). Planering för en jämlik stad 2019-2022 (Planning for an equal city 2019-2022).

City of Gothenburg (2019a). Planeringsstöd för ett gångvänligt Göteborg (Planning support for a walkable Gothenburg).

City of Gothenburg (2019b). Resultat attitydundersökning fotgängare 2019. (Results from attitude survey on walking 2019).

City of Gothenburg (2020). Trafik och resandeutveckling – TRU (Traffic and travel development), Trafikkontoret.

City of Gothenburg (2021). Environmental and climate program 2021-2030.

Ewing, R., Handy, S. (2009). Measuring the Unmeasurable: Urban Design Qualities Related to Walkability. Journal of Urban Design 14(1), 65-84.

FUSS e.V. – Fachverband Fußverkehr Deutschland (2018). Fußverkehrs-Checks & Fußverkehrs-Audits. Informationen zur Durchführung von Fußverkehrs-Checks. https://umkehr-fuss-online-shop.de/kostenlose-downloads/category/21-fussverkehrs-audit.html?download=393:check-broschuere and https://fussverkehrs-check.de.

Geurs, K.T., van Wee, B. (2004). Accessibility evaluation of land-use and transport strategies: review and research directions. Journal of Transport geography 12(2), 127-140.

Gothenburg Region (2019). Location Indicators for sustainable travel habits.

Handy, S. (2020). Is accessibility an idea whose time has finally come? Transportation Research Part D, 83, 102319.

Hinckson, E., Cerin, E., Mavao, S., Smith, M., Badland, H., Stewart, T., Duncan, S., Schofield, G. (2017). Associations of the perceived and objective neighborhood environment with physical activity and sedentary time in New Zealand adolescents. International Journal of Behavioral Nutrition and Physical Activity 14, 145.

Jun, H.J., Hur, M. (2015). The relationship between walkability and neighborhood social environment: The importance of physical and perceived walkability. Applied Geography 62, 115-124.

IPWEA (Institute of Public Works Engineering Australasia) (2020). Street Design Manual: Walkable Neighbourhoods, A contemporary guide for the design and development of Queensland's residential neighbourhoods. IPWEA, Queensland.

ITDP (Institute for Transportation and Development Policy) (2018). Pedestrians First, Tool for Walkability, 1st edition. ITDP, New York.

Lättman, K., Olsson, L.E., Friman, M., Fujii, S. (2019). Perceived Accessibility, Satisfaction with Daily Travel, and Life Satisfaction among the Elderly. International Journal of Environmental Research and Public Health 16(22), 4498.

Metropolitan City of Genoa (2019). SUMP of Genoa city, Sustainable Urban Mobility Plan 2018. https://pums.cittametropolitana.genova.it/content/approvazione-del-pums.

Municipality of Genoa (2020). Plan for the Elimination of Architectural Barriers, Facility Management Department, Municipality of Genoa, October 2020. https://smart.comune.genova.it/contenuti/peba-piano-eliminazione-barriere-architettoniche.

Municipality of Genoa (n/d). Modal Split data 2016: https://dati.comune.genova.it/dataset/matrici-origine-destinazione-spostamenti-e-viaggi.

MVBW – Ministerium für Verkehr Baden-Württemberg (2016). Fußverkehrs-Checks. Leitfaden zur Durchführung. https://vm.baden-wuerttemberg.de/fileadmin/redaktion/m-mvi/intern/Dateien/PDF/Fussverkehr_Checks_Leitfaden_zur_Durchfuehrung.pdf.

Otsuka, N., Wittowsky, D., Damerau, M., Gerten, C. (2021). Walkability assessment for urban areas around railway stations along the Rhine-Alpine Corridor. Journal of Transport Geography 93, 103081.

Rupprecht Consult and Koucky & Partners (2021). SUMP Topic Guide: Sustainable Neighbourhood Mobility Planning - Synergies between city-wide SUMP and neighbourhood-based planning.

TfL - Transport for London (2018). Walking Action Plan - Making London the world's most walkable city. London. http://content.tfl.gov.uk/mts-walking-action-plan.pdf.

TfL - Transport for London (2019). Pedestrian Comfort Guidance for London - Guidance Document. 2. Edition (first Edition 2010). London. http://content.tfl.gov.uk/pedestrian-comfort-guidance-technical-guide.pdf.

UBA – Umweltbundesamt (Eds.) (2018). Geht doch! Grundzüge einer bundesweiten Fußverkehrsstrategie. Edited version 15.06.2020 (Authors: Bauer, Uta; Hertel, Martina; Buchmann, Lisa; Frehn, Michael; Spott, Merja). Dessau-Roßlau (TEXTE, 75/2018). https://www.umweltbundesamt.de/sites/default/files/medien/2546/publikationen/2018-04_10_texte_75-2018_geht-doch_v4.pdf.

van der Vlugt, A.L., Curl, A., Wittowsky, D.(2019). What about the people? Developing measures of perceived accessibility from case studies in Germany and the UK. Applied Mobilities 4(2), 142-162.

Walk Friendly Communities (n/d). Community Assessment Tool. https://www.walkfriendly.org/wp-content/uploads/2017/03/WFC_Assessment_Tool.pdf.

Zukunftsnetz Mobilität NRW (2018). Fußverkehrs-Checks. Leitfaden zur Durchführung. https://www.zukunftsnetz-mobilitaet.nrw.de/media/2021/8/2/993c9460ce9e7009e0562707be91eb30/ZNM_NRW_Leitfaden_Fussverkehrs-Check_final___5f2bf6d3c3c42.pdf.