Pedestrians' Quality Needs

Part B4
Documentation – Measuring walking

PQN project – Measuring Walking collective

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PEDESTRIAN QUALITY NEEDS
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Colophon:

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Measuring walking: Towards internationally standardised monitoring methods

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'Only what's being counted, counts.'
Common experience

Summary

This paper focuses on the information needed to create more walkable cities, particularly in terms of developing and implementing successful walking and public realm strategies. The specific focus is guided by the observation that until now hardly any data on walking and public space qualities has been collected by cities or urban areas, particularly not on the strategic level. Yet the walking environment and public realm for people to enjoy are at the core of any successful, liveable and healthy city. This is increasingly being recognised by many communities but, at the same time, they do not know what and how they should assess and measure the mentioned qualities.

There are many ways how this difficulty can be overcome. We suggest two main approaches: First, specific data collection methods need to be developed that are adequate for walking and sojourning. This requires awareness of the characteristics of walking and sojourning. Secondly, data should be collected in a way that at least some results are comparable. This requires some standardisation and harmonisation of indicators and data collection procedures.

After establishing what we know and identifying the problems many cities face in terms of data collection; and after analysing the methodological concepts, it is possible to outline a comprehensive Assessment Model which includes all relevant aspects of walking and sojourning. Based on this Assessment Model a path can be sketched out to create key performance indicators and methodologies to measure walking. These could help cities to improve their understanding how much walking there is and what needs to be changed in the future to create even healthier cities and more attractive public spaces.

1. Introduction

Walking is such a ubiquitous activity that it is often not regarded as a transport mode at all. However, even in highly motorised societies, it is an important component of almost all trips and in most places it still remains an important mode in its own right.

If we want to enhance the role of walking, we need to improve the data situation. This means we need to develop good indicators and adequate data collection methods for measuring

walking and public space qualities. While we are currently witnessing an encouraging increase of surveys, counts and audits being performed to assess walking we are also faced with the problem that the methods used in different places are so diverse that the data are incompatible with often uncertain validity making it impossible to compare. So we not only need to develop adequate methods but also try to reach some common standards.

In the framework of this European COST Action 358 on 'Pedestrian Quality Needs' and the WALK21 international conference series (see www.walk21.com) we started such a discussion and international harmonisation process which aims to establish international guidelines for the collection, analysis and dissemination of qualitative and quantitative techniques for measuring walking. This paper discusses some of the results achieved from this activity.

The project started in 2006 after the adoption of the International Charter for Walking in Melbourne. Every year one day workshops attached to WALK21 conferences were held to find some common ground in terms of indicators and methods. The broad discussion process involving experts from many different professional and geographical backgrounds is by its nature very slow but gains the legitimacy necessary for globally shared standards[1].

Section 2 of this paper comprises a general assessment about what kind of information is currently available and what the problems are in terms of data collection. These general thoughts are illustrated with examples from the UK on data collected as part of mobility surveys and public realm assessments.

One of the basic problems is that the methods used are not adequate for walking. By analysing the characteristics of walking – in technical terms, the system's properties – we can make sure that the developed measuring techniques are adequate. Some examples will be given in this regard in the first part of section 3, while in the second part three issues are discussed that are relevant when devising new measuring concepts.

In section 4 an assessment model is presented as a suggested basis for a comprehensive approach to measuring walking. Building on this model, a possible way forward is outlined in section 5 to create several sets of key performance indicators to enable cities and interested parties to assess successful walking and public realm strategies.

2. The problem

2.1 Current data collection situation in Europe: survey results

There is much evidence to suggest that reliable, rigorously collected and spatially compatible data about walking and about the quality of public space for walking is still widely missing. This section considers the problems of the data collection situation in Europe with a particular focus on the United Kingdom.

[1] The first workshop in Toronto (2007) focused on the relevant dimensions of walking that should be measured. The Barcelona workshop (2008) brought together users and producers of automatic counting equipment to advance the issue of pedestrian counts. The third workshop in New York (2009) centred on performance indicators resulting in a list of such indicators that participants found most relevant and important. During the workshop in The Hague (2010) data collection methods are being discussed. The process will extend over the end of the Pedestrian Quality needs project and is open to any interested person. All workshops are documented online at the website www.measuring-walking.org where also more information about the project is available.

Within our Pedestrian Quality Needs (PQN) project we started with a survey aiming to find out what type of data were available in each country and how they were collected. The survey was a result of the first attempts within the project to collect and compare data about walking. It quickly showed that not only was there very little information but also that the data were collected in so many different ways that the results could not be compared. A similar approach had already been taken in COST Action C6 “Town and infrastructure planning for safety and urban quality for pedestrian” (see Monheim und Frankenreiter 2000). This allowed for some comparisons between the two surveys – with the result that not much has changed despite some improvements.

No specific figures or results were sought in the survey. We were rather interested in the means and ideas behind the data collection. We asked the participants to provide information on all levels (national, regional, municipal and project-related) as far as this was possible[2]. The number and type of data that can be collected is almost limitless. The questionnaire contained, therefore, those items which were considered to be most important and relevant including the following dimensions:

- Transport behaviour (mobility statistics);
- Pedestrian volume (counts);
- Activity and time spent in public spaces (sojourn without mobility, stationary activity);
- Road danger (accidents, safety);
- Security: threats, attacks, harassments;
- Health: physical activities, competences (disabilities);
- Walking environment: quality accessibility, etc.;
- Ecological footprint;
- Perceptions, attitudes and images: ‘measuring the smiles’ and expectations of pedestrians;
- Investments, personnel, research: institutional aspects.

10 countries took part in the survey and provided results: Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain and Switzerland. The information was mainly collected in 2007 and reflects the situation at that point in time.

The results not only confirm how little data are actually collected but also show the wide range of methodological approaches. Except for data on traffic accidents and on walking trips there is hardly any systematic collection of data undertaken. If there is any information it usually stems from single projects or case-studies. Even in the areas where there are some statistics available, walking is often not properly accounted for. An example of this is the lack of recording short trips (e.g. below 1 km or 1 mile) or the problem that only main modes are recorded which neglects stages to and from other transport modes. Generally, the recording procedures are not adequate to measure walking and can lead to a significant underestimation of walking trips and, therefore, to biased results.

Pedestrian counts are not conducted regularly in European cities with a few exceptions of a number of shopping streets in some countries. There is also very little knowledge and data about the activities and time people spend in public spaces. Information about pedestrian security is scarce as well. Available data on criminal acts usually suffers from severe reliability and validity problems as they are usually based only on reported offences to the police.

[2] The idea of the survey was to conduct a fairly quick scan of the main items of data collected within each country and it may well be that some data collection activity on the more local and project-related level has been overlooked. This, however, does not change the broad outcome from the survey.

Although most countries have some information about physical activities and obesity in their country (Body Mass Index based), the link to walking (transport surveys) is usually not made and the methodologies differ. The same is true for the assessment of people with disabilities. According to the survey there are also no systematic assessments of walkability (quality of the walking environment) performed by the cities although some single research projects are undertaken. Often GIS data on the municipal level is there but hardly ever used, except maybe for tourist guidance systems.

Data on CO_2 emissions, air quality, noise and energy consumption are collected in several countries but are not linked to walking levels. It is also interesting that cities and countries do not seem to be interested how their people feel as pedestrians as the data available on perceptions, attitudes and expectations of pedestrians is very scarce. Finally, very little is known about institutional aspects, e.g. investments into walking provision, economic benefits, marketing efforts and research, education and other resources provided to support walking.

We have to conclude from the survey results that the available data does neither give a comprehensive nor adequate picture of today's pedestrian situation. The detailed results of the survey can be found in the annex of the publication (available as separate pdf).

2.2 Problems of cities with data collection: views from city representatives

Based on in-depth discussions with representatives from a range of cities the main obstacles and problems were identified that contribute to today's paucity of data. The following points can be drawn as a result from these discussions:

- Lack of sensitivity and political will to collect data on walking: This is still a key reason why data on walking are not being adequately collected. As long as walking has little political representation the chances are slim that the needs of pedestrians will move up the transport agenda. What doesn't count isn't counted and what isn't counted doesn't count.
- Data are collected in a fragmented and inconsistent way: The lack of common standards contributes to this problem. In some cases the purpose of data collection is not clear.
- Indicators and/or methods are not appropriate for walking: Often indicators and data collection methods were developed for other purposes, but applied to walking. For example the collection of information only on main modes in travel surveys and their focus on distance, which neglects walking and distorts the picture of mode share.
- Restricted funding for studies and data collection on walking: The image of walking as being 'cheap' is also applied to money invested for the research. It is worth noting that often the funds for research are there but they are not allocated to walking and public realm research but to other transport modes.
- Staff lack knowledge and time to analyse and make use of data: Practitioners are often so absorbed in their everyday business that it is not possible for them to commission studies, analyse the results and translate them into policy or employ them to improve planning and design. This is true even if there is a political will and money available. The problem can develop as a vicious circle with lack of data weakening the position of dedicated staff, leading to even less time for their work.
- Information is there, but not edited to be used: The prime example is GIS information which often contains data on the walking network, distances, accessibility, connectivity and environmental quality, but the data are not edited into a format that can be accessed by the walking staff in the administration.
- Existence of data is not known or hard to access: Generally there seems to be very little co-operation between the different fields with a link to walking. For example the school board or health department may collect some information on children's trips to school or physical activity but this is not known in the transport department.

From the survey results, our own research and the discussions with city representatives we conclude that the available data gives neither a comprehensive nor adequate picture of today's pedestrian situation. The reasons for this situation are distorted definitions and terminology, inadequate methodologies, biased perceptions and structural obstacles (see also Sauter 2002).

2.3 What information is readily available on walking?

Clearly the answer to this question will vary somewhat according to location, scale of information and time period. However, this section seeks to examine what information is readily available to allow us to understand basic questions such as how much walking takes place (in a given location/time period) and how walking can be characterised. By necessity it is not possible to answer these questions in terms of every possible location, rather we focus on the UK as a case study and make comparisons where possible with other circumstance. In many other papers of the final COST action report, more data and methodological considerations can be found which cover not only a wide range of issues but also comprise data from other countries.

Sources of information about number of walking trips

At a national level in the UK there are two main sources of information about levels of walking – the National Travel Survey (NTS) and the Census of Population. The NTS is based on travel diaries collected from a large national sample in Britain and is undertaken on an annual basis, going back as far as 1988, with more ad hoc and less regular surveys since the mid-1960s. Its use is intended as a means to establish longer term trends and thus is less useful as a means of understanding more immediate changes. While an immensely useful source of information on travel and having some advantages for the study of walking (for example there is some information on trip stages i.e. walking as part of a longer trip), there are also weaknesses. There is probably some degree of underreporting of very short trips, particularly for walking. There is no information on routes. Perhaps most importantly it is not possible to break the locational information down beyond the level of Government Office Regions (currently England is split up into 9 such regions), partly due to the small sample size, but also as the data on origin and destination of trips is recorded at this level (and hence for walk trips most will start and end in the same GOR).

The Census in the UK is undertaken nationally every 10 years and involves all households, though the focus of the survey covers all aspects of life, not just transport. From a sample perspective it far exceeds the NTS, though there are other key limitations. Principally, it does not cover walking in any great detail and the main focus is on travel to work. It is, however, possible to get some idea of more local variations in walking from this source, which given the sampling issues, is not really possible from NTS. No information is available on changes which occur in the intervening 10 years between surveys.

Some urban areas undertake their own diary based travel surveys as a matter of course. For example, the London Area Transportation Survey (LATS) is a household based travel survey using a sample of households resident in the London area. This provides useful data on the amount of walking done by Londoners, but does not provide information on the amount of walking done in London as no information is collected on the walking done by those who do not live in the area, but who use it (for example the large number of people who commute into the city every day and tourists).

Importantly, none of these sources of information give any hint about suppressed demand for walking, simply they provide a record of some aspects of what actually happens. Nor do these sources provide information on the quality of the environments or the response of those who are doing the walking in those environments.

More ad hoc surveys of walking are undertaken, particularly by highway and city authorities, often providing a lot of detail, often based on observation and often linked to potential or ongoing work on aspects of the urban environment. Whilst useful and providing a lot of understanding for the specific locations involved there is rarely any systematic organisation of such surveys, nor consistency of application across different locations. Again, it is not possible from these to get a feel for how much walking or what type of walking happens in a given city or urban area.

Methodologies to assess the quality of the pedestrian environment

A range of methodologies (qualitative and quantitative) are evident in the literature that can be used to assess the pedestrian environment. These include the use of tools or checklists to assess the "walkability" of a particular route, stated preference techniques to determine pedestrian's value of specific aspects of their walking environments and more recently mobile methods which have been used to understand the pedestrian environment directly through the experiences of pedestrians (Kelly et al, 2007).

The needs of pedestrians can be elicited through the use of tools to assess the environment or the "walkability" of a particular route using some kind of scoring or checklist approach. These approaches usually use best practice for determining what pedestrian factors to include and the tools are often used by transport authorities and consultants. For example the Pedestrian Environment Review System (PERS) (TRL, 2004), permits users to rate a range of factors (including directness and road safety) about a pedestrian route, link or crossing. The aggregation of these results enables the operator to identify specific features which should be improved. The pedestrian level of service (LOS) methodology used by Gallin (2001) is another approach which provides an "overall measure of walking conditions on a route, path or facility" examining design factors (e.g. path width, obstructions), location factors (e.g. connectivity) and user factors (e.g. pedestrian volume). A weighting system is then applied recognising that certain factors are more important to pedestrians. The LOS approach has also been used to assess pedestrian trip quality based on more qualitative factors such as enclosure and proximity to traffic (Jaskiewicz, 2000).

Other examples of methodologies for assessing the walkability of the pedestrian environment focus on checklists or observations that are completed by the pedestrians themselves. Walkinginfo (2004) produced a "walkability" checklist, which asks residents to assess their local community (e.g. Did you have room to walk? Was it easy to cross the street?). Living Streets (2004) produced a DIY community street audit which focuses on identifying what communities want improving. More recently mobile methods are increasingly being used. Definitions of such methods are varied, contested and evolving, but defined broadly they are methods in which either the researcher moves on the journey with the person being studied or the method used is mobile in the way it captures the journey's or mobilities of whatever is being studied. The strength of such methods is that they provide spatially referenced information about aspects of the walking environment which are of interest or problematic (examples of such work include Brown and Durrheim, 2009; and Jones et al, 2008). More recently ethnographic techniques have been used where the researchers aim to become part of the environment in which they are working, but also to observe and find out about activity (see for example Pooley et al, 2009 or Kusenbach, 2003).

A number of studies have sought to produce monetary valuations for different aspects of the pedestrian environment (see for example Kelly et al, 2007). Typically these use stated preference (SP) modelling techniques where respondents are presented with hypothetical choices which represent the attributes of the scenario being tested. Then based on the choices that are made the relative value (willingness to pay) for the individual attributes can be determined. Such an approach provides a means of understanding the relative importance of various features of the urban environment to pedestrians (for example traffic

noise versus quality of pavement provision) and hence a basis for the allocation of scarce resources towards improving facilities for pedestrians.

3. From the problem to the solution: a window of opportunity?

The previous sections illustrate the current lack and short-comings of data collection but also the broad range of available methods with their strengths and weaknesses. To advance further from this situation, two main approaches are needed. First, the data collection methods need to be adequate for walking and sojourning. This requires awareness of the characteristics of walking as well as the needs, abilities and wishes of pedestrians. Secondly, the data should be collected in a way that at least some results are comparable. This requires some standardisation and harmonisation of indicators and data collection procedures.

Within the PQN project the decision was made to start work based on both of these requirements and not just (once again) deplore the fact that data are missing and cannot be compared. The idea is to start remedying the situation by setting a process in motion and strive for a “consistent methodology for recording pedestrian activity, to create easy to use auditing tools and guidance on national and local procedures for monitoring walking” (excerpt from the PQN objectives). It was also decided to try and co-ordinate these efforts on a global basis. Concurrently with the start of the PQN project the participants at the 2006 international WALK21 conference in Melbourne concluded that it was time to develop a set of “international guidelines for the collection, analysis and dissemination of qualitative and quantitative techniques for measuring walking” (Walker 2006).

This situation is also a window of opportunity. The fact that little is known while at the same time the interest to collect data is increasing rapidly, that more and more data are being gathered, surveys and audits performed, new methods developed and technologies placed on the market, is all a big step forward and a chance to use the momentum. It is the right moment to establish some common ground before everyone creates their own typology and data sets.

3.1 Characteristics of walking and the implications for measurement

Creating good urban spaces requires knowledge of the characteristics of walking and sojourning and also the needs, abilities and wishes of pedestrians. In technical terms, it means that we need to know what the system properties of pedestrian traffic are and base our work around these.

Understanding characteristics of walking is needed, for example, to create an appropriate institutional framework with laws, norms and financing procedures that properly include walking. The same is true to design, build and maintain adequate infrastructure provisions for pedestrians and sojourners in public spaces. Furthermore, the perception and communication by the public, media and politicians has to be grounded in the qualities of walking and, last but not least, also the methodologies and data collection tools to assess walking and sojourning have to be rooted in this knowledge to adequately measure it.

Since one of the basic problems is the inadequate understanding and tools to measure walking, it is the aim of this sub-section to focus on a phenomenological approach to some of the characteristics for walking and their implications to measure pedestrian activities. The following list indicates some of the key characteristics of walking:

- Walking is important as a distinct transport mode but also as link between other modes: Walking is the glue of the transport system which means it is often linked to other modes. It is important to always measure and present both the walking-only trips and the walking stages. When counting attention has to be paid to places where pedestrians are 'born' or 'disappearing'.
- Multiplicity of motivations, purposes and route choices: When measuring (e.g. in surveys), all simultaneous purposes, motivations, route choices and way-finding strategies need to be included.
- Flexible and small scale movements: Pedestrians are very flexible and characterised by their small scale movements. They can stop immediately and change direction quickly. Where possible direct routes tend to be taken. It's important to take all this into account when evaluating route choice and desire lines.
- Easy transitions between walking and sojourning: With no other means of transport can one switch so easily between moving and stopping, walking and sojourning. We need to record not only the walking but also the time spent in public spaces, the activities enjoyed there and the underlying motivations (e.g. to meet other people).
- Sensitivity for the immediate environment / surroundings: Pedestrians are very sensitive to the environmental qualities of their immediate surroundings. This includes architecture, flora and fauna, people present as well as influences of the weather. It concerns all senses and includes the feeling of security and the general atmosphere of a space.
- Communicative and social aspect: Walking is a highly communicative and social activity. We walk with other people and meet strangers, friends and neighbours. The potential for such communication is in itself a measure of the quality of the space.
- Socially inclusive and environmentally friendly: Walking excludes few people and is, thus, the most democratic form of transport. It is a low impact mode of transport and has fewer environmental implications than other modes.
- Walking is healthy – mentally and physically: The contribution of walking to health is increasingly being recognised. The current focus is on physical activity, but walking also is important to relax, contemplate and reduce stress.
- Walking happens everywhere, anytime: Walking is ubiquitous: often quality assessments and surveys concentrate on the city centre, but people on the urban fringe walk as well. We also need to consider the influence of season and time of day, not only counting at some assumed peak hour.
- People on foot often do not see and define themselves as pedestrians: Pedestrians, when surveyed, are often not aware how much they are walking (or have walked) and answer with other modes in mind. They may prefer to give their opinion from a car driver's perspective even when asked about their views as pedestrians. Since the media often shapes perceptions of walking (and other modes) it is helpful to look at current discussions in the media and politics.

From these descriptions it becomes evident how important it is to develop indicators and methodologies based on the specific qualities and characteristics of walking and pedestrian behaviour. They also illustrate the need for careful thinking and new research to find reliable and valid data collection techniques.

3.2 Relevant concepts in the field of measurement

There are a wide range of concepts used to measure walking and pedestrian activity. Often the terminology is confusing. Here we examine three selected aspects that influence the development of measuring techniques.

Qualitative versus quantitative and subjective versus objective assessments
Our position is that these varied approaches all have their merits and disadvantages and their use depends on the objective. Figure 1 tries to integrate and discuss these different ways of measuring, giving different examples of each.

	"qualitative" results usually based on small numbers, approximations, judgments, descriptions (verbal data)	**"quantitative"** results usually based on larger (representative) figures
"subjective" results usually based on personal perceptions and opinions	*Example:* Community street audit *(How community members judge safety of a crossing)*	*Example:* Population survey about attitudes towards walking *(How safe people feel generally)*
"objective" results usually based on 'immediate reality' ('objectivated' judgments)	*Example:* Expert street audit based on norm checklist *(How well a street fulfills official safety requirements)*	*Example:* Counts and 'hard' data collection *(How many people got killed and seriously injured)*

Figure 1 Classification of assessment methods

There is no hierarchy or implied importance between the different approaches; they are all valid in their own right. They need to complement and correct each other and their use also depends on the needs and requirements of the assessment.

Main types of assessment
Three main types of assessments can be distinguished which are illustrated in Figure 2.

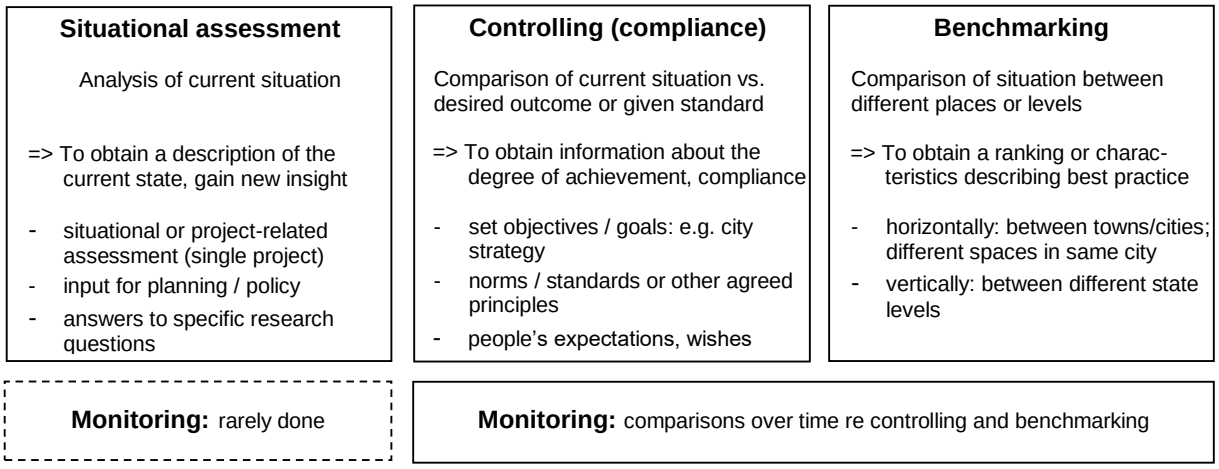

Figure 2 Three alternative types of assessments

Situational assessment: This usually analyses the current situation of a specific space and does not aim for any comparisons. It results in a description of the characteristics of a space or peoples behaviour answering a specific research question. It is often done by academics and other researchers to provide new insights but is also used to provide input for planning or policy. Due to its static and non-comparative nature, situational assessment indicators and methods can be freely chosen according to the research question and/or interest.

Controlling or compliance: A second type of assessment compares the current situation with a desired outcome or given standard. It aims to obtain information about the degree of achievement or compliance. The standard against which the situation is measured can be a set objectives or goals (e.g. city strategy) or it can be a normative standard (e.g. usable width of a sidewalk as defined by the national guidelines) or it can be measured against people's expectations or wishes as provided in a survey (e.g. quality of a space). Since this type of assessment explicitly aims to make comparisons, the indicators and methods have to relate

to the objectives i.e. they have to be valid and measure what they need to measure. The methodology employed has to be replicable and cannot change between different data collections. The data can be 'absolute' (e.g. km of footpaths) or 'relational' (e.g. number of walking trips per capita).

Benchmarking: The third type of assessment compares situations between different places or different levels. It aims to obtain a ranking or compare characteristics and can also be used to evaluate best practice. We can distinguish between 'horizontal' benchmarks of comparable towns, cities or specific spaces and 'vertical' ones between different state levels e.g. when comparing mode share of walking on the national level with the one on city level. In order to achieve valid and reliable results most statements and indicators have to be relational (e.g. per capita) and they need to be comparable in terms of adequate sample and perimeter. Intercultural comparisons are particularly difficult (even if the same methodology is applied) since the cultural understanding and concepts may widely differ. Benchmarking is often used as the broader term which includes also controlling as sub-category. However, the two concepts are kept separate here for easier communication.

Situational assessments are not usually aimed at comparing over time while controlling and benchmarking are usually implemented as part of a monitoring programme each with several measurement points in time. This also influences the detail and precision of the data necessary. While a situational approach may be pragmatic with approximations, data for comparing before with after situations need to be of higher quality to avoid arbitrary results.

Improving quality step by step

The current situation in terms of pedestrian facilities and measuring walking differs substantially around the globe. There are not only huge differences between countries and regions of the world, but also large differences within countries, specific regions or cities. Car-oriented societies with large urban sprawl, for example, differ widely from more compact cities with well established public transport infrastructure. The situation in small towns and cities is very different from that in large mega-cities. Provision for walking in old cities is often very different to newer suburban areas.

These developments can be seen in both diachronic and synchronic terms. Diachronic in the sense, that we can see differences in developments over time. Synchronic in the sense, that even in the same era the development differs substantially between regions or within the same city.

This wide range of situations has to be reflected in assessment tools. We can distinguish two requirements: first, the approaches and attitudes taken by the administration and those in power and, secondly, the degree of refinement an indicator or method has. Both requirements are briefly discussed below.

Approaches and attitudes: the quality ladder

The quality management literature defines several stages to achieve excellence (see EFQM, 2010) with regards to the attitude and approach taken by those in power and the integration of the different parts of the system. This kind of quality rating has particularly been developed and applied in the safety world. Fleming (1999) has, for example, developed the so called safety culture maturity model which then was refined by Hudson (2001). Methorst (2010.) has adapted these models to walking. The version of the quality ladder shown in Figure 3 is slightly enlarged to include a possible bottom step to the ladder. The reason is that it could be argued that measuring walking is based on so called pre-conditions. It requires and assumes the existence of knowledge, sensitivity to the issues and (political) willingness as well as a certain level of development in terms of walking policy and infrastructure. However, how do we reflect a stage where this is not given or only marginally established? Our model

is, therefore, enlarged with a stage of "complete ignorance" where the above mentioned pre-conditions are not yet established.

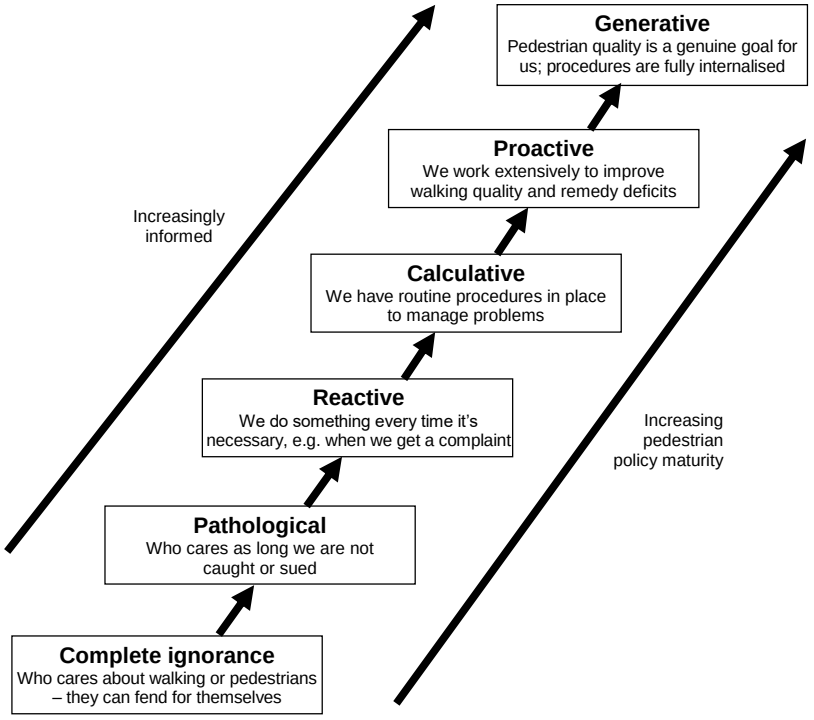

Figure 3: Maturity of pedestrian quality policy (adapted from Methorst, 2010)

The 6 phases or approaches can be more closely described as follows:

- Complete ignorance: This approach is characterised by complete disregard of walking and inactivity of the relevant bodies. The attitude is that pedestrians do not need any provision, they can fend for themselves. In extreme circumstances walking may be considered as an 'enemy' standing in the way of 'progress'.
- Pathological: This approach requires a minimal awareness of pedestrians and their needs. The attitude is that we don't care as long as there are no negative repercussions.
- Reactive: This approach is based on obvious problems and received complaints. The attitude is that we do the minimum and act if there is a serious problem or grievance brought to our attention.
- Calculative: Established procedures are in place in this approach to deal with problems of pedestrians. But every intervention is treated as a singular event. Managing problems is routinely done but in an isolated manner.
- Proactive: The work is organised in a way that the quality of pedestrian facilities is improved constantly and widely. Deficits are remedied on a regular basis and the people involved strive to optimise the system and co-operate with different partners.
- Generative: Pedestrian quality is a genuine goal for all of the involved. Improving walking policy is a permanent task, the procedures are fully internalised and the 'antennae' into the world are wide open meaning new ideas are actively sought and integrated, strategic partnerships (within and outside the administration) are developed and draw from a range of ideas.

Degree of indicator and methodological refinement

The approaches described above also have to be translated into different indicators of quality levels and methods. A big city probably has different needs, opportunities and means to measure walking compared to a small town. In a more advanced city it may be desirable to

fine-tune the information collection and go into more depth compared to other places where a simple indicator might suffice. To make indicators and methods adaptable to different situations while still being comparable we propose a modular approach. This also allows pragmatic approaches as well as the integration of new developments (e.g. technological advancements). For the time being it is suggested to differentiate between three quality levels (basic, intermediate and elaborate) which also relate to a corresponding time frame of their use (short-, mid- and long-term).

4. Assessment Model for Measuring Walking

When looking at what needs to be measured we can distinguish four main dimensions:

- How much walking?
- What is the quality?
- What are the perceptions?
- What are the institutional conditions?

These four dimensions were derived from discussions and go beyond traditional approaches which usually just comprise the first and second point. Subsequently, we have developed a more comprehensive Assessment Model to analyse walking and the public realm. It essentially shows what needs to be addressed in terms of measurement. Of course, there are many different ways in which such an assessment framework could be constituted. The one developed within this project is based on the Excellence Model by the European Foundation for Quality Management (EFQM, 2010) and Beckmann et al. (2004) and has been adapted and further developed from a cycling benchmarking assessment matrix from New Zealand (New Zealand Transport Agency, 2009). The content is adjusted to the specific requirements for assessing walking and public space.

The current model shown in Figure 4 developed as a result of a long discussion process over several stages with input from many international experts. Broad international support and agreement is important if we want to share and adhere to a common framework which will allow us eventually to compare results.

The Assessment Model is intended to serve as a reference point to ensure walking and public space are considered in a comprehensive and comparable way. It can be used as a resource for fine-tuning the different elements within the model. The Assessment Model itself stands on four main pillars: input, output, outcome and impact which are characterised as follows:

Input describes the institutional framework in which walking is situated and informs about the financial, material, organisational and human resources made available by authorities or other organisations as a basis for providing good walking conditions. This section specifically comprises the leadership given by politicians and (senior) officials, strategies and policies including the laws and norms as well as the implementation procedures, the resources allocated (in terms of staff and funding), the research settings and approaches and the co-operation within and between administrations, citizen participation and partnerships with stakeholders outside the administration.

Output focuses on products and activities by (institutional) actors, which are achieved through their efforts and activities. Outputs in the field of walking comprise land-use, the resulting accessibility and the (degree of) integration between different modes; infrastructure provision, features and qualities of public spaces; information, promotion and the marketing of walking and the enforcement (e.g. re speeds and parking of motor vehicles).

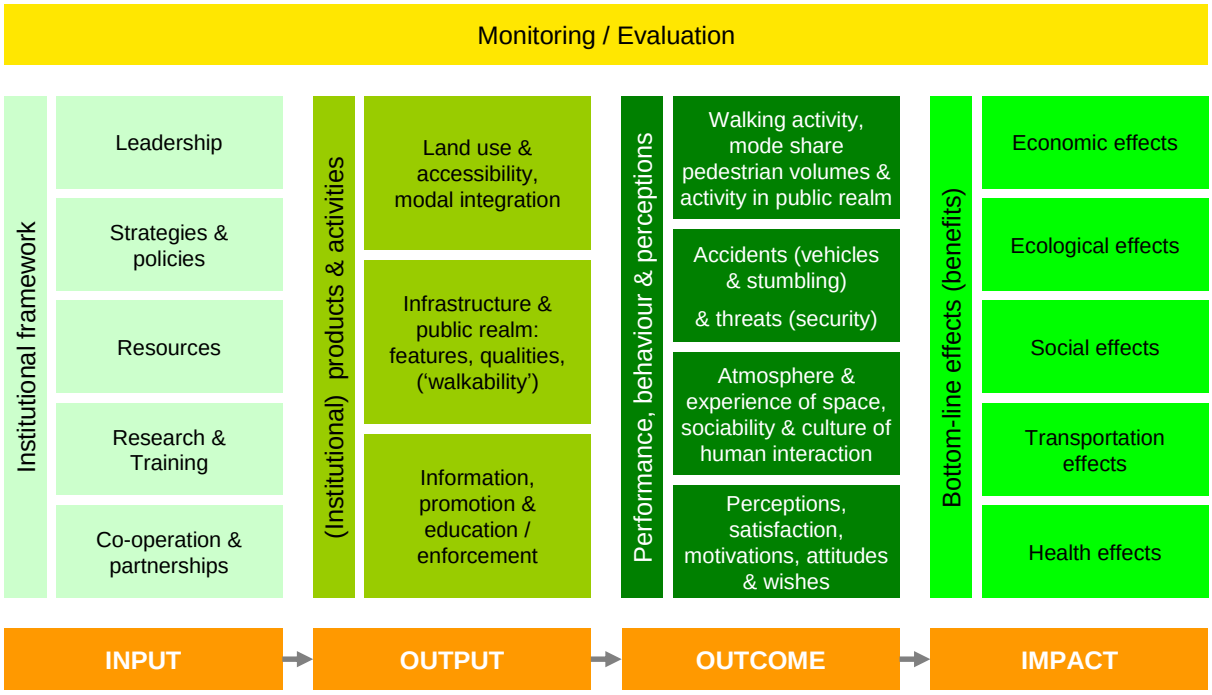

Figure 4 Assessment model for measuring walking

Outcome is the primary and immediately observable result of input and output for the recipients or beneficiaries. Outcome is measured as levels of walking and sojourning, user activities and behaviour, also in terms of accidents (with vehicles or as a result of falls) and security (threats and attacks). Outcome can also be observed as atmosphere of a space. In contrast to the 'hard' infrastructure, the sociability and mood of a space is created by the people using it. The final yet crucial dimensions are perceptions and levels of satisfaction, attitudes and motivations as well as expectations and wishes of users or non-users and of politicians and the media.

Impact is a secondary outcome usually with longer lasting, often indirect effects. It is often hard to measure. We can distinguish between individual and collective effects with the latter usually being of most interest. They include the bottom-line economic, ecological and social benefits (effects) and can also be discussed in terms of specific effects regarding transportation or health.

Based on the above elements it is possible to consider how effectiveness and efficiency may be derived. Effectiveness is calculated from the ratio of actual and planned output (or outcome / impact respectively) and efficiency is the ratio of output (or outcome / impact respectively) in relation to the costs (input).

While the current analysis of walking usually focuses on 'output' and 'outcome' (e.g. qualities of walking environment and walking activity), the political discussions and decisions often refer also to the 'input' and 'impact' factors (e.g. investments and ecological effects). So it is important to look at all relevant factors right across the board. The Assessment Model is not, however, a simple cause and effect model. There are far too many side, counter and reinforcing effects that influence the different parameters. They may also, for example, be influenced by such factors as changing transport demand, exogenous demographic and economic conditions (oil price) and social trends. All these factors and repercussions are not included in the model since it is static. A dynamic model to take account of these factors could ultimately be envisaged, but is beyond the scope of this paper.

5. Towards the creation of key performance indicators

Given the objective to define adequate standardised methods to measure walking, the next steps are to use the Assessment Model and its related dimensions to develop a set of indicators and methods. This will happen in several stages:

5.1 Identifying and selecting indicators

1) Firstly, a list of indicators has been identified and assembled based on the wealth of pre-existing indicators used in different professional fields and geographic areas (see annex).
2) Secondly, it is necessary to rationalise the large number of indicators and agree on those that capture the many dimensions of walking best and that can be easily used in different contexts worldwide.
3) The final stage may consist of creating indicator sets, i.e. to group them into applicable tools to be used for different purposes (see below).

One possibility is that the full list of indicators could be indexed in a relational data bank according to different criteria. This would serve as a resource for researchers who want to go beyond the agreed indicators for specific applications. The indexed indicators could be linked to suggested applications, methods and tools. Given the other tasks it is, however, not a priority to develop such a comprehensive resource.

5.2 Specification of methods on how data should be collected

When the indicators are assembled into sets the methods can be defined to specify how the data for the indicators should be collected. Only if the same kinds of data collection procedures are applied will we reach comparable data. The result will be recommendations and guidelines consisting of minimal standards about how walking and pedestrian activities should be measured. The methods have to orientate themselves with the characteristics of walking and measure what they ought to measure (validity) as well as possible (reliability).

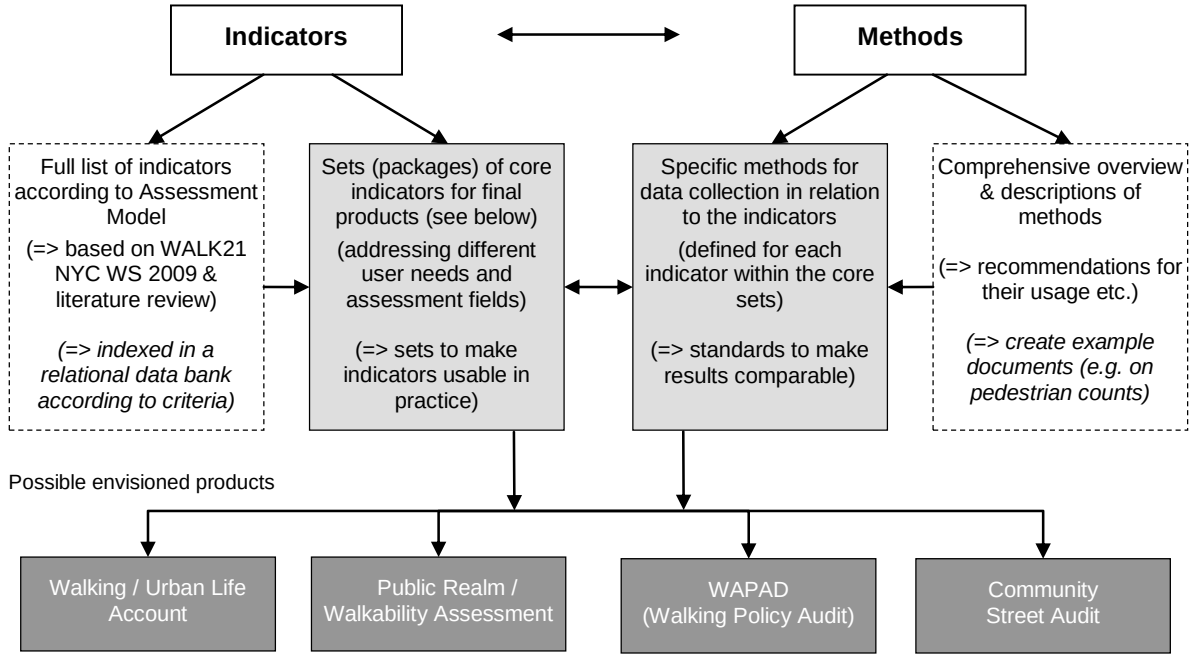

Figure 5 Overview of the next steps

* The boxes in light grey are those next steps which are seen as a priority; the boxes in dark grey are possible products that can be envisioned when combining the indicator sets with the specific data collection methods.

Just as with the indicators it should be possible to create a comprehensive data bank of methodologies relevant for measuring walking. This could contain (minimal) standards about data collection procedures to make sure walking activity and public space qualities are adequately assessed. First ideas and suggestions for methodological standards were made by Sauter and Wedderburn (2008). The comprehensive data bank would go beyond the immediate needs for agreement on methods for the indicators and, therefore, is not a priority. This process is shown in Figure 5.

As stated earlier this work does not aim to standardise all indicators and methods. The idea is to concentrate on core indicators which are easy to implement and which assure a minimal degree of comparability. Theses standardised indicators and methods could be grouped into products that reflect the needs of different users and address different purposes when measuring walking. Four core sets of quality indicators are envisaged and briefly described below.

Walking or Urban Life Account

The Walking Account or Urban Life Account would provide a set of key figures for each city to benchmark itself against other cities or towns. The Account would comprise indicators from all four pillars (input, output, outcome and impact) and would address policies and invested resources, figures on accessibility and pedestrian facilities, share of people walking and activities/time spent in public realm, perceptions as well as economic, social and ecological impacts. A range of methods would be employed to get the information including existing data from the cities and population survey data.

Several existing products can serve as examples and input for the Account, such as the Copenhagen Bicycle Account see www.kk.dk/english.aspx, City of Cyclists); Bicycling and Walking in the United States: Benchmarking Report 2010 (see www.peoplepowered-movement.org) or the project 'Making Walking Count' (see www.walk21.com).

Public Realm / Walkability Assessment

The Public Realm or Walkability Assessment would focus on the qualities of specific spaces, e.g. a square or a street. It would not comprise the whole city but selected areas where a more in-depth analysis could be performed. It is these spaces that are then compared. The assessment would include elements from all 'pillars' of the model but focus mainly on the output and outcome level. Methodologically the data collection may mainly be based on quantitative and qualitative data assembled on site or by GIS, possibly expanded by surveying local residents or performing on-site interviews.

There are many current products and studies that can serve as examples, among them studies by Project for Public Spaces (see www.pps.org) and Gehl Architects (see www.gehlarchitects.dk); information from the European ASI project (see Forward, Kaufmann & Risser, 2005 or Martincigh, 2009); the Pedestrian Environment Review System (PERS) (see www.trl.co.uk); Walkscore or walkshed (see www.walkscore.com or www.walk-shed.org). Many resources can also be found on the websites of Active Living Research (see www.activelivingresearch.org) and the Pedestrian and Bicycle Information Centre (www.walkinginfo.org).

WAPAD: Walking Policy Audit Tool

The Walking Policy Audit Tool would analyse in detail and in a comparable form the input side, i.e. the institutional framework: leadership, strategies, resources, research and training as well as co-operation and partnerships. These elements are all very difficult to measure quantitatively so a rating will be developed of the commitment by the towns, cities, national and regional governments.

The tool would probably be oriented along the lines of the European Quality Management model (see EFQM 2010) and more specifically along the excellent example of BYPAD (Bicycle Policy Audit - see BYPAD Consortium 2008, www.bypad.org). The audit could take on two different versions: a) similar to BYPAD where trained external auditors are doing the assessment during so called consensus meetings in which politicians, members of the administration and people from civil society (NGO's) rate the city's performance and come up with ways to improve the situation; or b) to make a self-assessment tool for the officers and/or the users so every interested person in a community could rate performance.

Among the examples for this kind of product are the already mentioned Bicycle Policy Audit BYPAD or the report by the New Zealand Transport Agency (2009).

Community Street Audit

Community Street Audits are a way to evaluate the quality of streets and spaces from the viewpoint of the people who use them, rather than those who manage them. It is about the stakeholder perceptions and input into improving spaces. A Community Street Audit usually is carried out together with local residents, business/store owners and visitors, all having many different backgrounds and capabilities. They comprise assessment elements from all 'pillars' with a special focus on accessibility and public realm qualities. It is important, however, to also include strategic and resource issues (input), perceptions (outcome) and impacts (e.g. on social inclusion).

The main objective of creating a Community Street Audit tool would be to standardise procedures and to a lesser degree make results comparable. Such an audit should be designed so that interested community members and groups (neighbourhoods, NGO's etc.) could use them without much professional help. This would be in contrast to the other tools which require some expertise to perform. Of course it would be desirable if the audit process was accompanied by people with experience. Methodologically, a Community Street Audit can take on many different forms. Usually it is centred around a site inspection, possibly complemented with workshops, focus groups and/or surveys. Among the examples of this kind of product are the Community Street Audits by Living Streets (see www.living-streets.org.uk) or the Assessment Tools by the Project for Public Spaces (see www.pps.org).

6. Concluding remarks

The increasing interest in measuring walking and using this information to create walkable cities is a very welcome sign of progress. For too long the potential of walking to create enjoyable public spaces and liveable cities has been neglected. The increased interest is a window of opportunity to create measurement techniques and procedures that are adequate to the characteristics of walking and, at least to some degree, are also standardised enough so the data is comparable. This will allow a city to benchmark itself against their neighbours or other cities in the world. We know from experience that this is one of the main drivers today to improve the public realm. What London does in Trafalgar Square, New York does in Times Square and Melbourne does in Federation Square reverberates through many cities and towns across the world, creating a great momentum.

Measuring and understanding the many aspects associated with walking and enjoyment of public spaces requires an adequate and comprehensive assessment model. In the framework of the PQN project such a model has been developed and can serve as a basis to create indicators and methodologies to appropriately measure walking. There is still a long way to go, but looking back at the dismal days of no information at all, the future looks promising.

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Annex: List of key performance indicators (or elements to create them)

Based on the framework of the Assessment Model a list of key performance indicators or elements necessary for creating them has been developed (status: June 2010).

	Main Criteria	Key performance indicators (or elements for creating them)

Input: Institutional framework	Leadership	• **Politicians and (senior) officials**
		  • Extent to which politicians and (senior) officials take a lead and direction in supporting walking and public space improvements
		  • Sensitivity and awareness of walking and public space issues
		  • Content and form of communication about walking and public space

	Strategies & Policies	• **Walking strategy & integration of walking in other strategies**
		  • Presence and quality (content) of a walking and public space strategy
		  • Presence and quality of strategies/policies closely related to walking e.g. land-use, health, transport/mobility, social integration, environment
		  => Degree of integration between these different strategies/policies: coherence, conflicts
		  • Policy principles supporting walking (e.g. polluter pays, 'true cost' approaches, 'complete streets', 'vision zero' etc.)
		• **Implementation procedures**
		  • Type of implementation programmes / action plans
		  • Type and degree of integration within 'Input' level, i.e. between policies and resources
		• **Legal framework**
		  • Laws, norms & regulations; supportiveness of legal framework for implementation

	Resources	• **Funding** (incl. infrastructure investments, promotion, maintenance, research etc.)
		  • The level and continuity of funding for modes/projects …
		  a) with adverse effects on walking; **b)** for rectifying poor walking situations and **c)** to genuinely improve walking conditions / public spaces
		• **Staff**
		  • Number and qualifications of staff, their seniority and training
		  • Position and power of walking unit within administration

	Research & Training (Education)	• **Funding**
		  • Research and monitoring (funding) procedures in place (yes/no)
		  • Resources allocated (funds, staff, share of resources for walking and other modes)
		• **Institutional setting**
		  • Research institutions (staff, position, funding, etc.), coordination with other research areas (on national level), position and power within administration of monitoring unit
		  • Education: students & professionals = continue education (engineers, health, architects); walking and design of public space included in curriculum
		• **Approach**
		  • Type of research: basic as well as applied research – creating new insights & monitoring

	Co-operation & Partnerships	• **Co-operation within and between government agencies ('vertically' and 'horizontally')**
		  • On / between all government levels (local, state, federal)
		  • Between different departments (transport, health, environment, etc.)
		  • Between different tasks (e.g. planning, maintenance, regulation, promotion, monitoring)
		• **Public involvement / citizen participation in decision making, consultation**
		  • Procedures, degree of decision-making powers
		• **Co-operation and dialogue with stakeholders outside government/administration**
		  • NGO's, advocacy groups, economic interests (developers, retailers etc.), 'friendly forces' and potential opponents

	Main Criteria	Key performance indicators (or elements for creating them)

Output: (institutional) products & activities	Land-use & modal integration	• **Land-use**
		  • Land-use: functional mix; mixture and density of uses
		  • Space allocation and distribution (e.g. green space, walking vs. other transport space)
		• **Distances, (macro-) accessibility & connectivity**
		  • Distances to amenities / provisions / destinations ('walkscore' / 'walkshed'),
		  • Accessibility and connectivity (macro level)
		• **Modal integration**
		  • Integration of walking with other modes, especially with public transport, cycling, car-share
		  • Accessibility of facilities at interchanges

	Infrastructure & public space	• **Walking network**
		  • Length, density and extension of footpath network e.g. according to type/category: sidewalks, greenways/trails, other stand-alone footpaths, pedestrian areas, pedestrian priority areas, shared space
		  • Connectivity, permeability, detour factors, micro accessibility
		• **Space (unobstructed)**
		  • Space allocated to pedestrians and sojourners, e.g. sidewalk width
		  • Amount of open spaces, spaces to relax, to stop, sit and/or stand
		  • Size of designated clear path, unobstructed walkways (opposite: density of obstructions)
		  • Seeing distances, visual perspectives (vistas)
		• **Pedestrian scale buildings & usages**
		  • Type of ground floor usage / frontages (shops, cafés, etc.), diversity, uniqueness
		  • Dimensions of buildings and facades (human/pedestrian scale), quality; e.g. number or proportion of buildings with human scale front structures on street
		  • Proportions of building height to street width
		  • Aesthetics of buildings, e.g. allowing a sense of history and context ('landmarks')
		• **Quality of environment, provisions**
		  • 'Green' and 'blue' on the street, i.e. trees, green areas, (accessible) water, fountains etc.
		  • Micro-/climate moderation and protection: sun, heat, rain, wind
		  • Seats provided: formal (benches) or informal (ledges), or in outdoor cafés; arrangement of seats (conducive to watching and interacting with other people)
		  • Availability of toilets and other services
		• **Street lighting, security**
		  • Street lighting generally, pedestrian level street lighting & its quality: 'warm' light
		  • Windows facing the streets, ground floor shops light up (no closed shutters)
		  • Number of people & activities in street spaces at night
		• **Crossings / road danger (safety)**
		  • Number, location and quality of crossings: well marked, distances minimal, no detours (neither vertically nor horizontally)
		  • Traffic lights timed to needs of pedestrians: calculated crossing speed, waiting times
		  • Crossings and traffic lights equipped for mobility and sensory impaired pedestrians
		  • Street(s) with speed limit(s) lower than 30km/hr (20mph) or traffic calmed streets (e.g. proportionate to all streets); actual speeds driven (V85) above 30 km/hr
		  • Vehicles (illegally) parked obstructing space and overview for pedestrians
		• **Wayfinding (orientation and signage)**
		  • Orientation/navigation intuitively possible, 'legible' street design, clear vistas
		  • Wayfinding system in place for major destinations in area,
		  • Tools are easy to follow and consistent (maps, signage), 'landmark' orientation

	Main Criteria	Key performance indicators (or elements for creating them)

Output: (institutional) products & activities (continued)	Infrastructure & public space	• **Pollution & disturbance by motor traffic**
		  • Noise level: e.g. proportion of street length or population exposed to traffic noise above certain levels; or: percentage of population feeling disturbed by traffic noise (day/night)
		  • Air pollution: e.g. proportion of street length or population exposed to pollution above certain levels
		  • Intrusive motorized traffic: volume and composition of motorized traffic; number of on-street parking spaces in proportion to streets length or surface area
		• **Maintenance**
		  • State of good repair (no holes and other stumbling elements, lights functioning)
		  • Cleanliness e.g. negatively measured as waste left on the ground per m2, dog poop
		  • Snow removed from walkways and transit stops in winter time (degree, efficiency, time)

	Information, promotion & education/ enforcement	• **Information / communication**
		  • about services and offers by public authorities and private actors
		  • about achievement and improvements made
		• **Promotion and marketing**
		  • Number and scale of promotional activities for walking
		  • Incentives / reward programmes for pedestrians
		  • Efforts to create a culture of walking and a culture of respect and tolerance between users of public space / road users
		  • Media coverage of walking (& related issues)
		• **Education and law enforcement**
		  • Driver education and enforcement of rules e.g. re speeds, parking
		  • Education re infrastructure accessibility / design for all (e.g. for private investors)
		• **Co-operation with third parties**
		  • Programmes together with third parties, NGO's, civil society, private companies etc. (e.g. events, services, communication etc.)

	Main Criteria	Key performance indicators (or elements for creating them)

Outcome: Performance , behaviour & perceptions	Walking activity, mode share pedestrian volumes & activity in public realm	• **Walking activity / levels of walking**
		  • Daily walking trips (stages), distance and time walked per person (according to age, gender, social status etc.)
		  • Mode share of walking (in relation to other modes)
		  • People walking for exercise (leisure walking: hiking etc.)
		  • Walking levels/intensity contributing to physical activity (WHO recommendations
		  • Children walking to school (unaccompanied)
		• **Pedestrian volumes & density**
		  • Number of pedestrians per hour (according to day and night time, diff. seniors and kids and if they and if they walk alone)
		  • Density (crowdedness): number of pedestrians per meter street/path width (Fruin)
		• **Activity in the public realm; route choice**
		  • Number of people in public spaces, activities performed (according to age, gender, social status, type and activity, groups day and night time, are seniors and women by their own present; kids playing, recording if they are accompanied)
		  • Intensity of use: average number per 100 m2
		  • Time spent in public spaces, type of night activities
		  • Route choice & flows
		• **Car-related information**
		  • Number of cars per household (share of car-free households)
		  • Short car trips (proportionate to all car trips; short = below 1km / 3 km)

	Accidents & threats (safety & security)	• **Road danger (safety)**
		  • Traffic accidents with pedestrians (involving at least one vehicle): killed and severely injured pedestrians (relative to population and time walked)
		  • Percent of users who witnessed directly or indirectly a traffic accident in the area during the last 5 years
		  • (Actual) speeds being driven by motor vehicles
		• **Single pedestrian accidents**
		  • Number of falling and stumbling accidents: Killed and severely injured pedestrians (relative to population and time walked)
		• **Security**
		  • Density of crime; threats, attacks, harassments
		  • Number of people on street at night (according to gender and age), type of night activities

	Atmosphere of space & culture of human interaction	• **Sociability & human interaction**
		  • Social aspects: sociability, social interaction, conflicts (people showing affections, spontaneous friendly interactions; eye-contact between strangers; smiles etc. but possibly also conflicts and hostile encounters
		  • ‘Mood’ of space created by users
		  • Culture of human interaction between street users, e.g. respect shown by car drivers towards pedestrians
		  • Number and type of local activities (flee-markets, concerts, etc.)
		  • Sensory aspects: sounds, smell, tactile impressions etc.
		  • Appropriation of space by users

	Perceptions, satisfaction & wishes	• **Perceptions & satisfaction**
		  • Personal satisfaction, happiness, comfort ‚measuring the smiles‘
		  • Mental well-being, emotional responses in space
		• **Motivations & attitudes towards walking**
		  • Motivations and barriers to walking
		  • Attitudes and general image of walking, awareness
		• **Expectations & wishes**
		  • Expectations, hopes, wishes and visions; e.g. expected quality by user

	Main Criteria	Key performance indicators (or elements for creating them)

Bottom-line effects (benefits)	Economic effects	• **Individual economic impacts**
		  • Cost savings re transportation
		• **Collective economic impacts**
		  • Cost savings: e.g. in terms of infrastructure, health, accidents and pollution
		  • Increased efficiency and effectiveness of mobility
		  • More retail activity (shoppers)
		  • Less unemployment
		  • Possibly higher real-estate and rental prices (for shop owners, residents etc.) (=> adverse effects)

	Ecological effects	• **Individual ecological impacts**
		  • Smaller individual carbon footprint
		• **Collective ecological impacts**
		  • Energy savings (fuel) and savings of other resources
		  • Reduced pollution, CO2 emissions, carbon footprint
		  • Less climate change effects
		  • Reduced noise
		  • Reduced land-use
		  • Reduced severance (better connections for people and animals)
		  • Reduced sealed surfaces => more permeability, flooding prevention
		  • Increase of ecological diversity

	Social effects	• **Individual social impacts**
		  • More autonomy, independent participation in social life (children, people with disabilities, elderly persons etc.)
		  • People feeling socially more included
		• **Collective social impacts**
		  • Increased social inclusion, more community cohesion,
		  • More social equality; democracy: participation for everyone in social life possible
		  • More peaceful interactions, less criminal offences

	Effects on transportation (system)	• **Individual transportation impacts**
		  • Time savings
		• **Collective transportation impacts**
		  • Less need for transportation space
		  • Less congestion, higher efficiency
		  • Infrastructure cost savings

	Health effects	• **Individual health impacts**
		  • Mental health: improvements in mental well-being => less stress, more happiness
		  • Physical health: improvements in physical well-being
		  • People live longer (healthier)
		• **Collective health impacts**
		  • Lower health costs
		  • Fewer health inequalities