

# MEASURING WALKING. TOWARDS INTERNATIONALLY STANDARDISED MONITORING METHODS OF WALKING AND PUBLIC SPACE

*Daniel Sauter, Urban Mobility Research, Zurich, Switzerland  
Martin Wedderburn, Colin Buchanan, London, UK*

## 1. PROJECT TO HARMONISE DATA COLLECTION METHODS

### 1.1 Introduction and background

For many years walking had not been seriously considered as means of transport and, consequently, not been measured. In recent years we have seen, however, a slow change towards the better. New methods and tools to assess walking have been developed all over the world. Data is gathered, surveys, counts and audits are performed. In parallel, new technologies and equipment is being placed on the market. This is a big step forward. However, many exchanges and debates show one common problem: the incompatibility of data and methods.

The European COST project 358 “Pedestrian Quality Needs PQN” ([www.walkeurope.org](http://www.walkeurope.org)) aims to publish (among other things) a consistent qualitative and quantitative methodology for recording pedestrian activity; easy to use auditing tools and guidance on national and local procedures for monitoring walking. Currently 20 European countries are participating in this project. In a first step we’re creating an overview of existing methods used to assess walking in the different European countries (a questionnaire has been circulated among participants). On this basis we started to discuss content and procedures to establish some common ground for the type of data to be collected and the adequate methods and tools to be used in order to make them internationally (more) comparable.

At the 7<sup>th</sup> WALK21 conference 2006 in Melbourne the International Charter for Walking has been adopted (for the conference series and the Charter please see [www.walk21.com](http://www.walk21.com)). It outlines what should be measured but it doesn’t say how this should be done. It is, therefore, logical and timely to make the next step and develop a set of “international guidelines for the collection, analysis and dissemination of qualitative and quantitative techniques for measuring walking”, as stated in the Melbourne conference conclusion. At the 2007 WALK21 conference in Toronto a day-long pre-conference workshop has been held to start the discussion and

exchange of know-how globally. More than 30 experts attended the whole day session which resulted in a fruitful brainstorming on the many aspects of measuring walking. The debate will be continued at the 2008 WALK21 conference in Barcelona in October with a special focus on counting pedestrians. To this, city officials, experts and equipment providers will be invited.

The two efforts in COST 358 and WALK21 run in close co-operation and are both facilitated by Daniel Sauter. Envisioned is the creation of a joint handbook with recommendations and guidelines by international experts – to be presented at the planned joint PQN/WALK21 conference in 2010.

The process of creating these guidelines is open to everyone interested: researchers, data users, persons responsible for measuring walking in cities or municipalities, promoters of walking, providers of technical equipment etc. If you are interested in contributing please contact the authors.

## **1.2 Preliminary approach towards relevant dimensions of measuring walking**

The discussions so far have shown that walking needs to be measured in a multitude of dimensions since walking itself is a highly multi-dimensional activity (see below). After preliminary discussions the following dimensions are suggested:

- A Transport and travel behaviour data
- B Pedestrian counts (user counts), behaviour analysis (observations, interaction/conflict analysis) and pedestrian flows (models)
- C Activity and time spent in public spaces (sojourn without mobility, stationary activities)
- D Road danger/safety: traffic accidents with pedestrians (involving at least one vehicle) & single pedestrian accidents (falling, stumbling etc.)
- E Security: threats, attacks, harassments
- F Competences (disabilities), physical activity (walking), health and health outcomes
- G Walking environment, accessibility, public space quality and infrastructure provisions (“walkability”)
- H Ecological footprint, land-use
- I Perceptions, attitudes and images: personal satisfaction and subjective perception: “measuring the smiles”
- J Investments, personnel and research: Data on institutional aspects

These dimensions can each be divided in a number of sub-dimensions to adequately reflect the different aspects. They will also be linked to the International Charter for Walking. In order to reflect the different needs and stages of development it is suggested to create three quality levels:

- Quality Level 1 ‘basic’ or ‘minimal requirement’
- Quality Level 2 ‘intermediate’ and
- Quality Level 3 ‘elaborate’

### **1.3 Objective of paper and contribution to ISCTSC conference**

With this paper and our contribution to the ISCTSC conference we aim to achieve the following objectives:

- Inform about the process started on harmonising data collection methods on walking. This is work in progress, so no final results can be presented yet.
- Inform about the special, yet rarely discussed characteristics of walking/pedestrians
- Demonstrate and discuss the effects of these characteristics on the methods using as examples (1) travel behaviour surveys, (2) physical activity surveys, (3) pedestrian counts and (4) pedestrian activities and time spent in public spaces
- Demonstrate why linkages between these methodologies are important, and make the case for some recognised cross-disciplinary standards
- Demonstrate approaches to collecting data using the examples of London and Zurich to allow for specific discussions on empirical results

In general, the ISCTSC conference offers a unique opportunity to

- learn from current method harmonisation efforts in the field of transport in Europe and worldwide
- provide input about the need to reflect walking adequately in current and future survey methods
- present the current efforts being made in the field of walking to harmonise data collection

## **2. TALE OF TWO CITIES: LONDON AND ZURICH**

Most of our examples used are from London where Martin Wedderburn is based and where he carries out different surveys and from Zurich where Daniel Sauter does similar work. In both cities walking and data collection in walking has become a more prominent issue. The two cities are, of course, not representative for the European or even global approach we intend to take on this issue. They are only used as examples to illustrate the methods and the benefits of comparable benchmarks. Interestingly, we have quickly found common ground despite the two quite different starting points in both cities.

### **2.1 Why London and Zurich?**

In February 2004 the Mayor of London published a Walking Plan for London (Transport for London, 2004). This followed intense lobbying from a wide range of stakeholders including environmental, business and retail lobby groups. Jan Gehl's 2004 report on London, entitled 'Towards a Fine City for People' (Gehl-Architects, 2004), brought home to policymakers the degree to which London's overcrowded, traffic-dominated and unwelcoming streets delivered a pedestrian environment well below the standard of other European streets.

In Zurich the first in-depth debate questioning the common approach to traffic policies took place in the eighties and led in 1987 to a strategy in which the city defined as objectives to (1)

promote public transport; (2) reduce motorized traffic; (3) introduce traffic calming in residential areas; (4) reduce parking for cars, particularly for commuters; and (5) secure and promote walking and cycling (Stadt Zürich, 1987). Although walking was explicitly only mentioned as last point, the programme, known as the “blue book” policy, had a tremendous long term effect to improve walking conditions in the city.

In 2001 the city adopted a new, integral mobility strategy under the promotional title ‘mobility is culture’ which aims to support sustainable mobility and is based on the concept of a city of short distances (Stadt Zürich, 2001). Instead of the former five main guidelines the new strategy is divided up into 18 partial strategies, formally all equal, which define the objectives and measures e.g. regarding main streets, public and private transport, parking policies, mobility consulting, design of public space and institutional aspects. Two of these partial strategies specifically address pedestrian issues:

- the partial strategy on “walking” (Stadt Zürich 2003a) underlines the importance of walking for urban life (“the city only lives where there are pedestrians”) and aims to promote journeys on foot (1) by ensuring a continuous, safe and attractive pedestrian network; (2) by improving the qualities of public space, particularly in the more suburban parts of the city; and (3) by improving data collection, institutional ‘anchorage’ and image of walking within the administration.
- the partial strategy on “disabled persons, older persons and children” (Stadt Zürich 2003b) emerges from a participatory process which actively integrated those concerned through specific workshops. Its main objectives are (1) obstacle free public space (design for all); (2) improve the feeling and objective safety, security and certainty for these groups; and (3) create more awareness within the administration and create participative planning procedures.

## **2.2 How have London and Zurich been improving walking?**

Funding for walking in London has been growing exponentially since the Walking Plan of 2004. Initially one funding focus was the creation of the London Strategic Walk Network, an independent body charged with managing and improving some of London’s most important walking routes, ranging from the Jubilee Walkway linking major tourist attractions to the London Loop, a 70km path around the edge of the city. As an arm’s length organisation competing for funding, it was this body that was responsible for introducing a clear business plan with objectively measured performance indicators and subsequently for developing the first business cases for walking investment. The substantial recent increases in funding now mean that major improvements to encourage walking can be spread and are being targeted towards key walking routes into and around London’s many local centres.

As mentioned above the starting point in Zurich is different from the one in London for reasons of size and history. The city of Zurich has for a long time put a lot of emphasis on the quality of its public transport system - trams and buses – resulting in a high modal share (37% of all trips are made by public transport). An integrated traffic management system covering the whole city allots systematic priority to public transport at crossroads. Being faster makes it more attractive. Zurich also leads an active policy of regenerating prior industrial waste-

lands and favours urban density. These urban planning policies result in a context favouring pedestrians.

Due to the fact that since 1979 the national Constitution commits all cantons and municipalities to plan, build and maintain a continuous network of footpaths and hiking trails and due to the fact that Zurich has always kept its extensive public transport network (partly because the network was not affected by the Second World War and because of favourable decisions on initiatives and referendums) the basic conditions for walking have never been as bad as in other places. Of course, the city was transformed in many ways to favour the car but the small scale and high density also made it possible to keep the relatively short distances. This is maybe why there is not so much new political enthusiasm for walking being felt in Zurich as in other cities (e.g. London). Conditions have been gradually improved for walking (e.g. residential areas all have a speed limit of 30 km/hr; along a number of main streets the pavement is continuous) but a lot remains to be done. Particularly crossing main streets is still difficult. Residential areas are full of parked cars. Many public spaces in the city still lack attractiveness and charm and are not yet inviting to spend time outside. In residential areas and central areas more so-called 'encounter zones' (20km/hr speed limit, pedestrian priority) could be created to open up the street for all users again.

### **2.3 What are the main policy drivers in London and Zurich?**

Measurement methods are not developed for their own sake but always in response to particular concerns. For example, since road safety has been a major concern for many years, collision statistics are recorded around Europe. In recent years in London, the drive towards a more pedestrian-friendly public realm has been driven by concerns about the attractiveness of the city for business, tourists and retail. This in turn generates interest in footfall numbers as well as how people use the public space. Likewise it is recognised that pedestrians provide the best natural surveillance for other pedestrians, and interest from crime and security experts is increasing.

Most recently, health has become a key driver with concerns in Europe about obesity and the lack of physical activity. It is widely recognised that the vicious circle created by the growth in car ownership and the trend towards unsustainable, car-dominated patterns of land use is contributing to a massive reduction in the amount of physical activity undertaken by citizens of all ages.

The main policy drivers in Zurich are in principal the same as in London although not as prominent. Health-concerns are only very slowly gaining the attention of city officials and traffic planners. This may be because walking has not declined much in the last 10 years; on the contrary, there is even a slight increase, also for main trips on foot not just stages. Most children are still walking to school (in early primary school this share is 80%, less than 10% are driven to school by car). And the obesity rate is still relatively low, although increasing.

While the situation in Zurich may be better than in many places, the city is still far from being a walker's paradise. People and the administration still focus more on public transport than on walking, even for short trips. 80% of pedestrians say that trams and buses are their favourite

means of transport – less than 10% mention their own feet. The car is still quite dominant in planning and the minds of many people. A policy change, particularly in view of the physical activity crisis, is necessary. Substantial improvements are also still needed in terms of data collection for walking. Although there are some counts and surveys these are not yet done in a systematic approach and some of the surveys still do not adequately reflect the qualities of walking.

### 3. SPECIFIC CHARACTERISTICS AND QUALITIES OF WALKING

Walking has, like all other modes of transport and their users, specific characteristics and qualities. But for pedestrians and the mode of walking these characteristics have hardly been studied and recognised yet. This has had and still has serious consequences on how this mode is measured. Two aspects can be distinguished, both with detrimental effects: Firstly, walking for a long time has not been considered a relevant mode of transport and has been ignored in data collection. This functioned as a vicious circle according to the principle: What isn't counted doesn't count and what doesn't count isn't counted. Secondly, in the rare cases when walking was and is measured, then this is often done by using the methods for other means of transport, leading to distorted figures.

The point of this first part of the chapter is to illustrate some of the specific characteristics of walking in a phenomenological approach. Martin Wedderburn will then illustrate these thoughts with empirical data from London. In point 4 we will discuss the effects of these findings on some methods, in particular for travel behaviour surveys, physical activity and health surveys and for pedestrian counts and activity surveys.

The proper analysis of the characteristics and qualities of walking is a prerequisite to develop adequate measuring techniques. It also is a prerequisite to assess the range of reliable and valid results. Only when we're able to depict and measure walking more adequately we will have better founded decisions in planning and in policy-making processes – and this is the ultimate goal of all these efforts.

#### 3.1 Phenomenological approach

##### *Flexible movements on small scale*

Pedestrians have a unique capability for flexible and small scale movements. Walking satisfies the needs for the smallest scale transport. It is hardly ever linear. When you observe people's movement on foot (live or on a video) you will be amazed how much meandering, sudden changes of directions and stop and go movements there are. Some of these movements may be forced by outside pressure: motor traffic, other pedestrians et cetera, but many are self chosen. Meeting a person unexpectedly, discovering something in a shop window, being distracted by the mobile phone or getting suddenly hungry or thirsty while walking past an outdoor café are just some aspects of this phenomenon. The reasons for this behaviour are limitless and it is amazing that city planning and data collection have virtually never taken this into account. On the contrary, the flexibility of pedestrians has always been turned against them: narrowing their space, sending them through underpasses, channelling their routes and forcing

them towards fixed crossing points. No other means of transport is this flexible and no other means has paid such a high price in the past for this extraordinary quality.

As pedestrians we are ‘born’ and ‘disappearing’ virtually at every corner, e.g. when we leave the house, when we change modes, when we walk in or out of a store (and depending on the definition also when we sit down or get up in public space). This is due to the flexibility, small scale movements and the fact that we are all ‘naturally’ pedestrians,

All these elements pose a number of challenges when measuring walking: Where do you measure/count pedestrians? How do you assess trip length? How do you ensure that short stages are properly recorded?



Photos © Daniel Sauter

*Mobility on foot and activity in public space: easy transitions and fuzzy definitions*

Walking is always more than just a movement from A to B. It can take on the form of many intermediary stages between movement and sojourn activities. It is often not clear what is mobility and what is an activity in public space. And in terms of the user: it is often not clear when someone is a link user (someone who travels through a space to reach a destination) and when he/she is a place user (someone for whom the space is the destination). When it comes to walking both are pedestrians, although this term until now has often only been used to characterise the first type (link user). One of the main attractions of walking is precisely this easy transition between the two states, to be able to (gently) switch from one state to the other virtually anytime.

Often it is only momentarily possible to define a person as a space or as a link user. The quality of walking often does not depend on the number of people passing but of the time they spend in the space. Therefore, the time used to walk through a street may be just as relevant as the number of persons walking through.

Children often play for hours outside when the conditions are right (see, for example, Huettenmoser, 1995). They run around, visit other children, visit a shop, play soccer et cetera, all in the same play period – they are highly mobile and active place users. But they never appear in a travel behaviour survey because not all their movements are goal-oriented. And since they are not in the survey their exposure to risk of traffic can not be properly assessed either.

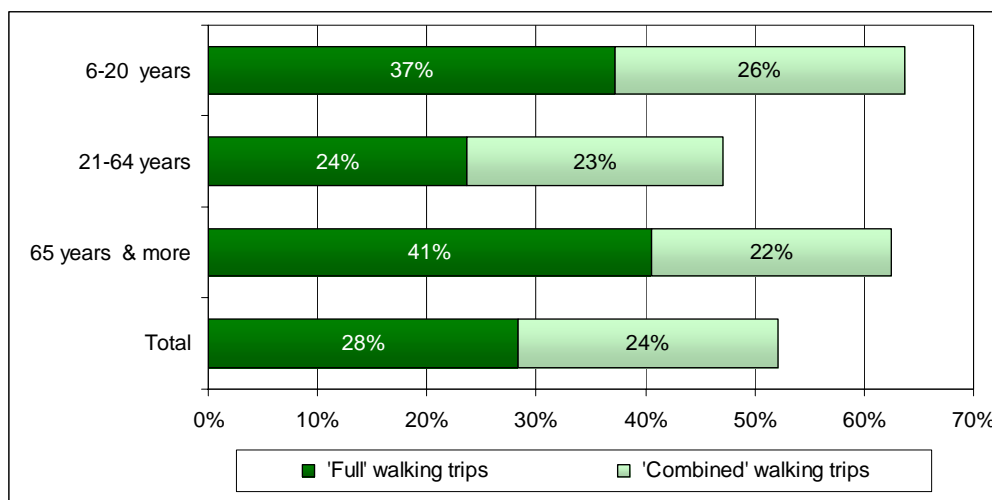


Photos © Daniel Sauter

*Walking is important as own transport mode but also as link between other modes*

No other means of transport functions so well on its own and serves at the same time almost invisibly as the main link between all other modes. In Switzerland, 28% of all trips are done by walking alone (the share differs according to age, see figure below). Additionally 24% are combined trips (BFS/ARE, 2007). This means walking is part of a trip together with another mode of transport. Walking covers most often the first and last mile and a number of in-between miles. Without the walking the public transport system would not function. Still too many public transport providers forget this fact. They forget for instance that the people waiting at the traffic lights leading to the bus/tram stop are their clients and should get an advance green light. Or they invest hundreds of millions to speed up trains by a few minutes. And when their passengers leave the train station they wait a few minutes at a traffic light... Since walking trips are often linked to other modes they are often ignored in the data collection. Walking stages disappear behind a main mode (which is often determined according to distance covered) or are simply ignored all together when only full walking trips are counted.

Figure 1 'Full' and combined walking trips according to age group 2005 (N=108,880 trips)



Source: Mikro-zensus Verkehrs-verhalten 2005, BFS/ARE, 2007 (own calculation)





Photos © Daniel Sauter

*Multiplicity of motivations: the trip as a purpose in itself, reasons for route choices*

A trip purpose is usually defined as the activity which is undertaken at the destination. The transport part itself usually does not have a purpose except for escort and some leisure trips. Walking, however, often consists of a number of purposes while a person is under way from A to B. When walking home from work one may not only make a return trip home but also enjoy it as leisure time and as a health walk. While visiting a green space for enjoyment one may also work there to some degree (mobile phones and laptops make this combination easier all the time). While walking with others one may briefly slip into a store and buy something. Or one may go shopping to a place further away to get some exercise on the way there.

A similar phenomenon of multiplicity of functions and motivations can be seen in route choices. One may choose a certain route to suit other needs than just going to a destination. One may, for example, want to get some fresh air, walk there for scenery or because it is more pleasant. Or it may be curiosity because one has never taken that route. As Martin Wedderburn will show below with empirical data, there is always more to walking than just getting to a destination. Walking is more than just a functional transport mode. Of course, this is in some cases also true for other modes (in particular for longer trips in public transport), but for walking this is one of its main characteristics.

As pedestrians we constantly choose our pace and rhythm. We stroll, scurry, promenade, trek, run, meander, walk (see International Charter for Walking: WALK21, 2006). This variety can happen during the same trip, according to purpose or feeling. Each type of movement carries a different mood. It determines how we perceive the environment (see below).



Photos © Daniel Sauter

Walking happens everywhere

Walking is the most widespread mode of transport and can be of importance even in small places. In Switzerland, for example, more than 60% of the population walk on average at least once per day<sup>1</sup>. This share is larger than with any other mode. From the smallest mountain villages to the main squares in the city of Zurich people walk. While commonly traffic on the large highways is considered nationally relevant traffic, it is in fact walking which is nationally the most wide ‘spread’ and used mode of transport.

At the same time it is the mode in many instances with the highest density: In large cities the pedestrian flows in some streets exceeds the number of cars on the most heavily travelled sections of national motorways. The number of pedestrians walking through the Bahnhofstrasse in Zurich on a regular day between 7 am and 7 pm is estimated at 90’000 (see Zweibruecken *et al.*, 2005) – this figure is higher than the vehicles travelling on the busiest section of the motorway bypass which is often in the news for its congestion. But, so far, the number of pedestrians is neither counted regularly nor is it present in the media. If it were the money might go towards increasing the width of pavements and not motorways.



Photos © Daniel Sauter

Time spent walking is long, distances covered are relatively short

Since walking is a slow mode, time spent walking is relatively long and distances covered are relatively short. About 40% of the time spent in traffic (mobility time) is spent there as pedestrian. This leads to a different kind of experience and perception of traffic, the environment and time (see below).

The large gap between time spent and distance covered commonly leads to underestimating walking since most transport data is measured in distances. This then is mistakenly taken as importance: The longer the distance travelled with a means of transport the higher the importance which is generally attributed to it. Not the need we satisfy or activity we perform at the end of the trip is decisive in this calculation but the number of kilometres travelled there. In such a perspective, buying a loaf of bread in a shopping centre 15 km away by car becomes statistically, politically and economically more important than buying the same bread in a shop around the corner on foot.

When we look at the different ways of measuring the share of transport modes, we see the large differences in percentages taking the number of stages, distance or time. The data for Switzerland 2005 shows that 45% of all stages are done by walking. And 40% of the time

<sup>1</sup> The other 40% consist of people not leaving the house on the particular day surveyed (because they are sick, disabled or they do not feel like going out) or use a mode which brings them door to door not involving a walking stage (e.g. by car). 25 metres is the minimal distance for a stage to be counted in the Swiss travel behaviour survey.

spent in traffic is done so as a pedestrian while the distance walked makes up only 6% of all distances travelled (BFS/ARE, 2007). For London the distribution is relatively similar, although the different method of quoting trips rather than trip stages produces a lower walking mode share.

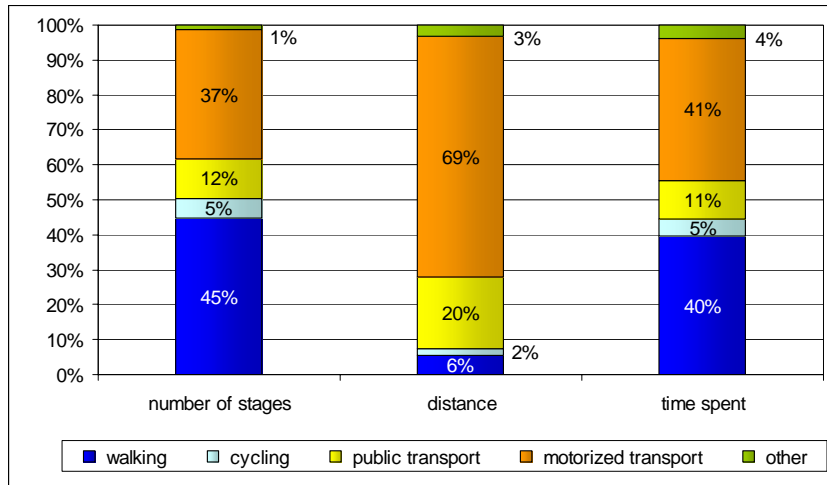


Figure 2 Share of transport modes according to number of stages, daily distance travelled and time spent 2005 (N=33,390 persons)

Source: Mikrozensus Verkehrsverhalten 2005, BFS/ARE, 2007

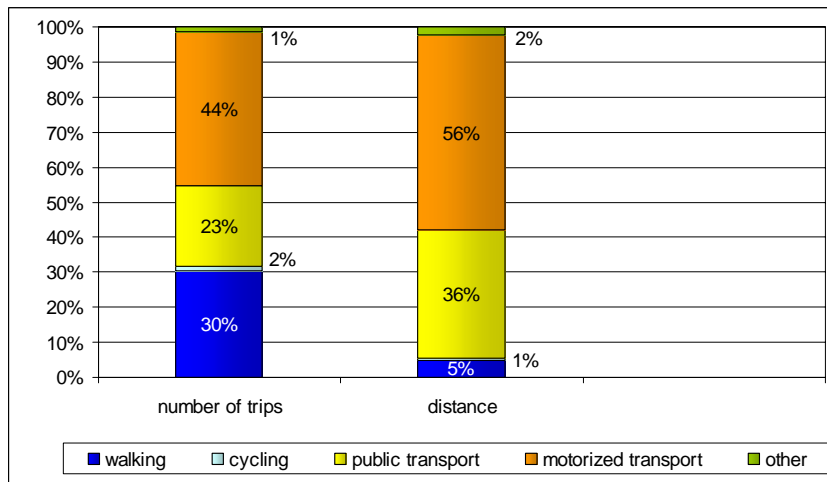


Figure 3 Share of transport modes according to number of trips (main mode), and distance travelled 2001

Source: London Area Travel Survey (LATS)<sup>2</sup> 2001 (Transport for London, 2007a)

Sensitivity for the immediate environment / surroundings

People often walk consciously or unconsciously along places where it is attractive and comfortable, be it in the shade in the summer or where there are shop windows to look into or they choose a route where other people are or where one feels safe. Perceptions of the surroundings play a crucial role in walking – more than for any other means of transport. This fact could be particularly relevant in sub- and peri-urban areas when measuring walking.

Interestingly, the effects of the weather on walking are smaller than commonly believed. There certainly is an effect with extreme weather conditions such as heavy winds or rain / snow, thunderstorms, heat et cetera but not on the average day. This is different for some leisure trips and for staying in public spaces: here the weather determines the number of users to

<sup>2</sup> The London Area Transport Survey (LATS) is carried out every 10 years, the most recent being in 2001. The 2001 survey consisted of an interviewer administered sample survey of 30,000 London households, carried out for TfL between January 2001 and April 2002. The survey included a one-day travel diary to collect data on Londoners’ weekday travel patterns. The data has also been expanded to represent the household population of London as measured by the 2001 Census of Population.

a large degree. The sensitivity of walkers for their environment and the effects of the weather on some activities have to be taken into account when gathering data on walking, particularly when doing counts and public space surveys.



Photos © Daniel Sauter

### *Communicative and social aspect of walking*

Walking can be, and often is, a highly sociable activity. Walking together with others or meeting others while walking are both characteristic elements. No other means of transport – with the exception of public transport – can provide such a quality of possible personal interaction. People like to walk beside each other when space allows it. If the pavements (sidewalks) were as wide as streets usually are, one would regularly see people walking in rows of 4, 5 or more beside each other.

Because pedestrians are not armoured with metal sheets, they can take up contact with other persons on the street – consciously or unconsciously. In anonymous cities or in small villages one might not always want to do that but to some degree it can not be avoided to be public while walking. Walking is, therefore, the most individual and at the same time most public form of transport one can think of.

Studies show that children often choose their routes to school according to where their friends live. They make great detours to be able to walk with their favourite buddies to school. In such instances they do not follow the routes adults (parents, teachers, local police etc.) have designated as best and safest but rather according to their spontaneous feelings. Surveys show that up to three quarters of children vary their route to school often (Sauter, 1993). Due to fear of conflicts (e.g. of being beaten up) children also often avoid underpasses or narrow passages. This is the other, darker, side of ‘communication’ and its effects on walking.





Photos © Rodney Tolley, Daniel Sauter

Walking: the most environmental-friendly and socially inclusive form of transportation

It is well known and only repeated here as reminder that walking is the most environmental-friendly and socially inclusive form of transport. Pedestrians ‘operate’ carbon-free, without using resources such as fossil fuels or electricity and do not create any greenhouse gases or pollute otherwise. Walking is usually a quiet form of movement and does not create any engine-noises. But pedestrians are, in turn, disturbed by a certain noise-level, reducing the quality of walking. The relatively low need for space means a saving of precious lands and soil. Walking is, with few exceptions, open and free for everyone. It is, therefore, the most socially inclusive and democratic form of transport. Providing for pedestrians does not exclude anyone – contrary to providing for most other means of transport. Pedestrians do not pose any dangers to other road users, while they in turn are very vulnerable.

Definition of accidents and vulnerability of pedestrians

Statistics on single pedestrian accidents are not collected in most countries. The reason for this is the international definition of accidents which requires a vehicle to be involved to count as a traffic accident. While all car accidents are covered with this definition, pedestrian accidents aren’t. Another example of how definitions based on car traffic lead to a distorted picture for walking.

A study of elderly people (65 years and older) in 1995 in Switzerland showed that for every accident involving a vehicle, fifteen single pedestrian accidents happen. Reasons for the single accidents are mostly slipping and falling because of snow, ice and uneven surfaces. If all pedestrian casualties including the ones from single pedestrian accidents were counted, pedestrians were to make up three quarters of all casualties, while motor vehicle users amounted only to about 10% (Hubacher/Ewert, 1997).

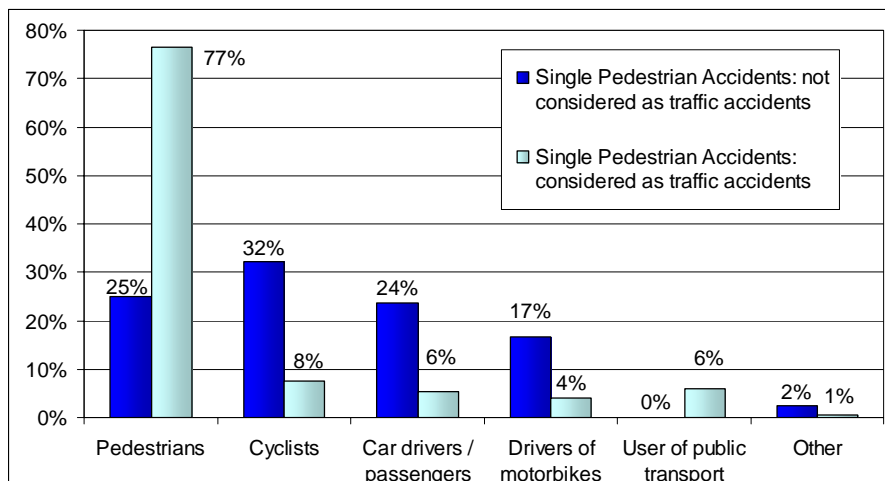


Figure 4 Distribution of casualties of seniors according to definition of accidents and mode of transport 1995

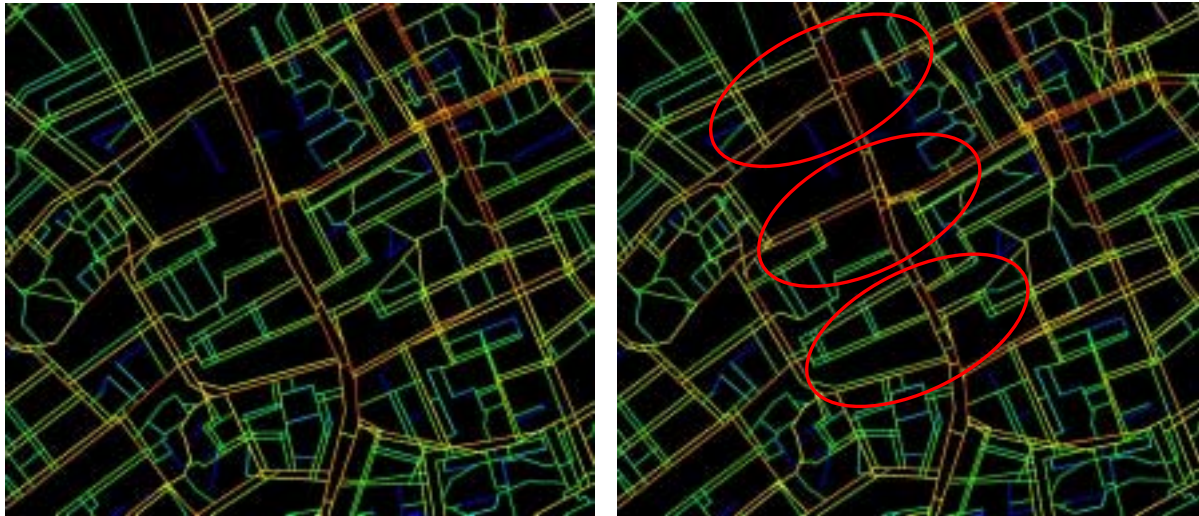
Source: own calculations based on Hubacher/Ewert, 1997

### 3.2 Empirical approach

#### *Flexibility and scale*

Pedestrian movement has long been of interest to architects – perhaps more so than transport professionals. Within this profession, movement is considered at much smaller scales: within buildings, between buildings as well as through networks of streets or across open spaces. One model of movement that transgresses the issue of scale is the theory of Space Syntax that can be used to estimate pedestrian flows based on the configuration of pedestrian links and spaces. For example, ‘closeness’ is a measure of how close a link is to all others within the radius studied, and ‘betweenness’ is a measure of on how many quickest routes a link lies upon.

Figure 5 Walworth Road before (left) and after (right)



Example image supplied by Christian Schwander at Space Syntax ([C.Schwander@spacesyntax.com](mailto:C.Schwander@spacesyntax.com))

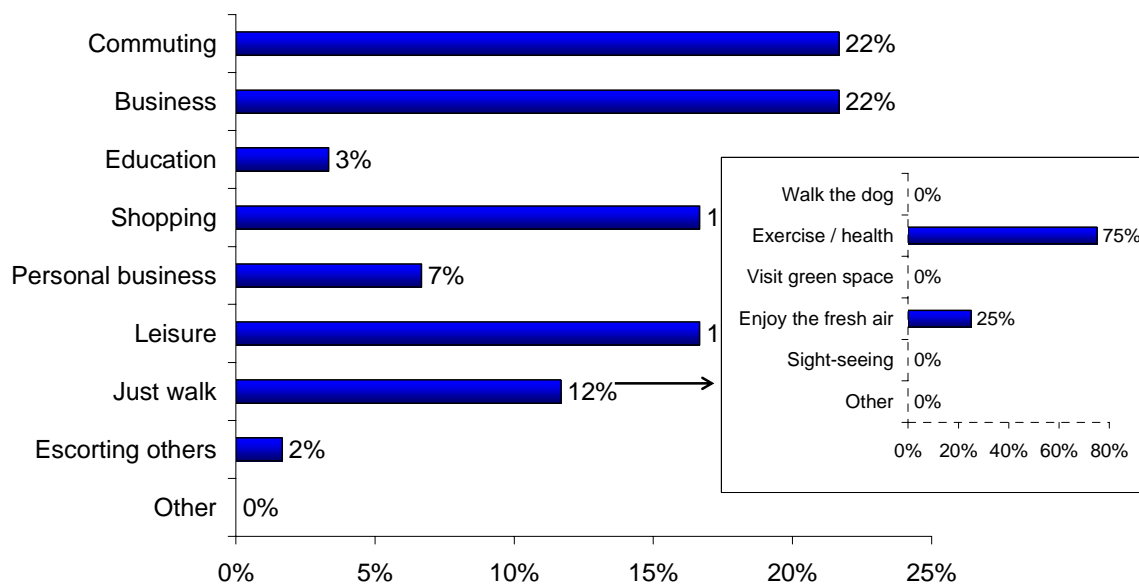
The following example outputs from the Space Syntax model show Walworth Road in London before and after the street was reconfigured. In this detailed model both footways on either side of the streets are measured separately. In this example it is interesting to observe how such apparently minor changes to the locations of crossings have a profound impact on both the relative level of local accessibility and the relative route choice preferences of not only sections of the street itself but also many of the side streets. What constitutes a ‘minor’ change in terms of distance depends on the perspective. Due to their flexibility, pedestrians have the most complex movements around such a street and they also have the greatest level of choice of routes through the side streets. This is why small changes in crossing location, for example, can have a big impact on local movement patterns.

#### *Multiplicity of motivations*

In any introductory lecture on transport planning or transport economics, students are told that all transport is a derived demand, in other words the demand is not for the trip itself but to get from point A to point B. Therefore in the majority of cases, if humans could beam themselves from A to B they would. The typical exceptions to the rule that are mentioned are pleasure trips on steam railways or cruises. But can walking really be thought of in the same way? There is recent evidence from a variety of environments suggesting that this is not always the case.

Most travel surveys work with a simple concept of journey or trip purpose with a standard selection of categories across all modes. Yet when designing a standard monitoring questionnaire for the Strategic Walk Network in London, where routes range from the busiest parts of Central London to rural pathways on the edge of the city, a slightly different approach was taken. Standard categories were selected carefully to be comparable to other travel survey data, whilst a “just walking” category was included. Sub-categories were then designed to cater for distinct leisure walker groups such as dog walkers. Figure 6 below shows an example output of these categories from interviews undertaken on the riverside path in the centre of Kingston-upon-Thames (see Colin Buchanan, 2007).

Figure 6

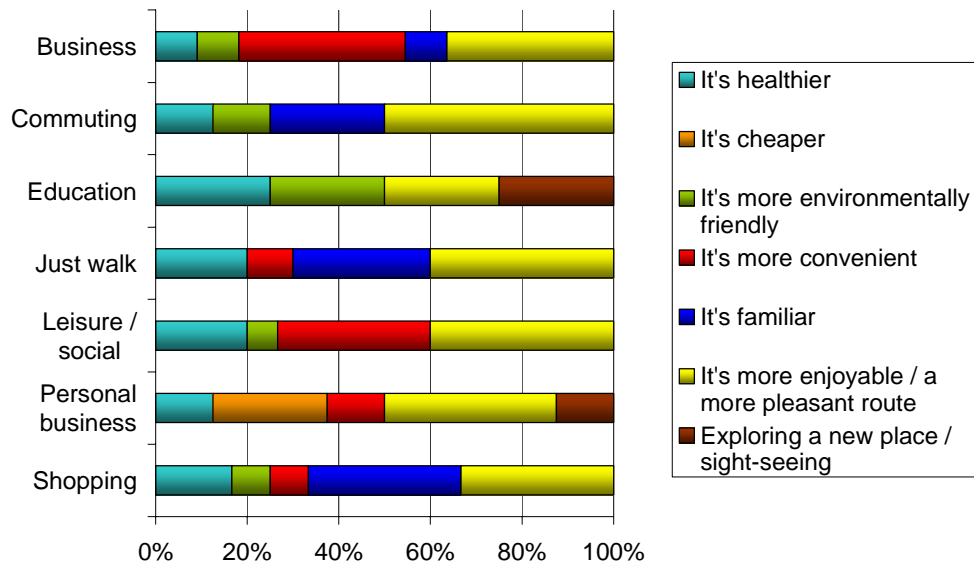


In order to better gauge user motivation for walking beyond the simple journey purpose categories, a further multiple response question was added:

“Can you tell me why you chose to walk here today rather than take an alternative route or use an alternative mode of transport?”

The results for the riverside site in Kingston-upon-Thames are shown again in figure 7 below (see Colin Buchanan, 2007).

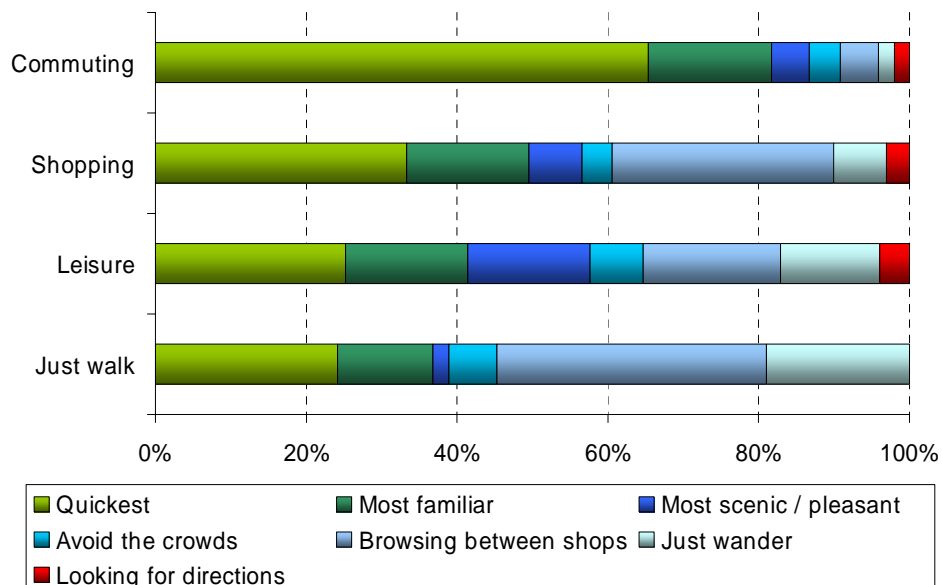
Figure 7



It should be noted that this sample is based on one survey site and one that is perhaps somewhat atypical. Yet it is fascinating to see that at this site not a single respondent had chosen to walk along the river as it was the quickest route. A large proportion of the “utility” walkers with a defined journey purpose cited reasons such as “it’s healthier”, “it’s a more pleasant route” or simply “it’s familiar” for choosing to walk along the riverside path to their destination. Treating all walking as a purely functional activity like taking a bus from point A to point B is clearly not applicable in this case.

A more recent survey of how pedestrians are choosing where to walk and how they find their way around the busy West End of London was conducted as part of the evaluation a new wayfinding system (Colin Buchanan, 2008). The findings provide a large sample of over 1,200 responses about how users choose where to walk around the busy Bond Street area. This is a very mixed area including the shops of Oxford Street, a high density of employment, proximity to tourist destinations, nearby educational facilities and also a relatively high residential population. Figure 8 below shows the breakdown of route choice method of some of the key journey purpose types.

Figure 8





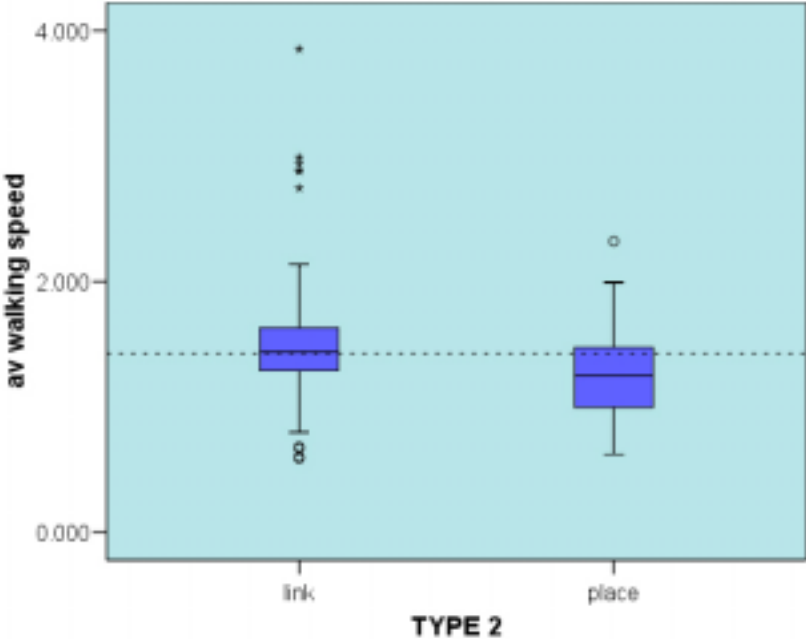
Over 80% of commuting and business respondents were trying to walk the quickest route or that most familiar to them. For the shopping, leisure and just walk categories, around half were not seeking the fastest route and were choosing their route on the basis of the shops, the most pleasant streets, deliberately taking detours to avoid the crowds (a very typical behaviour around Oxford Street) or were happy to just wander. A small number of persons stated that they did not know where they were and were actively seeking directions to help them find their way. This suggests that in a busy city centre context, somewhere in the region of 20-40% of users may not be displaying typical “I need to find my way from point A to point B” behaviour.

The concept of motivation is also important since it can be a powerful determinant of actual behaviour. For example, where recently the terms *link* and *place* have become fashionable as a conceptual framework for planning the design of streets, the terms link and place do not simply describe the *role* a street plays; they also describe the *people* that make use of that space and whose needs ultimately define the importance of the link and place role attributed to it. Link users are those persons who want to travel through a space to reach another destination. This can include either travelling through the space in a vehicle or walking through it.

Place users are those persons, for whom that space is their destination, and who make use of the space itself or the facilities located on it. Regardless of the mode of travel users employ to reach the space, if they use the space or its facilities once they have reached it, they can be considered pedestrian place users. On the other hand, there may be pedestrians who are simply walking through a space to reach a destination similar to other link users in vehicles. The decisive point is that, although not all pedestrians are place users, place users regardless of their mode of arrival are pedestrians once they alight from vehicles at their destination. For this reason, the patterns of movement of pedestrians are more complex than those of other modes of transport, yet the understanding of these patterns is so vital to encouraging vibrant and successful urban places.

In a recent piece of thesis research over 300 pedestrians were tracked through three high streets in London (see Wedderburn, 2007). Based purely on their observed behaviour (i.e. whether they used any shops or facilities on the section of street in question), they were classified as link or place users. The mean walking speed of link and place users was 1.48 and 1.26 respectively (see figure 9). This variable proved to be as strong a determinant of walking speed as other previously identified variables, such as age, gender and walking in a group.

Figure 9



Furthermore it was found that place users were generally more patient at pedestrian crossings but that they were more likely to cross away from formally designated crossing zones. This makes sense as one would expect place users to be less hurried but to have more dispersed movement desire lines.

## 4. DRAFT REQUIREMENTS FOR MEASURING WALKING

In this part we are drawing some conclusions for measuring walking based on characteristics of walking and the special challenges this poses. The implications and consequences for data collection are discussed with regards to four of the dimensions mentioned in sections 1:

- Travel behaviour surveys
- Walking as physical activity in health surveys
- Pedestrian counts and
- Public space activity surveys

It has to be stressed that this is work in progress and, therefore, no final conclusions and recommendations can be made yet. The draft requirements suggested below are input for further discussions and not be taken as fixed guidelines yet.

### 4.1 Draft requirements for travel behaviour surveys

In order to properly measure walking in travel behaviour surveys the following requirements have been formulated based on a first debate among walking experts at the WALK21 conference in Toronto (October 2007), within the COST Action 358 and based on own analysis (see e.g. Sauter 2008). More in depths discussions are needed on this, however. The experts agreed that all travel behaviour surveys should aim to address and record properly the elements mentioned below. These are only the specific requirements related to walking. General requirements and challenges such as sampling problems due to higher use of mobile phones, or probability checks, proper weighting of data et cetera are not mentioned here.

Figure 10 Draft data collection requirements in travel behaviour survey from the point of view of walking

Physical ability to be mobile on foot	degree of non-mobility, reasons for not being able to be mobile
Mobile & non-mobile persons on the day recorded	reasons for not being mobile (categories to be determined; do people limit mobility e.g. because of insecurity on street?)
Stages, trips and journey	Need to record (walking) stages (not only main mode of trip) and journeys (leaving house and coming back) to (=>multi-modal and inter-modal trips)
Minimal length of (walking) stage or trip recorded	preferably 10 meters (possibly 25, 50 meters?)
Minimal time of (walking) stage or trip recorded	preferably 0 minutes (possibly 1, 5 minutes?)
Age and other relevant socio-demographic, -geographic and -economic criteria	preferable from birth on; minimally from 5 years on, no upper age limit, single years (not age groups) gender, income, degree of urbanisation etc. are necessary information also with regards to walking
Purpose	Traditionally recorded: work/school; shopping; leisure/recreation; escort/service; business – needs more thought from the point of walking, e.g. add more detailed reasons such as exercise/health, fun, walk the dog, visit green spaces etc.; distinguish leisure/recreational trips further, e.g. shopping for fun etc. (=> registering multiplicity of purposes per trip)
Transport modes; particularly other non-motorised modes	Besides the ‘usual’ transport modes, distinguish between walking and other non-motorised modes besides cycling (e.g. roller blades)
Accessibility of services	Time / distances to everyday destinations such as schools / workplace; shopping facilities (distinguished further into subcategories; green spaces; leisure and sports facilities => time or real walking distance)
Weather data	For each trip or at least for the day the weather data should be recorded

Reference population	all residents independent of their language (not just e.g. permanent residents speaking the place's language)
Geographical reference	all stages and trips within or outside jurisdiction (e.g. country); => estimate of trips by non-residents (e.g. through use of multi-modal cordon survey at stations, airports and road-side interviewing)
Sample size	on national level: large enough so that calculations on the level of larger cities can be made (preferable also smaller cities)
Survey period	representing all days of the week and all seasons
Reporting period	usually one day (previous day); desirable: travel patterns of same persons over longer periods (e.g. one week)
Survey intervals	At least every 5 years during one year or ongoing
Presentation of results	Share of transport modes according to stage, trip length and time – mean and median (particularly in terms of distance and time)

## 4.2 Draft requirements for physical activity and health surveys

In some instances travel behaviour surveys are now used to collect data on physical activity, in addition to separate surveys e.g. focused on health. In these in turn, also walking and cycling data is collected. Besides the already mentioned requirements for collection of accurate walking data within travel behaviour surveys, additional elements may need to be considered for physical activity surveys. In particular they need to address, among others some of these problems:

- **Estimation problems:** estimations by surveyed persons are often not accurate and do not reflect their true everyday behaviour. This is particularly true when questions are asked for longer time spans (several days/ a month).
- **Differentiation problems:** in terms of types and purposes of walking: for example between utilitarian and leisure walking, walking during work; and between different types of leisure walking: everyday leisure walking, jogging and rambling/hiking et cetera.
- **Assessment problems:** with regards to the intensity of walking (physical activity): The International Physical Activity Questionnaire (ipaq) suggests to distinguish between “vigorous activities that make one breathe much harder than normal” and “moderate activities that make one breathe somewhat harder than normal”. Other surveys use sweating episodes or the walking pace as criteria. It is known that these all can pose some problems, e.g. with older / obese persons who get easily out of breath; warm temperatures causing sweating episodes.
- **Context problems:** related to type of survey: travel behaviour questions in a health survey will lead to other results than physical activity questions in a travel behaviour survey.

As mentioned there is the International Physical Activity Questionnaire ([www.ipaq.ki.se/ipaq.htm](http://www.ipaq.ki.se/ipaq.htm)) which tries to standardise some of the data collection but it seems that in many countries different questions and criteria are used (see below, the examples of the UK and Switzerland). There are, however, many new methods currently being developed and not all changes may have been registered by the authors of this paper.

### *Some examples of health / physical activity surveys and their results*

In the UK, the largest research exercise on physical activity is the ‘Active People’ survey conducted by Sport England. This organisation is a Central government agency tasked with pro-

moting physical activity, investing money (including lottery funding) to sports-related bodies, and advising sports clubs. The first year of the survey in 2005/06 had a sample of over 360,000 adults in England and Wales, making it the largest ever sport and recreation survey in Europe. From 2007 the survey will be updated annually.

More recently, the data has been combined with Experian market segmentation to develop 19 target market segments. A local area segmentation profile is available for geographic areas, aimed primarily at sports clubs to target their promotion.

#### Utility vs recreational walking (and cycling)

The segmentation profiles generated by the Active People questionnaire do specifically account for both utility and recreational walking. The specific questions posed are as follows<sup>3</sup>:

Firstly, I would like you to think about all the walking you have done. Please include any country walks, walking to and from work or the shops and any other walks you may have done. Please exclude time spent walking around shops.

In the last four weeks, that is since [^INSERT^] have you done at least one continuous walk lasting at least 5 minutes?

In the last four weeks, that is since [^INSERT^] have you done at least one continuous walk lasting at least 30 minutes?

On how many days in the last four weeks have you walked for at least 30 minutes?

How would you describe your usual walking pace?

*SINGLE CODE. READ OUT LIST.*

A slow pace

A steady average pace

A fairly brisk pace

A fast pace

Don't know

You said that you had walked for 30 minutes on [*^NUMBER OF DAYS^*] in the last four weeks. Can I ask, on how many of those days were you walking for the purpose of health or recreation not just to get from place to place. Again please exclude time spent walking around shops?

#### Physical activity data in the Swiss travel behaviour survey

Usually data on physical activity is collected in the large national health survey conducted every five years. The latest figures are available from the 2002 survey. The questions regarding physical activity did not distinguish much between the different activities. Sports, gardening and walking activities were included in one item. While there was a distinction between

---

<sup>3</sup> Details of the Active People Survey questionnaire can be found in the Questionnaire Briefing Note prepared by Ipsos Mori for Sport England:  
[http://www.sportengland.org/index/get\\_resources/research/active\\_people/active\\_people\\_1/active\\_people\\_faq.htm](http://www.sportengland.org/index/get_resources/research/active_people/active_people_1/active_people_faq.htm)

activities with sweating episodes and such where people get out of breath, both seem to include similar items (activities) which probably does not help to achieve a distinctive result. There also was a distinction between leisure time activities and work related physical activities but again this is not always clear. The only question addressing walking as a separate item was about choice of transport mode for daily trips e.g. to work, shopping. As we know from travel behaviour surveys such general questions may not render very valid and reliable results. One other question addressed the minutes the surveyed persons estimated themselves to be walking and/or using a bike on a daily basis. Again, the question is quite general – leaving a lot up to the personal estimates, aside from putting walking and cycling into the same item and not separating them.

Figure 11 Excerpt from questionnaire of the Swiss health survey 2002 (Schweizerische Gesundheitsbefragung 2002, BFS, 2003) (non-official translation by DS)

44.20	And the daily trips, e.g. to work, for shopping or for recreation you usually do ... <i>INT: Read items, 3 answers possible!</i> ----- - on foot..... 1 - by bicycle..... 2 - by public transport ..... 3 - motorised ..... 4 ----- - refused / no answer ..... (9)	continue 44.30 continue 44.30 continue 44.30
44.21	How many minutes do you travel daily on foot or by bicycle? ----- - __ hours and __ minutes per day ----- - don't know ..... (98 98) - refused / no answer ..... (99 99)	

The 2005 Swiss travel behaviour survey also included for the first time a number of questions regarding physical activity, some questions similar to the ones asked in the health survey. This allows for some comparisons of results.

Besides the general questions on physical activities (sports, dancing, yard work, brisk walking etc.) there were questions specifically asked with regards to how many minutes a person usually walks during a weekday and on the weekend. Both were estimates. In the same survey there was the precise data on the mobility of the particular day of that person evaluated.

Figure 12 Excerpt from questionnaire on travel behaviour 2005 (Mikrozensus Verkehrsverhalten 2005, BFS/ARE, 2007) (non-official translation by DS)

8.9	When you think of physical activities during which you get at least somewhat out of breath, for example brisk walking, hiking, dancing, yard work or many sports activities. On how many days per week do you do such activities?	- Number of days per week - Never
8.10	For how long are you on average active on each of these days?	- Hours, minutes per day
8.11	Now we are talking about sports and physical activities during which one gets sweating quite a bit, for example, jogging, aerobics, tennis, fast bicycling, sports games, swimming, carrying weights, digging, shovelling. On how many days per week do you do such activities?	- Number of days per week - Never
8.12	For how long are you on average active on each of these days?	- Hours, minutes per day
8.13	For how many minutes do you walk on an average weekday?	- Hours, minutes per day
8.14	For how many minutes do you walk on an average day on the weekend?	- Hours, minutes per day
8.15	For how many minutes do you cycle on an average weekday?	- Hours, minutes per day
8.16	For how many minutes do you cycle on an average day on the weekend?	- Hours, minutes per day

The results show that there are large differences between the number of minutes walked on the particular day surveyed and the estimate of the same person of how many minutes he/she walks on average on a day. The estimated time was on average almost triple that of the day surveyed (33.7 vs. 111.4 minutes)<sup>4</sup> (source: Schad et al., publication pending). The reasons why people overestimate their walking time so much is not clear. It could be that in the context of the questions regarding physical activity they may have thought of the time 'being on their feet' (also when dancing, gardening etc.) as reference and not of walking as mode of transport specifically. Furthermore time is usually overestimated while the number of walking stages and trips are underestimated.

If we neglect the general estimates and concentrate only on the minutes walked on the day surveyed (a fairly reliable and valid information) then we can see that about a third of the population (34%) walks for more than 30 minutes a day, thus covering the recommended time of physical activity by walking (although they may be additionally active). If only those people are counted whose walking stages consist each time of at least 10 minutes (in total also walking more than 30 minutes per day), then 30% of the population spend at least the recommended time of physical activity by walking<sup>5</sup>. This result indicates that most of those who walk at least half an hour a day do that in stages of at least 10 minutes.

Children, young people and seniors walk more often 30 minutes and longer per day than the rest of the population. It has to be said, however, that many children are far more active running around and playing outside than during goal-oriented mobility (e.g. going to school, shopping etc.). And for children the recommended minimal time for physical activity is more than the 30 minutes for adults (in Switzerland it is 1 hour).

Figure 13 Proportion of population walking more than 30 minutes per day, 2005 (own calculation based on Mikrozensus Verkehrsverhalten 2005, BFS/ARE, 2007)

	30 and more minutes walking per day	30 and more minutes walking per day with stages of at least 10 minutes	N
6-20 years	38.8%	33.8%	5,575
21-64 years	31.5%	27.1%	20,997
65 years & more	41.1%	38.2%	6,818
Total	34.4%	30.2%	33,390

Emerging research results in Switzerland also suggest that people who are physically very active are not necessarily those who also walk often. The two groups can be distinguished in a statistically significant manner. Those who do sports and/or are active at work or in their garden are only partially more likely to walk more than 30 minutes a day (see Schad et al., 2008; publication pending).

<sup>4</sup> Both are relative to the whole population of 18 years and older. If only those with at least one walking trip on the day surveyed are considered then the mean is 57.3 minutes. Of course, the average time may differ from the time measured on the survey day. But the difference is so substantial that this does not seem to explain it all.

<sup>5</sup> These figures are based on the travel behaviour survey which only covers one day per person. The person who walked more than 30 minutes today may not do that the next day as well. The results allow only a general statement about the whole population and not about behaviour patterns of individuals.

### 4.3 Draft requirements for pedestrian counts

The characteristics of walking and pedestrian behaviour as described in point 2 are particularly relevant for counting pedestrians and surveying their activities in public space. Some implications and consequences on the requirements for counts and observations are mentioned below. This is a first draft based on experiences mainly in London and Zurich and will need further discussions in the process of harmonising data collection methods globally.

#### Why count pedestrians?

There are many reasons for pedestrian counts. Although there are also cases where only pedestrian flows will be of interest, in many cases pedestrians are counted as part of exercises measuring all transport modes. Therefore it is important to consider the particularities of pedestrian movement before simply applying methodologies and standards designed for other vehicular modes. Counts are often required in the street design process as inputs to transport models, for capacity assessments, to measure the attractiveness of different spaces, to estimate route choice or for the appraisal of different design options. Longitudinal counts over many years can be used to provide trend data, for example for visits to a particular site or grouped as a means of benchmarking total pedestrian activity.

Monitoring activity can also take place to measure the impact of changes, for example before-after counts as a means of measuring the change in usage resulting from an intervention. The evidence base provided can also serve to generate a robust picture of who is using a public space, or can serve as indicator data for conflict analysis between pedestrians and other modes. However, the problems remain much the same in that in order to draw comparisons over different places or different points in time, a sampling framework must be in place to ensure the statistical validity of the conclusions drawn.

#### Automatic or manual?

Although traditionally pedestrian counts have been conducted manually, a number of automatic systems also exist. The main technologies include infrared counters that sense body heat or laser counters where movement is captured by a rotating beam, or a mixture of the two. Other technologies include video recording combined with software designed to recognise the number of pedestrians, or simply a pressure pad with an induction loop.

Automatic pedestrian counting systems have now reached a level where a number of reliable products are available for long-term fixed application. Laser and infrared counters have been employed in covered areas (e.g. shopping centre entrances) to count very high volumes for many years now. The latest outdoor laser counter applications include extremely small counters that can be fitted inside a post or wall, reliably counting low to medium volumes up to a width of around six metres. For low volumes, modern pressure pad counter technology can be buried under a number of surfaces including paving slabs, asphalt and bound resin.

Major technological advances mean that devices can be delivered with fitted battery packs designed to enable several years of autonomous counting, thus reducing the maintenance requirements. Moreover, data can be transmitted electronically relieving the installer of the task of physically going to extract the data from the counter.



On the other hand, attempts to install automatic counters for short periods of time are generally not cost-effective due to the significant amount of time required to calibrate the system before reliable counts can commence. In these cases manual counts will generally be more cost-effective. Manual counts can be conducted on-site or using CCTV camera technology. Modern systems allow ultra lightweight cameras to be mounted on an extendable pole that can easily be strapped to street furniture. CCTV counts allow for better quality control since results can be verified, and are suited to very high or very low volumes since footage can be viewed slower or faster than real-time to maximise efficiency and quality.



Photos © Martin Wedderburn

### Choice of a count site

Earlier the small scale of pedestrian measurement, as compared to the scale of other modes, was mentioned. This makes the choice of count sites extremely difficult. Figure 14 below shows a section of Hampstead High Street in London with a sample of the paths of 120 randomly followed pedestrians (see Wedderburn, 2007). At first glance, we cannot fail to see that one side of the street is more heavily used than the other. This is largely because the entrance to the Underground station is on this side of the street. But suppose our task were to identify a site for monitoring pedestrian use of the high street. For example, look how the top of the less busy side of the street is particularly under-used. A closer look at the urban form shows that a pedestrian cut-through is partly responsible for this. There is also a secondary desire line of movement from this cut-through into another pedestrianised street opposite, causing a significantly higher flow along the high street for a few metres adjacent to this point.

Figure 14



The above example provides a good illustration of how the location of public transport stations and stops, the layout of land uses with an active ground floor frontage, as well as the urban form itself can all combine to cause high variation in pedestrian flows at a very small scale.

#### Variation and sampling

The main difficulty with one-off counts is that of the inherent daily and seasonal variation. Traditionally, this has been an area where significantly less research exists than for vehicular flows. However, recent studies in London and Zurich have led a major step forward in estimating the scale of the variation in flows. These are summarised in the form of three 'rule of thumb' sampling quality levels below.

Figure 15 Draft sampling according to quality levels (adapted from/based on Transport for London 2007; Zweibruecken et al. 2005)

	<b>Quality Level 1</b>	<b>Quality Level 2</b>	<b>Quality Level 3</b>
Useful for	Initial rough estimate	Comparing relative usage between sites or changes over time (expected change >+/-10%)	Measuring precisely change over time
Confidence interval	90%	90%	95%
Margin of error (average weekday total for the time of year)	+/- 25%	+/- 5%	+/- 4%
Method	Two hour long counts (10:00 – 11:00 and 16:00 – 17:00) on one weekday	Every 5 <sup>th</sup> 15-minute period (i.e. periods rotating ‘around the hour’) on one weekday	Full 07:00 – 22:00 count for 3 weekdays
Intervals	15 mins.	15 mins.	15 mins.
Reporting period	Every 5 years Or before/after an intervention	Every 2 years Or before/after an intervention	Yearly Or before/after an intervention
Multiplication factors	Factor to 24 hour total using 750% (or a more appropriate factor from local surveys if available)	Multiply by 5 (or linear interpolation) to calculate a 07:00 – 22:00 total.  Use 105% (or 110% in areas with a lively night economy) to factor to a 24 hour total	See quality level 2

The following two pages give examples of daily patterns from London and Zurich showing how the patterns differ according to location where counts are performed

Examples of daily patterns from London

Figure 16 Shrublands Road – Walthamstow (residential, near train station)

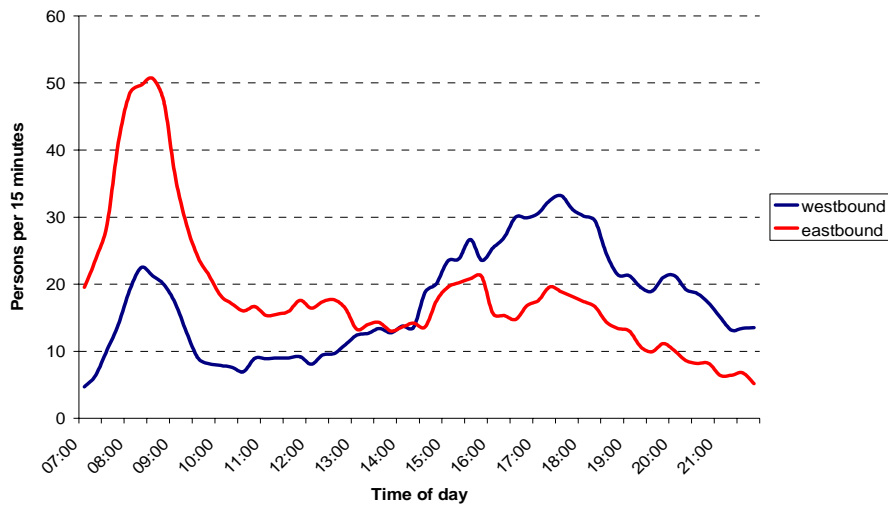


Figure 17 Tolworth Broadway – Tolworth (high street)

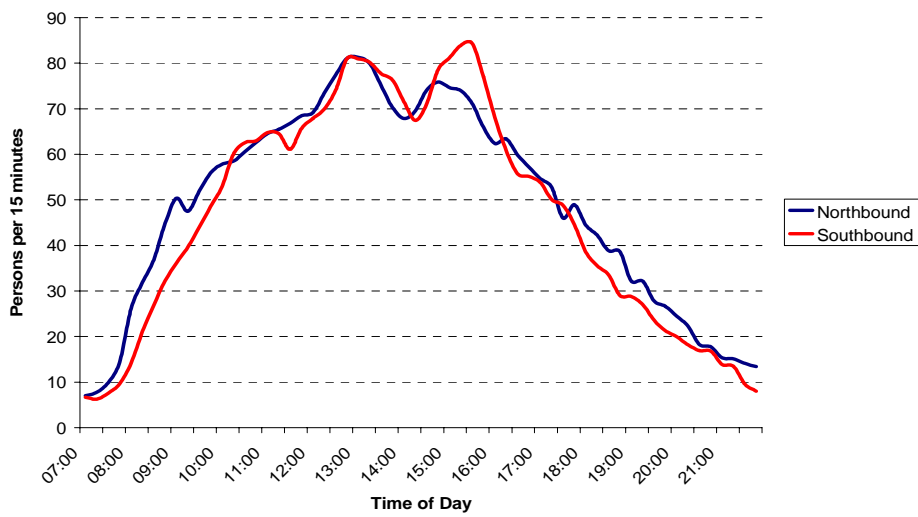
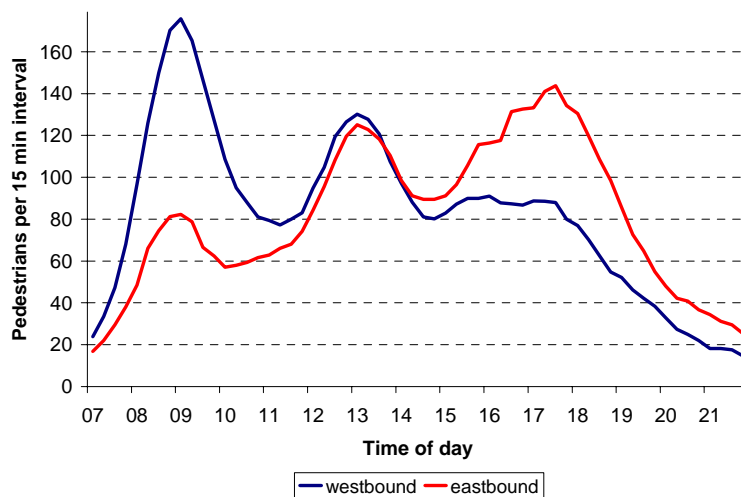


Figure 18 Old Street – London Borough of Islington (offices, retail, residential and train station)



Examples of daily patterns from Zurich

Figure 19 Mühlebachstrasse – Seefeld-Quartier (residential area near school; most children still return home for lunch in Switzerland; cycle route)

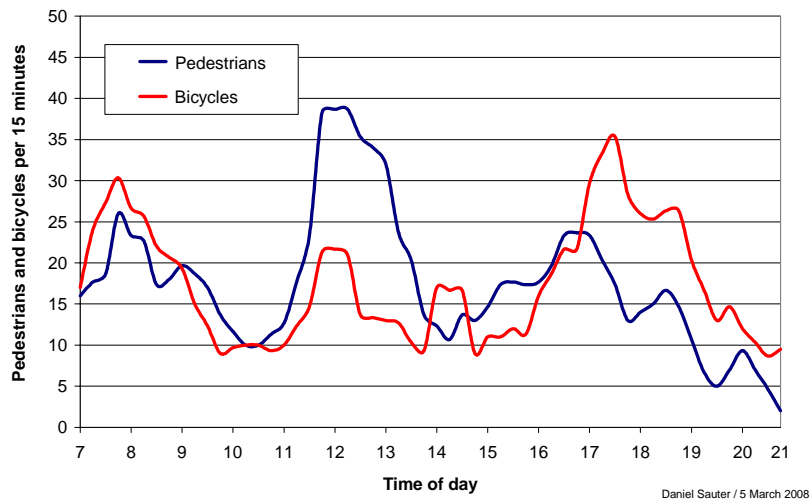


Figure 20 Seefeldstrasse (inner city area with many offices and restaurants, => people walk to lunch at noon)

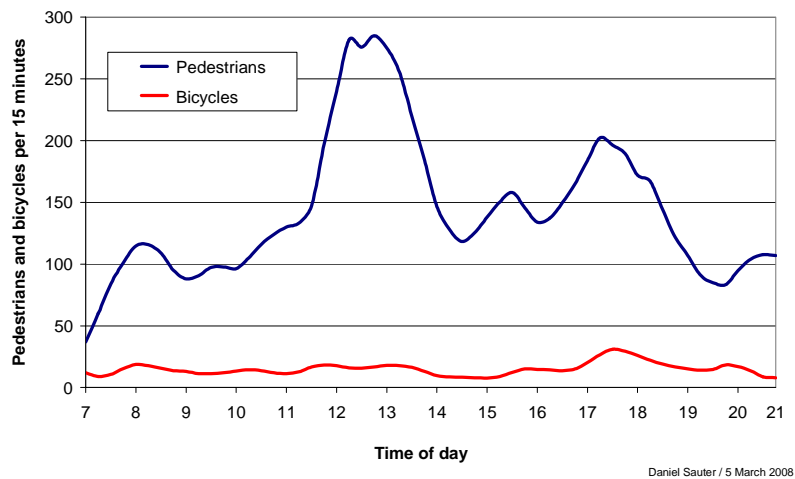
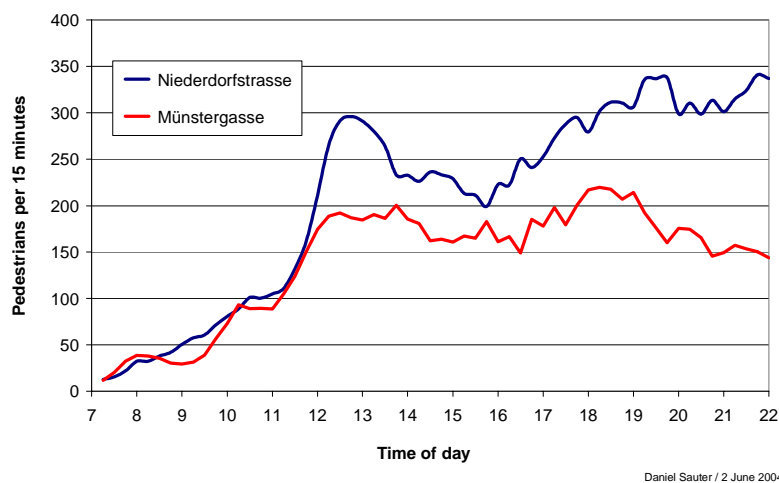


Figure 21 Niederdorfstrasse und Münstergasse (two parts of pedestrianised street in the old city with many restaurants => highest numbers of pedestrians at 10 pm when count stopped)



Seasonal and weather variation

The level of seasonal variation in pedestrian flows or that attributable to weather conditions can be in the region of up to 10-15%. This relates primarily to 'typical' areas where the majority of trips are likely to be habitual such as to work, education or shopping. However, in areas with a high proportion of less habitual trips, an obvious example being near to a major tourist / visitor attraction, variation would be expected to be substantially higher.

Therefore it is recommended that pedestrian counts are not undertaken on days with extreme weather conditions for the time of year. And as a general rule, before-after comparison counts should be undertaken at the same time of the year.

Figure 22

<b>Time of year / season</b>	Usually spring or fall When special requirements also in winter or summer (see also 'weather')
<b>Time of week</b>	
Weekdays	All weekdays possible except for Monday (is usually quite different from other weekdays); ideal are Tuesdays to Thursdays (Friday may be different from other days)
Weekends	When special requirements/objectives (leisure, events, tourism etc.)
General	Not during school or working holidays, special events and festivities
<b>Time of day</b>	Beginning 7 am, ending at 7 pm (in certain locations longer in the evening, e.g. entertainment districts, or earlier in the morning, e.g. industrial site) If limited time/resources: best times to count are between 10-11 am and 4-5 pm (see above) With automated counts, there are usually no time limits
<b>Weather</b>	Nice day without rain, not too hot or too cold (relative to average country conditions) – effects of humidity ?
	Counts during special weather conditions are possible depending on the objective of the research e.g. number of people walking in wintery/snowy conditions

Types of count

Although most pedestrian counts are generally simple flow counts at one site, cordon counts can be undertaken, for example to measure all flows into and out of a town centre on one day. A series of other observational methods can be used to track where pedestrians walk and to observe their behaviour. For example, behavioural studies could be employed to study pedestrian movement through a junction, a public square, or a section of street. Typically in these cases, a sampling framework can be developed by defining an entry cordon around the area and conducting spot counts at all entry points. The total sample can then be weighted between the entry points to reflect total pedestrian movement within each selected time period. Care should be taken to incorporate pedestrians 'entering' the study area when they are already inside it, e.g. alighting from public transport or exiting buildings.

Besides 'just' counting, some characteristics of people can be observed as well, for example, gender, age, groups, children being escorted (e.g. near schools), people with bags/luggage. Not all elements are easy to observe, however, (e.g. group or age assessments can be particularly difficult) and they require more personnel since the capacity to count is significantly lower.

As mentioned earlier, the quality of walking often does not depend on the number of people passing but of the time they spend in the space. Therefore, the time used to walk through a street or a square may be just as relevant and can be measured.

#### General remark

As a general point, care should be taken when using pedestrian counts as a basis for estimating future demand. To cite Hermann Knoflacher, the need for and the potential use of a bridge cannot be estimated by measuring how many people swim through the river. In many cases, future demand cannot be estimated from empirical data and has to be elicited from other pedestrian movement estimation models<sup>6</sup>.

### 4.4 Draft requirements for recording activities and time spent in public spaces

#### Why observe pedestrian activities in public space?

The observation and measurement of pedestrian activities in public space is increasingly becoming an accepted method of assessing the quality and attractiveness of a public space. The number of people and the amount of time they spend outside in a space are good measures of environmental quality and the attractiveness of that space for activities other than pure goal-oriented mobility. This method can provide quantified evidence to demonstrate whether specific policy objectives, e.g. if designs are successful in encouraging certain groups of society to feel safe in a space or if they encourage children to play outside and engage in physical activity. Finally and ultimately most importantly, observing spatial and temporal patterns of behaviour is a powerful design tool that can inform the design of other public spaces.

The origins of this method stem from techniques developed by William H Whyte (1980) and the Project for Public Spaces in New York (see [www.pps.org](http://www.pps.org)), as well as Jan Gehl and Lars Gemzøe in Europe (see, for example, Gehl, 1987; Gehl/Gemzøe, 1996). Recently conducted activity surveys in Zurich and London have again used comparable methods to allow for some benchmarking (Wedderburn, 2007, Transport for London 2007b, Sauter, 2006a, 2006b), see below.



Eagle Brewery Wharf, London



Wipkingerpark Zurich

Photos © M. Wedderburn/D. Sauter

<sup>6</sup> Particular software to this effect has been developed, for example by Space Syntax ([www.spacesyntax.com](http://www.spacesyntax.com)) or Intelligent Space, now part of the Atkins Group (see [www.intelligentspace.com](http://www.intelligentspace.com)).



Example of public space survey / pedestrian activity from London

Figure 23 Activities in Public Space Analysis with two classifications used: Eagle Brewery Wharf along the river Thames (Colin Buchanan, 2007)



The example shows the activity classification on the left which is suitable for benchmarking, the other (on the right) responds to specific concerns of policymakers.

Example of public space survey / pedestrian activity from Zurich

Figure 24 Public space analysis in a park (Wipkingerpark) along the river Limmat in the west of Zurich (Sauter 2006b)





The figure shows the aggregated use of the park during a weekday (Thursday) in May 2005 (total from 7 snapshots) with the following classifications: men (square), women (circle), children up to 12 years (triangle); standing (yellow), informal sitting (orange), formal sitting: bench (red), café sitting (light blue), laying on the ground (dark blue), physical activities (green), cultural activities (purple), commercial activities (brown) (the last two categories were not relevant here)

### Types of observation methods

#### a) Observational methods on site

- Snapshot or scanning method (also known as ‘flashlight’ or ‘Burano’ method): The names describe the approach quite well: The observer walks up a street or space slowly, registering all persons staying in public space the moment he or she passes through. The person functions like a scanner, registering line by line the situation thus providing for each point a snapshot or flashlight ‘image’, ‘freezing’ the situation. Since the method first was used on the Venetian island of Burano it is also known under that name.
- Time-sample method: in this method the observer does not move through the space but stays in one place (e.g. a square or park segment) registering all changes in activities during a certain period (e.g. new persons coming onto the square to sojourn, children starting or ending a game etc.)

Time sample and snapshot methods can also be combined: For example by observing a square for a certain period and at certain intervals registering the activities going on. Both methods can be supported by using video-camera technology. Where other surveys, e.g. counts are undertaken at the same site this can be particularly cost-effective.

#### b) Survey methods

Instead of observing people on site, they can be asked where they spend their time in public spaces and for how long they stay there. It could be interesting how much time people spend in their neighbourhood, in central city spaces or in parks. However, just like for travel behaviour surveys there are limits to this kind of data collection, particularly regarding time spent. Staying for short periods may also happen semi-consciously leading to omission of data in the survey. Furthermore, some activity, such as waiting for other people, may not be perceived as *voluntary* yet the choice of where to wait still reflects a spatial preference of one space over another.

#### c) Tracking methods and measuring intensity of physical activities

New technologies such as GPS receivers and mobile phones allow tracking people and determining where they spend how much time. However, the equipment is not precise enough yet to see if a person sat in a street café or inside a restaurant. The reflections in city surroundings make it still impossible to determine the exact location of a person. With increasing precision and technological advancements, these instruments may become very useful in determining a person’s sojourn in public space. Data protection and anonymity will be crucial questions to be solved.

Accelerometers (activity monitors) register how physically active i.e. how intense a person is moving in space (determined by acceleration metres). This equipment is already fairly reliable and has been used in a number of studies (e.g. for children). Combined with a survey the information can help to determine where a child plays for how long.

Figure 25 Surveying pedestrian activities in public space (draft standards and requirements) (adapted from /based on Gehl/Gemzøe 1996; Transport for London 2007; Zweibruecken et al. 2005; Sauter 2006b)

	Quality Level 1	Quality Level 2 &3
Useful for	Initial rough estimate	Compare relative usage between sites or changes over time
Achievable result	Number of people staying in public space as a total of the snapshot observations	Number of people per snapshot observation and in total (hour or day)
Position / Activity (categories)	<ul style="list-style-type: none"> <li>• Standing</li> <li>• Café sitting</li> <li>• Formal sitting (benches etc.)</li> <li>• Informal sitting (ledges etc.)</li> <li>• Playing activity (e.g. children) / sports (running etc)</li> <li>• Waiting for bus/tram/train (usually standing or sitting but at a stop)</li> <li>• Commercial activity (e.g. street vendor) – without costumers</li> <li>• Cultural/political activity (e.g. busker) without audience</li> <li>• Service activity (e.g. cleaning streets, garbage pick-up etc.)</li> </ul>	Same as quality level 1 but in addition more detailed accounts of the activities: <ul style="list-style-type: none"> <li>• Eating/drinking</li> <li>• Talking</li> <li>• Reading</li> <li>• Sunbathing</li> <li>• Affection</li> <li>• Smoking</li> <li>• Watching others</li> </ul> => <i>several of these activities often occur simultaneously</i>
Gender *	<ul style="list-style-type: none"> <li>• None</li> <li>• or male / female</li> </ul>	Male / female
Age (categories) * <i>Age assessment is often very difficult!</i>	<ul style="list-style-type: none"> <li>• None</li> <li>• or only rough estimates:               <ul style="list-style-type: none"> <li>- children &amp; adolescents (0-18 yrs)</li> <li>- (young) adults: 19-65 years</li> <li>- seniors: 66 years and more</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• None</li> <li>• or detailed estimates for specific purposes, e.g.:               <ul style="list-style-type: none"> <li>- very young children (0-6 yrs)</li> <li>- children (7-15 yrs)</li> <li>- adolescents and young adults (16-24 yrs)</li> <li>- adults I (25-40 yrs)</li> <li>- adults II (41-65 yrs)</li> <li>- young seniors (66-75 yrs)</li> <li>- older seniors (76 yrs and more)</li> </ul> </li> </ul>
Groups <i>Group assessment is often difficult without asking (not observable who is together)</i>	<ul style="list-style-type: none"> <li>• None</li> <li>• or number of people in group</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> <li>• or number of people in group</li> </ul>
Additional information* (dependent on objective) <i>Difficult to assess disadvantaged persons</i>	<ul style="list-style-type: none"> <li>• Presence of disadvantaged persons</li> <li>• Children: escorted or not</li> <li>• Intensity of activities of children (e.g. physical activities, play)</li> <li>• Dogs: on leash or not</li> </ul>	<ul style="list-style-type: none"> <li>• Presence of disadvantaged persons</li> <li>• Children: escorted or not</li> <li>• Intensity of activities of children (e.g. physical activities, play)</li> <li>• Dogs: on leash or not</li> </ul>
Interval	Snapshot every two hours between 10:00 and 20:00 (or 22:00 in central areas)	Quality level 2: snapshot once every hr Quality level 3: snapshot 2 to 4 times per hour
Sample size necessary	Unkown (research needed)	Unkown (research needed)
Confidence interval and margin of error	Unkown (research needed)	Unkown (research needed)
Reporting period	Every 5 years Or before/after an intervention	Quality level 2: every 2 years or before/after an intervention Quality level 3: yearly or before/after an intervention

\* Observations on gender and age categories as well as information on presence of disadvantaged persons and escorted children can provide information about social exclusion or inclusion in a public space. For example, Project for Public Spaces suggest that women are more selective in their choice of sojourn spaces than men, and that an increase in the proportion of females voluntarily spending time in a space is a reliable indicator of improved environmental quality and perceived security.

Open questions needing to be discussed:

- ⇒ How to define (physically/socially) disadvantaged persons? Purely from sight? Some physical or sensory impairments can be seen (walking stick, cane etc.), others not; social distinctions can be very problematic
- ⇒ Age and group assessments: how can it be done? Meaningful?

If not only people but also the facilities they use is counted then a number of interesting references can be made. If, for example, the number of street café seats or seats for formal seating (bench places) is surveyed then these can be measured against the number of users of these seats. Gehl and Gemzøe have shown in Copenhagen and other places how new offers of such provisions are adopted by place users very quickly. Similar results could be observed in studies in the cities of Zurich and London.

Weather

The use of public space for sojourn is certainly more dependent on the weather than mobility patterns of pedestrians. There is, however, no exact data yet on the effects of the weather. Generally nice and warm weather (relative to average country conditions) will bring out lots of people. If it is too hot they will not use certain places (e.g. non-shaded places), when it is too windy, exposed parts will be avoided. Temperatures below 15 degrees have been shown to have a negative effect on numbers. However, this is dependent on the season and on cultural factors. In spring and after longer periods with rain, people are more eager to sit out even when temperatures are lower. People in northern (European) countries are affected differently by heat or cold than those in more southerly regions. Rain may also have an effect on the numbers of place users after it stopped, e.g. because the grass or other places to sit are wet.

Seasonal

Public space surveys should be carried out during spring or fall. Time changes may affect the numbers of users (e.g. longer evenings in spring).

Figure 26

<b>Time of week</b>	
Weekdays	All weekdays possible except for Monday; ideal are Tuesdays to Thursdays (Friday may be different from other days)
Weekends	In general: weekends can be also important not just weekdays: Saturday or Sunday depends on requirements
General	Not during school or working holidays, special events and festivities
<b>Time of day</b>	Beginning 10 am, ending at 7-8 pm (in certain locations longer in the evening, e.g. entertainment districts), also dependent on the objective If limited time/resources: best times to count are over lunch time and in the later afternoon, early evening

## 5. CONCLUSIONS

This paper outlined the direction towards internationally standardised monitoring methods of walking and public space. Based on a number of the specific characteristics of walking some first conclusions have been drawn to show the implications of the characteristics for the methodology and type of data needed. Examples from Zurich and London have been used to illustrate the approach. It is clear, however, that the results from the two cities need to be broadened, both in terms of geography and methodology. This is work in progress providing a first basis for further discussions.

The figure below attempts to summarise some of the conclusions for the data collection with regards to walking. These requirements are neither exhaustive nor yet detailed enough in terms of the guidelines envisioned, but they give a first idea. The column on the very right indicates the dimensions for which these insights may be particularly relevant. There are a number of (sub-)dimensions such as risk/exposure- or cost-benefit-analysis which are not mentioned here because they are derived from the 10 main dimensions (A-J). A more comprehensive picture will be developed in the years to come.

Figure 27

Characteristics of walking	Some conclusions based on the characteristics for the data-collection (not an exhaustive list)	Particularly relevant for dimensions
Flexible and small scale movements	<ul style="list-style-type: none"> <li>- carefully assess and decide where to count</li> <li>- record also stages and not just (full) trips in surveys</li> <li>- include the walking links between different modes</li> <li>- use adequate equipment to record the flexibility of movements (e.g. video camera)</li> </ul>	A, B, C
Easy transitions between walking and sojourning	<ul style="list-style-type: none"> <li>- measure walking <u>and</u> sojourning (i.e. when counting pedestrian include pedestrian activities)</li> <li>- additional surveys needed for non goal-oriented mobility (mobile activities), e.g. children's play</li> <li>- measure (ask) for time spent in public space in (activity or travel) surveys</li> </ul>	A, B, C, G
Importance as own mode and as link between modes	<ul style="list-style-type: none"> <li>- pay attention to where pedestrians are 'born' or 'disappearing' (particularly when counting)</li> <li>- include the walking links/stages between different modes (number of stages, time)</li> <li>- distinguish/show the linked trips and the walking only trips in presentations</li> </ul>	A, B, C
Multiplicity of motivations, purposes and route choices	<ul style="list-style-type: none"> <li>- include all purposes and motives, particularly also health as a motive in surveys</li> <li>- make it possible to record several trip purposes for the same trip (=&gt; details need to be worked out)</li> <li>- find ways to better assess physical activity and its intensity; e.g. by record walking pace (?)</li> <li>- consider and include alternative/parallel routes into assessments e.g. when counting</li> <li>- consider the wide range of wayfinding and navigation strategies adopted by pedestrians</li> </ul>	A, B, C, D, F, H
Walking happens everywhere	<ul style="list-style-type: none"> <li>- do not only survey and count in city-centres, but across cities (including urban fringe) and also in towns and villages</li> </ul>	A, B, C, G, I
Time spent and distance covered walking	<ul style="list-style-type: none"> <li>- measure the time for walking through or staying in a space</li> <li>- when comparing modal share, do not take distance but number of stages and/or time</li> <li>- measure time needed to access daily services (e.g. shops, pubs); distance can be used as an approximation</li> </ul>	A, B, C, H

Sensitivity for immediate environment	<ul style="list-style-type: none"> <li>- measure security and road danger as well as their perceptions</li> <li>- assess the quality of the walking environment, e.g. noise-level</li> <li>- pay attention and/or measure the influence of weather and season on sojourning</li> <li>- take into account where people might walk depending on environmental qualities when counting</li> </ul>	B, C, E, G, I
Communicative and social aspect	<ul style="list-style-type: none"> <li>- include information of children being escorted, walking alone or with other children (e.g. to school)</li> <li>- register the number of (un-)friendly encounters between pedestrians and between pedestrians and other road users</li> <li>- take into account (e.g. when counting) that people choose routes where communication and social contacts are possible or likely</li> </ul>	A, B, D, F
Environmental-friendly and socially inclusive	<ul style="list-style-type: none"> <li>- demonstrate the savings on carbon emissions, fuels, the gain in noise reduction etc. when walking instead of using other means of transport</li> <li>- include all age groups, gender etc. into the surveys (is true for all characteristics and dimensions)</li> <li>- assess the social inclusiveness of spaces</li> <li>- measure accessibility</li> </ul>	A, B, E, G, I
Accident definitions and vulnerability of pedestrians	<ul style="list-style-type: none"> <li>- include stumbling and falling accidents (not only those involving a vehicle)</li> <li>- assess exposure and risk properly (measured against time and not distance)</li> <li>- assess if children are escorted</li> </ul>	A, B, C, D

**List of dimensions as reminder (see page 2):**

- A Transport and travel behaviour data
- B Pedestrian counts (user counts), behaviour analysis (observations,) and pedestrian flows (models)
- C Activity and time spent in public spaces (sojourn without mobility, stationary activities)
- D Road danger/safety: traffic accidents with pedestrians & single pedestrian accidents (falling, stumbling etc.)
- E Security: threats, attacks, harassments
- F Competences (disabilities), physical activity (walking), health and health outcomes
- G Walking environment, accessibility, public space quality and infrastructure provisions (“walkability”)
- H Ecological footprint, land-use
- I Perceptions, attitudes and images: personal satisfaction and subjective perception: “measuring the smiles”
- J Investments, personnel and research: Data on institutional aspects

## REFERENCES

- BFS, Bundesamt für Statistik (2003) *Schweizerische Gesundheitsbefragung 2002*. Neuchâtel
- BFS/ARE: Bundesamt für Statistik, Bundesamt für Raumentwicklung (2007): *Mobilität in der Schweiz. Ergebnisse des Mikrozensus 2005 zum Verkehrsverhalten*. Bern/Neuchâtel
- Colin Buchanan (2007) *LIP walking outcome monitoring 2007/08: Baseline report*. London: TfL / Colin Buchanan
- Colin Buchanan (2008) *Legible London Bond Street Prototype: Evaluation framework*. London: TfL / Colin Buchanan
- Gehl, J. (1987, orig. 1971) *Life between Buildings. Using Public Space*. New York
- Gehl J, Gemzøe L (1996) *Public Spaces – Public Life Copenhagen 1996*. The Danish Architectural Press, Copenhagen
- Gehl-Architects (2004) *Towards a Fine City for People – Public Spaces – Public Life*. London: Transport for London & Central London Partnership
- Hubacher M, Ewert U (1997) *Das Unfallgeschehen bei Senioren ab 65 Jahren*. bfu-report 32
- Huettenmoser, M. (1995) 'Children and their Living Surroundings: Empirical Investigations into the Significance of Living Surroundings for the Everyday Life and the Development of Children', in *Children's environments*, 12(4), pp. 403-413
- Schad H, Ohnmacht T, Sonderegger R, Sauter D (publication pending) *Gebaute Umwelt und körperliche Aktivität* (working title), Luzern
- Sauter D (1993) *Schulwegsicherung Herrliberg*. Arbeitsgemeinschaft Recht für Fussgänger im Auftrag der Gemeinde Herrliberg
- Sauter D (2006a) *Erhebung des Fuss- und Veloverkehrs und der Aufenthaltsnutzung am Limmatquai: Zwischen-Erhebung – Mai 2005 im Vergleich zur Vorher-Situation*. Stadt Zurich
- Sauter D (2006b) *Aufenthaltsnutzung im Wipkingerpark. Ersterhebung Mai 2005*. Stadt Zurich
- Sauter D (2008) *Mobilität von Kindern und Jugendlichen. Fakten und Trends aus den Mikrozensen zum Verkehrsverhalten 1994, 2000 und 2005*. Bundesamt für Strassen, Bern
- Stadt Zürich (1987) Bericht zur Verkehrspolitik der Stadt Zürich ('Blaubuch'). Zürich
- Stadt Zürich (2001) *Die Mobilitätsstrategie der Stadt Zürich*. Zürich
- Stadt Zürich (2003a) *Mobilitätsstrategie der Stadt Zürich. Teilstrategie Behinderte, Betagte und Kinder*. Zürich
- Stadt Zürich (2003b) *Mobilitätsstrategie der Stadt Zürich. Teilstrategie Fussverkehr*. Zürich
- Transport for London (2004) *Making London a walkable city: The Walking Plan for London*. London: Transport for London
- Transport for London (2007a) TfL *Walking Strategy*. Unpublished
- Transport for London (2007b) *Measuring Pedestrian Activity*. London: TfL / Colin Buchanan
- WALK21 (2006) *International Charter for Walking*. Adopted at the WALK21 conference in Melbourne 2006
- Wedderburn M (2007, unpublished) *Link and Place: Analysing pedestrian behaviour in the high street*. Thesis, MPhil Town and Country Planning, Bartlett School, University College London
- Whyte, W.H. (1980) *The Social Life of Small Urban Spaces*. Washington
- Zweibruecken K, Sauter D, Schweizer T, Staeheli A (2005) *Erhebung des Fuss- und Veloverkehrs*. Forschungsauftrag 2001/503. Bundesamt für Strassen. Bern