THE GLOBAL WALKABILITY INDEX
by
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ABSTRACT

Although a significant number of trips are made by foot in developing cities, pedestrian infrastructure, amenities, and services are often neglected in municipal planning and budgets. Since helping city planners understand the scope and extent of local pedestrian conditions relative to other cities would be a positive step towards improving the quality of the pedestrian environment, I was retained by the World Bank to devise a walkability index, which would rank cities across the world based on the safety, security, and convenience of their pedestrian environments.

To accomplish this task, I first generated a list of Index variables by studying existing tools for evaluating non-motorized transport and by consulting experts from a variety of related fields. After considering different methods for survey area selection, field data collection, and data aggregation, I created prototypes of the index and survey materials and organized field tests in cities throughout the world, including Beijing, Washington, and Delhi. I also oversaw a full-scale pilot in Ahmedabad, India, where 65 volunteers from the Centre for Environmental Planning and Technology (CEPT) conducted physical infrastructure, public agency, and pedestrian surveys in eight neighborhoods, which were selected using a random spatial sampling method.

Results from these tests and pilot were used to refine the Index composition and data collection methodologies, resulting in a two-pronged tool. Since, out of practical necessity, the Global Walkability Index’s robustness is limited by its simplicity (the Index is primarily intended to generate awareness of walkability as an important issue), I developed an additional set of Extended Survey Materials that may be used to gather more detailed, site-specific data for use in developing investment and policy proposals.

The Index is burdened by at least two significant limitations, namely that the notion of walkability itself is not well understood, paving the way for widespread misunderstanding and that the Index requires that most of the data be collected in the field, which presents difficulties in terms of funding, translation, and quality assurance.

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write down immediately afterwards. Thank you, Chris Bennett, for caring so much about my welfare! I was so delighted to find your colleagues waiting for me at the airport in Ahmedabad. I want to thank Sally Burningham for helping me understand pedestrian conditions in the cities she has worked in, and I thank Judy Baker for helping me develop the random spatial sampling method. I want to thank Tony Bliss for providing insights on the safety dimension of the work, and I thank Mohammad Loutfy and Sebastian Veit for helping me make an Index that would capture the needs of disabled people. Finally, I want to thank Nona Sachdeva for my great hat (!) and for making me feel so welcome in the unit.

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1.0 Introduction

"Isn't it really quite extraordinary to see that, since man took his first steps, no one has asked himself why he walks, if he has ever walked, if he could walk better, what he achieves in walking...questions that are tied to all the philosophical, psychological, and political systems which preoccupy the world?"

-- Honoré de Balzac, Théorie de la Démarche

Every trip begins and ends with a walking trip. Whether in a developed or developing city, nearly all trips will require some walking, either directly to a destination or to another mode of transport. How well the pedestrian environment can service these trips will impact the overall quality and efficiency of the urban transportation network, and in turn, overall mobility and accessibility for residents and visitors.

The modal share of pedestrians in developing cities tends to be very high. For example, between 25 and 50 percent of trips in major Indian cities and about 50 percent of all trips in major African cities are made entirely on foot. In medium and smaller developing cities, the share of all-walking trips can be as high as 60 to 70 percent (Gwilliam 2002). But, although a significant number of trips are made by foot in developing cities, pedestrian infrastructure, amenities, and services are often neglected in municipal planning and budgets (Fang 2005).

Faced with rapid rates of motorization and the need to accommodate growing congestion, cities will typically make improvements in vehicular rights of way at the expense of pedestrians. For example, it is not untypical for a city to eliminate at-grade crosswalks in between blocks to improve traffic flows (as in Beijing) or to construct new roads without any allocated space for walkers (as in New Delhi). Further, with what little paved walking space developing cities have, cities rarely designate adequate resources to regulate and
maintain walking paths, resulting in chaotic pedestrian environments, where deteriorating walking paths are encroached upon by vendors, parked vehicles, or even make-shift dwellings. Scarce financial resources, lack of political will, and simple unawareness are among the many reasons why such counter-productive practices persist.

Inadequate planning for pedestrians has many negative consequences, the most notable being unnecessary fatalities and injuries. Pedestrians in developing countries are much more likely to be injured or killed than they are in developed countries, even at equal vehicle flow rates. For example, in a British study completed in 1991, researchers found that at a rate of 1,500 vehicles per hour, risk rates in Nairobi and Surabaya were 86 and 172 percent greater than in urban areas in the UK (Downing 1991). Further, according to another study conducted by Transportation Research Laboratories (TRL), pedestrians can represent more than half of all traffic-related fatalities in developing countries (Sayer 1997).

Beyond these safety implications, there are other negative consequences from insufficient pedestrian planning. For example, economic and social mobility can be impeded by lack of physical mobility -- traveling long distances along physically daunting corridors reduces the time and energy residents can spend on jobs, families, studies, and other productive activities. Further, there are opportunity costs from lost tourism and investment opportunities -- pedestrian facilities play a significant role in the way outsiders perceive a city’s image.

World Bank transportation specialists Ke Fang and Sally Burningham have stated that most Bank clients do not make pedestrian planning a priority and note that there are few
incentives for them to do so. Helping city planners understand the scope and extent of local pedestrian conditions, relative to other cities, would be a positive step in the right direction, as would helping them identify specific countermeasures and costs associated with improving pedestrian conditions.

To this end, the World Bank hired me as a consultant to devise a kind of “walkability index,” which I decided would rank cities across the world based on the safety, security, and convenience of their pedestrian environments.

The following sections describe how I developed the Index and data collection methodologies, present findings from initial field tests and full-scale pilot I had organized, and discuss next steps.

2.0 Research Objectives

The overarching goal of this approach is to improve the walkability of developing cities. Key objectives include:

- Generate awareness of walkability as an important issue in developing cities;
- Provide city officials with an incentive to address walkability issues;
- Help city planners understand scope and extent of local pedestrian conditions, relative to other cities; and
- Provide city planners with the information necessary to identify specific pedestrian-related shortcomings, as well with recommendations for next steps.
3.0 Research Scope and Organization

3.1 Definition of Walkability

There are many different ways to consider “walkability.” For example, in many developed countries, walkability discussions focus on encouraging mode shifts from motorized to non-motorized vehicles for short trips, or on promoting walking as a healthy leisure activity. In developing cities, walking is often considered in terms of providing mobility for the poorest residents. Some urban planners tend to think of walkability in terms of a city’s spatial land use arrangement, favoring mixed-use zoning over segregated uses. Despite all of these possibilities, in this project we shall consider walkability only in its most basic sense: the safety, security, economy, and convenience of traveling by foot. Our goal is to develop a project that targets those aspects of walkability that can be improved upon in the short and medium terms (e.g., availability of infrastructure and relevant policies), as opposed to those that may only be affected in the long term (e.g., prevailing land uses).

3.2 Phasing

I initially conceived the Walkability Index as a multi-phase research effort, as outlined below:

Phase I

Step 1 Conduct background research and literature review

Step 2 Draft survey methods and survey implementation guidebook. Test survey materials in developed and developing countries to refine methodology.

Step 3 Use refined survey materials to conduct full-scale pilot in a select developing city. Analyze results.

Step 4 Finalize survey methodology and implementation guidebook.
Phase II

**Step 5** Complete rough method for data aggregation – that is, transforming the data into index rankings (to be further refined as data is collected).

**Step 6** Promote widespread implementation of Index survey materials. Begin to construct Global Walkability Index.

**Step 7** Develop generic counter-measure guidebook that outlines steps (additional studies, resources that may be consulted, etc.) city planners and leaders can take to improve upon areas deemed insufficient by the Index.

**Step 8** Analyze Index data and produce final report. Establish mechanism for ongoing implementation.

The work discussed in this paper focuses solely on Phase I, with some reference at the conclusion of this paper (Section 12.0: Conclusion and Next Steps) about next steps for Phase II.

### 3.3 Selected Cities

The Index has been designed such that it may be universally applicable to developed and developing cities alike. Cities selected for the development of the index methodology itself are further described in Section 7.0: Field Tests.

### 3.4 Tie-ins to Broader Context

Although this project focuses exclusively on the development of a Walkability Index, it should be noted that the tools and survey methodologies developed herein may also be used to accompany other initiatives, such as local pedestrian advocacy movements, urban transport infrastructure upgrading projects, or individual grant programs.

What follows is a discussion of the Index's foundation – a foundation that may be altered to suit the specific needs of a non-Index project, such as devising an investment proposal.
Section 10.0: Extended Index Surveys shows how Index tools may be used to derive investment and policy-making programs.

4.0 Index Components

The Walkability Index, designed around the aforementioned project objectives, comprises three components: safety and security, convenience, and degree of policy support.

Component 1: Safety and Security

This first component is intended to determine the relative safety and security of the walking environment. For example, what are the odds a pedestrian will be hit by a motor vehicle? What safety measures are in place at major crossings and intersections? How safe from crime do pedestrians feel along walking paths?

Component 2: Convenience and Attractiveness

The second component reflects the relative convenience and attractiveness of the pedestrian network. For example, do pedestrians have to walk a kilometer out of their way just to cross a major road? Is there sufficient coverage from weather elements along major walking paths? Are paths blocked with temporary and permanent obstructions, such as parked cars or poorly placed telephone poles?
Component 3: Policy Support

Finally, the third component reflects the degree to which the municipal government supports improvements in pedestrian infrastructure and related services. Is there a non-motorized planning program? Is there a budget for pedestrian planning? Are pedestrian networks included in the city master plan?

In a previous iteration of the Index, these three components were further subdivided into 22 indicators and 45 variables. These components, indicators, and variables were the final product of a substantial amount of research that included:

- Evaluation of more than 20 different established methodologies for evaluating urban non-motorized transport (*Appendix A: List of Indices and Evaluative Methodologies Reviewed*);
- Evaluation of three different econometric methods for compiling indices (*Appendix A*);
- Consultations with experts from a multitude of fields, including urban planning, pedestrian planning, transportation engineering, urban transport policy, pedestrian safety, accessibility for disabled persons, urban design, and economics (*Appendix B: List of Consulted Experts*); and
- Comments from field testers in Alexandria, VA; Washington, DC; Hanoi, Manila, Bangkok, Beijing, and Delhi (*Section 7.0: Field Tests*).
Table 1 illustrates the original Index's formulation. I presented this form of the Index at the Association of Bicycle and Pedestrian Professionals annual conference in Chicago in October 2005. The overwhelming response from conference participants (and other audiences) was that the methodology, while appropriate for developing targeted investment programs, was far too complicated for practical implementation purposes.

\[1\] Note that the "Source" column refers to where the data is collected from.
Table 1: Original Global Walkability Index: Summary of Components, Indicators, and Variables (2005)

<table>
<thead>
<tr>
<th>Component</th>
<th>Indicator</th>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pedestrian Fatalities and Injuries</td>
<td>1 Proportion of road accidents that resulted in pedestrian fatalities (most recent year avail.)</td>
<td>2 Proportion of road accidents that resulted in pedestrian injuries (most recent year avail.)</td>
<td>2</td>
</tr>
<tr>
<td>2 Modal Conflict</td>
<td>3 5-minute interval count of pedestrians walking in street among other modes</td>
<td>4 Pedestrians concerned about modal conflict on walking path</td>
<td>3</td>
</tr>
<tr>
<td>3 Crossing Safety</td>
<td>5 Walking path modal conflict Level of Service from 1 to 5 (1-5 LOS)</td>
<td>6 Pedestrians who do not feel safe from road accidents</td>
<td>1</td>
</tr>
<tr>
<td>4 Crossing Exposure</td>
<td>7 Crossing safety 1-5 LOS (surveyed crossings = sc)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5 Traffic Management at Crossings</td>
<td>8 Average time waiting to cross (sc)</td>
<td>9 Judgement: sufficient time given for healthy adult to cross (sc)</td>
<td>1</td>
</tr>
<tr>
<td>6 Security</td>
<td>10 Judgement: sufficient time given for person with small children to cross (sc)</td>
<td>11 Judgement: sufficient time given for elderly / disabled people to cross (sc)</td>
<td>1</td>
</tr>
<tr>
<td>7 Safety Rules and Laws</td>
<td>12 Type (e.g., ped-phase signal) as function of # lanes and avg. traffic speed (sc)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8 Pedestrian Safety Education</td>
<td>13 Perception of security from crime 1-5 LOS</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>9 Motorist Behavior</td>
<td>14 Proportion of walkable roads with street lights</td>
<td>15 Pedestrians who do not feel streets are well lit at night</td>
<td>3</td>
</tr>
<tr>
<td>10 Trees</td>
<td>16 Security of crossings (particularly subways) 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>11 Cleanliness</td>
<td>17 Existence of relevant pedestrian safety laws and regulations</td>
<td>18 Enforcement of relevant pedestrian safety laws and regulations</td>
<td>2</td>
</tr>
<tr>
<td>12 Quality and Maint. of Walking Path Surface</td>
<td>19 Presence of pedestrian safety education programs</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>13 Disability Infrastructure</td>
<td>20 Yielding to pedestrians</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>14 Coverage</td>
<td>21 Safe driving speed in heavily pedestrianized areas</td>
<td>22 Running red traffic lights and stop signs</td>
<td>3</td>
</tr>
<tr>
<td>15 Obstructions</td>
<td>23 Average number of trees per km of road</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>16 Availability of Crossings</td>
<td>24 Cleanliness of walking paths 1-5 LOS</td>
<td>25 Pedestrians inconvenienced by lack of cleanliness of walking paths</td>
<td>3</td>
</tr>
<tr>
<td>17 Walking Path Congestion</td>
<td>26 Presence of open sewers along walking paths</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>18 Pedestrian Amenities</td>
<td>27 Quality and maintenance of walking path surface material 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>19 Connectivity</td>
<td>28 Pedestrians inconvenienced by poor walking path surface quality and maintenance</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>20 Overall Convenience</td>
<td>29 Proportion of roads without sidewalks</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>21 Planning for Pedestrians</td>
<td>30 Existence and quality of facilities for blind and disabled persons 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>22 Relevant Design Guidelines</td>
<td>31 Proportion of walking paths that are covered (e.g., arcades) with climate weight</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>32 Permanant and temporary obstacles on walking paths 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>33 Pedestrians inconvenienced by obstructions</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>34 Sufficient safe and convenient opportunities available to cross streets</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>35 Pedestrian congestion 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>36 Amenities (e.g., benches, public toilets) 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>37 Pedestrian wayfinding signage 1-5 LOS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>38 Connectivity between residential and employment centers 1-5 LOS</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>39 Pedestrian perception of convenience -- rating</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>40 Presence and quality of pedestrian planning program</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>41 Incorporation of pedestrian plans in transportation or city master plan</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>42 Relative importance of pedestrians in city planning (agency self-rating)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>43 Degree of centralization among bodies responsible for different aspects of ped. planning</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>44 Presence of relevant urban design guidelines</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>45 Presence of relevant building design guidelines</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Data Sources: 1 Physical Infrastructure Survey; 2 Public Agency Survey; 3 Walker Survey; 4 City Background Research
I based the simplification of the Index on feedback from previous Index and included those elements deemed the most important indicators of walkability. The new Index compromises thoroughness for practicality, yet still stands as a plausible indicator of walkability in cities throughout the world. The simplified Index variables are presented in Table 2.

Table 2: Global Walkability Index – Summary of Components and Variables (2006)

<table>
<thead>
<tr>
<th>Component</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety and Security</td>
<td>1 Proportion of road accidents that resulted in pedestrian fatalities (most recent year avail.)</td>
</tr>
<tr>
<td></td>
<td>2 Walking path modal conflict</td>
</tr>
<tr>
<td></td>
<td>3 Crossing safety</td>
</tr>
<tr>
<td></td>
<td>4 Perception of security from crime</td>
</tr>
<tr>
<td></td>
<td>5 Quality of motorist behavior</td>
</tr>
<tr>
<td>Convenience and Attractiveness</td>
<td>6 Maintenance and cleanliness of walking paths</td>
</tr>
<tr>
<td></td>
<td>7 Existence and quality of facilities for blind and disabled persons</td>
</tr>
<tr>
<td></td>
<td>8 Amenities (e.g., coverage, benches, public toilets)</td>
</tr>
<tr>
<td></td>
<td>9 Permanent and temporary obstacles on walking paths</td>
</tr>
<tr>
<td></td>
<td>10 Availability of crossings along major roads</td>
</tr>
<tr>
<td>Policy Support</td>
<td>11 Funding and resources devoted to pedestrian planning</td>
</tr>
<tr>
<td></td>
<td>12 Presence of relevant urban design guidelines</td>
</tr>
<tr>
<td></td>
<td>13 Existence and enforcement of relevant pedestrian safety laws and regulations</td>
</tr>
<tr>
<td></td>
<td>14 Degree of public outreach for pedestrian and driving safety and etiquette</td>
</tr>
</tbody>
</table>

Unless otherwise specified, each of these variables is in the form of a Level-of-Service (LOS) unit, on a scale from 1 to 5. Calculation of the Index based on these variables is discussed in Section 8.0: Converting Data into Index Rankings. A full description and justification of the Index variables may be found in Appendix C: Global Walkability Index Survey Materials and Implementation Guide.

One unusual feature of the Index variables is that cities are not punished for the absence of traditional raised sidewalks. This is because the absence of sidewalks does not necessarily imply an unwalkable environment. For example, through careful urban design, the Dutch
have created woonerfs\textsuperscript{2}, neighborhoods that are very walkable yet lack raised sidewalks.

Further, it makes little sense to penalize a city for not providing sidewalks in areas where demand is minimal. Finally, unless sidewalks are well maintained and free from obstructions, their mere presence is not a guarantor of walkability. Thus, variables measuring the quality of dedicated pedestrian \textit{walking paths} have been included in lieu of the presence traditional sidewalks.

5.0 Data Collection Methodology

The quality of the data collection methodology will largely determine the overall quality and usefulness of the Walkability Index. That said, while it is desirable that the data collection methods are thorough, they should also be very simple to ensure widespread, error-free implementation. To this end, I developed a set of two surveys for collecting the data described in Table 2: a public agency survey and a field survey (\textit{Appendix C: Index Survey Materials}).

It is important that these surveys are conducted by local populations to prevent undue bias in results. We are more interested in attaining a walkability index that ranks cities on pedestrian facilities and services, \textit{relative to their local political and economic conditions}, rather than an index that merely mirrors GDP rankings. To illustrate the problem of non-local persons conducting surveys, consider this: an American conducting a walkability survey in Washington, DC, may give the city very low marks for safety and security, while an Indian

\textsuperscript{2} "Woonerf: A street in which, unlike in most streets, the needs of car drivers are secondary to the needs of users of the street as a whole. It is a space designed to be shared by pedestrians, playing children, bicyclists, and low-speed motor vehicles." (\textit{Wikipedia}: "Woonerf" <http://en.wikipedia.org/wiki/Woonerf>)
from Mumbai might give Washington very high marks, given the substantial different levels of infrastructure development between the two cities.

5.1 Implementation Guide

I developed a simple guidebook to help teams in different cities conduct the surveys in a consistent manner (Appendix C: Index Survey Materials). Early versions were tested by persons in the US and overseas to determine relative ease and feasibility of the survey methods.

6.0 Survey Area Selection and Time-of-Day Considerations

6.1 Survey Area

It is important that selected survey areas within cities provide comparable results, and it is important that the areas surveyed are representative of a large cross-section of cities’ varied neighborhoods and districts. Establishing a survey area selection methodology that suits these criteria is quite difficult, given I call the Alexandria Effect.

Alexandria, Virginia, is famous for its historic district, which features a very pleasant, pedestrian-friendly environment (Figure 1). Few people realize, though, that Alexandria’s walkable streets comprise only a fraction of the entire city (both spatially and in terms of population), which is, in fact, very unwalkable (Figures 2 and 3). Traffic speeds tend to be
relatively fast (40 – 55 mph), there are few pedestrian crossings, and many corridors lack continuous, well maintained sidewalks, despite an apparent need. So, the question is, is Alexandria a walkable city? How can we devise a survey area selection method that would
both capture the walkability of the historic district while at the same time both capturing the unwalkability of greater Alexandria and giving that area an appropriate weight?

**Figure 3: Alexandria, Virginia – Beyond the Historic District**

Bearing this issue in mind, I considered at least five different survey area selection methodologies:

a) **Method 1: Street Typology**

After deriving a list of different street typologies (e.g., low-income residential street, central commercial street, etc.), one would elect to survey at least $n$ of each different street type in each city. This method has a few distinct advantages. First, assuming that city transportation planners can estimate the number of each type of street within the municipality, we can use data collected from each street survey to generate city-wide estimates. Second, this method lends itself to more acceptable comparisons across cities, since typologies are by definition the same across different locations. Problems with this method include the difficulty in deriving universally applicable street typologies and in retaining the expertise required to identify which roads within a city fall into the established typologies.
b) **Method 2: Street Location**

Rather than derive a list of different street typologies, one would generate a list of typical districts (e.g., low-income residential, middle- and high-income residential, central commercial district, industrial district, etc.). Then, one could survey \( n \) streets of varying widths and uses in each district in each city. This method may be executed more quickly than the street typologies method, since it is easier to pinpoint districts than street typologies. But at the same time, this method would not provide the same degree of standardization across cities for a few reasons. First, the typical districts would be arbitrarily chosen, lending bias to the selected survey areas. Second, the selection of streets within the districts would be arbitrarily chosen, as would the district boundary. For the results to be widely acceptable, one needs to consider methodologies that incorporate some greater degree of objectivity.

c) **Method 3: Arbitrary Bounded Area**

An arbitrary buffer zone with a predetermined radius could be drawn around a universal landmark, such as a town hall or central bus station. All streets (excluding alleys) within the analysis zone would be included in the survey. Although this method enables the survey team to get started relatively quickly, it also poses a few distinct disadvantages. First, data collected from the survey areas cannot be used to generate estimates at a city-wide level. Second, analysis zones would not necessarily be comparable across different cities.
d) **Method 4: Spatial Random Sample**

In survey work, econometricians typically prefer to use random samples to avoid as much bias as possible. While the previously outlined methods have their merits, none include a random component that would lend credibility to survey results. One way to insert randomness into the survey area selection would be to obtain a random spatial sample, as described below. This method was initially proposed by Judy Baker, an economist at the World Bank.
Step 1
Lay a 500 meter by 500 meter grid on top of a city map. Map and grid scales shall be uniform across cities – in this case, we have used 1km x 1km squares for illustrative purposes. Block out squares that fall beyond the city border or in areas inappropriate for conducting surveys (e.g., lakes, parks, private property, etc.).

Step 2
Generate a random number table. In this example, we generated numbers along a normal distribution from 1-93 (there are 93 unblocked squares on our map).
Step 3
Transpose randomly generated numbers from table to the map, as shown in the diagram.

Step 4
Although the sampling method will have a random component, we want to be certain that specific types of neighborhoods are covered by the survey. Pre-select four survey squares that fall within: 1) A high-income neighborhood with mostly housing; 2) A low income neighborhood with mostly housing, a transport hub (e.g., rail station), and a commercial district.
Step 5
Mark these pre-selected areas on the city map.

Step 6
To ensure that the Index is fair, the remaining squares shall be randomly selected. We used the same random number table we had generated previously. Starting from the left, if a number on the table appeared in our map, than that corresponding square would be selected (see diagram). The number of additional squares should equal the total number of available squares divided by 10 (the answer is rounded down), minus the four pre-selected squares. (Note: technically, in the case, then, there should be five additional squares)
Step 7
Based on selections, make individual maps that can be used in the field to conduct surveys. For the purposes of constructing Index rankings and identifying general strengths and weaknesses, every major public road within each square should be surveyed — alleys, private drives, very minor residential roads, etc. are excluded.
This method is advantageous in that: 1) the random component mitigates some bias from the results, therefore making the survey data more readily comparable across cities; and 2) surveying a square area rather than a selection of single streets ensures issues such as connectivity can be captured in the data – that is, surveying whole areas give is a sense of general walkability for a whole neighborhood, as opposed an isolated road that may or may not be of import. One drawback is that a random spatial sample, inherently, will not cover all areas in the city and may miss important corridors. But, since this is the case for all cities, and since these surveys are conducted for the purposes of constructing an index, as opposed to an investment program, this loss may be considered acceptable. The more areas that are selected (and therefore the less-detailed the surveys are), the more this issue may be mitigated.

e) **Method 5: Random Sample of Streets**

This method requires a list of all streets in a city, which should be obtainable from the municipal agency responsible for transportation planning. The Consultant shall assign randomly generated numbers to each street and then select a sample of streets. The survey teams shall then survey typical one-kilometer stretches on selected streets. Although relatively simple, this method poses at least one key difficulty, namely, in some developing cities, no such master list of street names exists for all or most major and minor roads.
In terms of drawing a city boundary, we shall consider developed areas contiguous to the city center. That is, satellite neighborhoods and neighborhoods separated from the city by agricultural land or significant natural or manmade barriers shall not be considered.

6.2 Time of Day

In addition to location considerations, there are also time-of-day issues to bear in mind. For example, a street that seems very safe at 9:00 a.m. may seem much less so at 9:00 p.m. Or, a sidewalk that seems perfectly walkable on a Sunday afternoon may be impossible to navigate during Monday rush hour. Under ideal conditions, all surveyed areas would be visited at least twice – during peak and a non-peak traffic times (note that the specific peak times of day will vary from city to city) However, should limited resources prove multiple visits unfeasible, then conducting surveys in all cities only during local peak hours may be an option.

7.0 Field Tests

The form and content of these surveys have been refined though field tests in cities throughout the world, including Beijing, Hanoi, and Washington D.C. Test cities were chosen based on accessibility – that is, cities where volunteers were willing to examine the methodology and provide feedback. Table 3 summarizes these efforts:
A selection of materials from these field tests may be found in Appendix E: Selection of Field Test Materials. It is important to note that the tests were conducted for the purposes of refining the Index methodology, rather than to merely collect data, in which case the sample sizes would have needed to be larger in most cases. Testers submitted hundreds of comments on the materials, which I drew upon to make the following changes in the methodology and composition of the Index.

7.1 **Simplified Survey Format**

The Alexandria pilot revealed that the original physical infrastructure survey was too cumbersome and difficult to complete within a reasonable amount of time. Changing the
order of questions, format of the survey, and question content are among the many changes that were made over time to overcome this hurdle.

Initial tests of the pedestrian survey conducted among World Bank staff at its headquarters in DC and Beijing office revealed that the questions were not intuitive and not all respondents understood the questions being asked. To remedy this, 1) some questions were accompanied by multiple-choice response fields, rather than fill-in blanks; 2) some questions deemed redundant were dropped; and 3) an instructional guide for persons conducting the pedestrian surveys was developed.

The Washington pilot conducted among pedestrians in eight randomly selected neighborhoods revealed that the language of the pedestrian survey is too formal/academic and not necessarily suitable for survey work in diverse contexts, such as low-income neighborhoods. To remedy this, the language was simplified and an additional note on this issue was included in the survey guide.

7.2 **Design for Simplified Data Entry**

Physical infrastructure data entry from the DC pilot was cumbersome, largely because the volunteers had too much freedom in deciding how to fill in responses. To remedy this, most of the questions were rewritten as multiple choice, rather than fill-in-the-blank. Also, fill-in PDF files have been developed, so that data may be entered directly into the PDF sheet and then saved as a “.csv” file, rather than a more cumbersome, less-intuitive spreadsheet template.
7.3 Changes in Survey Content

Tests in Hanoi, Beijing, Manila, Delhi, and Bangkok revealed that not all important pedestrian-related problems are covered by the survey questions. For example, a tester in Hanoi noted that at crossings, it is not enough to measure the amount of time given to cross a street – one must also note whether that time is sufficient. Comments such as these were used to further refine the survey content, such that the questions are more universally applicable, and such that they capture a significant proportion of pedestrian issues faced throughout the world.

8.0 Converting Data into Index Rankings

Without data from a selection of cities, it is difficult to develop an Index methodology in specific terms. Thus, the following paragraphs describe how one might go about constructing the Index once more data is gathered.

For the public agency portion of the survey, points are assigned to each response, summed, and then normalized across results from all cities with a z-score. To illustrate, Figure 4 shows a filled-in public agency form. Point allocation is summarized in Table 4.
Figure 4: Sample Filled-In Public Agency Survey

1) Please rate degree of municipal funding and resources devoted pedestrian planning.
   - Enough to sustain a high-quality program in long-term
   - Sufficient for short term, but not the long term
   - Neutral
   - Insufficient to achieve meaningful goals
   - Non-existant

2) Please check the pedestrian-related urban design guidelines that are already well-established. Feel free to add any relevant guidelines that are not included in the list.
   - Sidewalk pavement type
   - Placement of benches and similar amenities on walk paths
   - Sidewalk widths
   - Design for disabled persons
   - Other

3) Attach available data on pedestrian fatalities and injuries to survey materials. Enter estimated proportion of traffic fatalities involving pedestrians in 2004.
   - 25% %

4) Have there been public outreach efforts (by this or other agency) to educate pedestrians or drivers on road and pedestrian safety?
   - Yes
   - No

5) Is there a law or regulation for any of the following items? If so, is the law or regulation enforced? Feel free to add any relevant laws or regulations that are not included in this list.

<table>
<thead>
<tr>
<th>Is there a law or regulation for:</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Enforced?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaywalking</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Vendors on sidewalks</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Parking on sidewalks</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Driving / riding on sidewalks</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Drunk driving</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Other Littering</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 4: Point Allocation for Public Agency Surveys

<table>
<thead>
<tr>
<th>Question</th>
<th>Point Assignments</th>
<th>Sample (Figure 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-5 Scale; Non-Existent = 1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>One point for each box checked</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Divide percentage by 10</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>Yes = 5, No = 1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3 for each ‘usually’ to 1 for each ‘rarely’, divided by 2.</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>9.5</td>
</tr>
</tbody>
</table>
Figure 5, which is taken from the survey materials in Appendix C, shows a blank field data collection form.

### Figure 5: Field Data Collection Form

<table>
<thead>
<tr>
<th>Surveyed Road Stretch</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>( \frac{(x \times \text{length} \times 10 \times \text{count})}{#} / 10 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Walking Path Modal Conflict</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Security from Crime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Crossing Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Motorist Behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Amenities (Cover, benches, public toilets, street lights)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Disability Infrastructure and Sidewalk Width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) Maintenance and Cleanliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) Obstructions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) Availability of Crossings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) Pedestrian Count</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Length of Surveyed Stretch (km)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unweighted Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For each surveyed area, up to 10 stretches of road may be surveyed (this number was derived based on field tests, in which there were, on average, 8 stretches per surveyed area). If more than 10 stretches are present, additional sheets may be used. The surveyor records a Level-of-Service (LOS) measurement into each square, on a scale of 1-5, according to principles laid out in the survey implementation guidebook, which may be found in Appendix C. To normalize LOS inputs, each LOS is multiplied by the length of surveyed road and the pedestrian count (x10). The results are then summed up across rows 1-9 and averaged by the number of stretches surveyed. The resulting number is divided by 10 for simplicity. A final average is then calculated and used in the derivation of the Index. Note that all of the
calculations are done automatically using a dynamic PDF form, which is supplied to all surveyors. Figure 6 presents an example of a filled out Field Data form:

**Figure 6: Example of Filled-In Field Data Collection Form for One Survey Area**

<table>
<thead>
<tr>
<th>Surveyed Road Stretch</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>(\sum(x\times\text{length}\times10\times\text{count})/#)/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Walking Path Modal Conflict</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>51.1</td>
</tr>
<tr>
<td>2) Security from Crime</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>58.9</td>
</tr>
<tr>
<td>3) Crossing Safety</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>40.6</td>
</tr>
<tr>
<td>4) Motorist Behavior</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>34.4</td>
</tr>
<tr>
<td>5) Amenities (Cover, benches, public toilets, street lights)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>40.8</td>
</tr>
<tr>
<td>6) Disability Infrastructure and Sidewalk Width</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>13.1</td>
</tr>
<tr>
<td>7) Maintenance and Cleanliness</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>41.6</td>
</tr>
<tr>
<td>8) Obstructions</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>38.6</td>
</tr>
<tr>
<td>9) Availability of Crossings</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>40.9</td>
</tr>
<tr>
<td>10) Pedestrian Count</td>
<td>25</td>
<td>62</td>
<td>3</td>
<td>30</td>
<td>46</td>
<td>50</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Length of Surveyed Stretch (km)</td>
<td>0.5</td>
<td>0.25</td>
<td>0.25</td>
<td>0.45</td>
<td>0.55</td>
<td>0.35</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
<td>Unweighted Average</td>
</tr>
</tbody>
</table>

A final average is derived from the sum of the unweighted averages for each survey area, divided by the total number of survey areas. The final average is then added to the average from the public agency survey. The total is assigned a z-score to avoid problems of scale in cross country comparisons (the statistical z-score is obtained by subtracting the observations from the mean and dividing by the standard deviation of the variable).

The variables may or may not be weighted equally – this is an important issue for discussion. Weights ensure that variables of less import do not skew the overall index rankings. The
problem lies in determining which issues are most important. For example, some women's
groups might believe that variables related to security should receive the greatest weights,
whereas groups representing disabled persons might believe that variables related to
infrastructure such as ramps and blind paths should be weighted more heavily. I found that a
number of global indices, such as the respected Yale Environmental Sustainability Index,
assign equal weights to all its variables to overcome this very issue. Thus, for the time being,
the Global Walkability Index shall also assign equal weights. Ideally, in the future, the Index
will be available on-line, and users would have the ability to adjust the weights to see how
different emphases impact rankings.

The issue of weights for the variables and possibly components will require more research
and discussion. Also, further work would require a full discussion of different kinds of Index
approaches and their relative merits, solving problems indicative to this kind of work, and
mapping out more specific details for the Index's construction. But again, to pursue this path
of inquiry, data from at least two cities must be obtained.

9.0 Index Presentation

The Index format will largely dictate its function. For example, an index that comprises a
single ranking number would primarily be useful for encouraging low-ranking cities to take
action. But such a format would not be useful for helping cities identify specific areas for
improvement. Following are three Index presentation methods that have been considered:\n
---

3 Note that for each method, scores would have to be standardized across cities, since different groups
would be carrying out the surveys at different times of the year. Also, where appropriate, consensus would
need to be reached to determine appropriate weights for each category.
a) **Method 1: Categorical**

A separate number or letter is assigned to different Index categories, as in the following example (categories are used for purposes of methodology illustration only):

<table>
<thead>
<tr>
<th>City</th>
<th>Safety</th>
<th>Security</th>
<th>Health</th>
<th>Convenience</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>City A</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>City B</td>
<td>C</td>
<td>D</td>
<td>D</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>City C</td>
<td>A</td>
<td>B</td>
<td>E</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>City D</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

Just as bonds can have AAA or CCC ratings, cities would have AAAAA or ABECB rankings. In this case, City A ranks lowest in all categories, with an EEEEE ranking.

The advantage of this method is that it helps city planners readily identify areas for improvement and rewards them for areas where they are doing well. A disadvantage is that, particularly with letter scores, it is not immediately evident what the scores mean without some further inspection, and it is somewhat more difficult to give cities numerical rankings.
b) **Method 2: Ordinal Ranking**

With ordinal ranking, only the final ranking score is published. The advantage of this kind of index is that it is very simple to read and understand.

<table>
<thead>
<tr>
<th>City</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>City A</td>
<td>4</td>
</tr>
<tr>
<td>City B</td>
<td>3</td>
</tr>
<tr>
<td>City C</td>
<td>2</td>
</tr>
<tr>
<td>City D</td>
<td>1</td>
</tr>
</tbody>
</table>

So, according to this table, City D is the most walkable, ranking number 1, and city A is the least walkable. The disadvantage of this method is that it does not reveal very much information about how the score was derived. Further, this method does not reveal the interval between ranked cities – for example, while cities ranked 1 though 3 may be somewhat walkable, the city ranked fourth may be terrible.

c) **Method 3: Combined**

Another option is to combine both categories and rankings, such as in the following example (note: categories and weights used in the example are for illustrative purposes only):

<table>
<thead>
<tr>
<th>(weight)</th>
<th>Safety</th>
<th>Security</th>
<th>Health</th>
<th>Convenience</th>
<th>Policy</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>City A</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td>City B</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>8.6</td>
</tr>
<tr>
<td>City C</td>
<td>18</td>
<td>12</td>
<td>3</td>
<td>10</td>
<td>14</td>
<td>12.5</td>
</tr>
<tr>
<td>City D</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20.0</td>
</tr>
</tbody>
</table>
Each column contains the normalized, unweighted score for each category. The “Overall” column is the weighted sum across each row. In this case, City A ranks the lowest, because it has the lowest overall score, and City D ranks the highest overall. In terms of individual categories, City C ranks second in Safety, while City B ranks second in Health. With more cities, the scale would be increase from 1-20 to perhaps 1-100.

The combined method features the advantages of the previous two -- it helps city planners readily identify areas for improvement, rewards cities for areas where they are doing well, and provides a readily understandable final ranking. This method also has challenges, however. One challenge would be assigning rankings to cities that have “missing” categories (due, for example, to sampling error or general non-applicability). Further, the issue of weights could be highly contentious.

Given the advantages and disadvantages outlined above, Method 3 has been selected as an effective way to present Index rankings.

10.0 The Next Step: Extended Survey Materials

As mentioned previously, while the Global Walkability Index serves to raise awareness of walkability as an important issue, it is too general for use in devising an investment or policy strategy. Thus, I developed a set of Extended Survey Materials, which would enable cities to pinpoint specific infrastructure and policy needs, in addition to deriving the simple Index ranking.
10.1 *Composition of the Extended Survey Materials*

The extended materials comprise three sets of surveys: a physical infrastructure survey, a questionnaire to be administered to pedestrians, and a public agency interview form. Each survey is described in greater detail below and may be found, with complete instructions and implementation guide, in *Appendix D: Extended Survey Materials*.

The physical infrastructure survey is a “supply side” tool used to collect raw data on the availability and quality of pedestrian infrastructure. The survey is relatively simple and could be conducted by volunteers with minimal training (*Appendix D*).

The public agency survey is used to collect important data that is not obtainable through physical infrastructure surveys, such as pedestrian fatality statistics and pedestrian-related laws and regulations (*Appendix D*).

The pedestrian survey is used to collect “demand side” data and enables residents most impacted by the walkability of a city to voice their opinions on current conditions and to suggest improvements. Topics covered in this survey include: perception of safety, quality of mode transfers, accessibility of low-income neighborhoods to places of work and public services, and general convenience afforded by the walking environment (*Appendix D*). As with the physical infrastructure surveys, these may be conducted by volunteers with minimal training.
10.2 Role of Extended Surveys in the Global Walkability Index

To reiterate, in practice, the Global Walkability Index survey materials are simple and general, giving cities only a vague picture of their strengths and weakness and some sense of how their walkability compares to that of other cities. This process serves to generate awareness of walkability as an important issue and provides justification for more in-depth examination. The Extended Surveys are a simple tool cities can use to collect quantitative and qualitative data about existing pedestrian infrastructure conditions, feedback from residents on relevant pressing concerns, and a clear assessment of exiting institutional capacity and policies for ensuring safe, secure, and convenient pedestrian environments.

11.0 Full-Scale Pilot

11.1 Overview

After incorporating field test results into the Index methodology and survey materials, I conducted a full-scale pilot in Ahmedabad, India, in August 2005, using the extended survey materials. Ahmedabad was selected as the pilot city because: 1) a colleague at the World Bank, Ke Fang, had close ties with local non-profits and urban planning professors who could both assist with the survey work and advocate for implementation of its results; 2) there is a pending Bank-led urban development and upgrading project that, if successful, will begin in 2006, for which it may be possible to incorporate survey results as an investment component; and 3) Ahmedabad planners and officials are unusually receptive to this kind of non-motorized travel advocacy. For example, in 2005, the government has begun a bicycle-lane construction program at the behest of 12,000 petitioners.
The Ahmedabad pilot was neither funded nor supported by the World Bank – funds came from a grant – the Claire Barrett Memorial Scholarship, given by the Women’s Transportation Seminar.

I had hoped that at best, the work completed in Ahmedabad would result in a targeted investment program and, hopefully, act as a catalyst for Index survey implementation in other cities. The work would be published, and project participants would be credited for their pioneering efforts. At least, planners and non-profit organizations in Ahmedabad would have been given a set of simple tools to use for selecting target areas for pedestrian infrastructure investment, and sufficient data would have been collected to move the Index project closer to a wide-scale implementation phase.

11.2 Pilot City Background

Ahmedabad, a city of 4.6 million people (150 people per hectare), is the commercial capital of one of India’s wealthiest states, Gujarat (see Figure 7). The local economy is primarily based on light industry and academic institutions, though there is an unusually large informal sector, comprising 77% of the workforce (SEWA 2005).
In 2004, there were 1,490,000 registered motorized vehicles in Ahmedabad (including private automobiles, taxis, two-wheelers, etc.), and this number is expected to increase, on average, by 13% over the next few years (CEPT 2005). In terms of public transport provision, there were 540 public buses covering 150 routes and serving 385,682 passengers per day in 2003 (CEPT 2005). The modal split of all trips in Ahmedabad is summarized in Table 8.

### Table 8: Ahmedabad Modal Split for All Trips (2000)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile</td>
<td>3%</td>
</tr>
<tr>
<td>Motorized two-wheeler</td>
<td>25%</td>
</tr>
<tr>
<td>Rail-based transport</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Public bus</td>
<td>8%</td>
</tr>
<tr>
<td>Informal transit</td>
<td>8%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>18%</td>
</tr>
<tr>
<td>Walking</td>
<td>38%</td>
</tr>
</tbody>
</table>

Source: Louis Berger IDTS Study (2000)
11.2.1 Institutional Framework

At present, pedestrian networks are not considered in the city master or transportation plans.

There is no specific non-motorized planning program or coordinator in the Ahmedabad Municipal Corporation, even though there are at least seven different agencies in charge of various aspects of the pedestrian environment (Table 9). Urban design guidelines do not exist for such pedestrian facilities as sidewalk pavement type, placement of benches and similar amenities on walking paths, walking path widths, or design for disabled persons, and according to Abhijit Lokre of the Environmental Planning Collaborative in Ahmedabad, there have been no efforts made to introduce such guidelines. Finally, although various pedestrian-related laws and regulations exist, they are rarely enforced (Figure 8), largely due to insufficient resources devoted to the traffic police force. In a city of 4.6 million people, there are less than 250 traffic police on duty at any given time.

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing of street activities</td>
<td>Ahmedabad Municipal Corporation (AMC)</td>
</tr>
<tr>
<td>Sidewalk construction</td>
<td>AMC – Engineering</td>
</tr>
<tr>
<td>Sidewalk infrastructure maintenance</td>
<td>AMC – Engineering</td>
</tr>
<tr>
<td>Sidewalk cleaning</td>
<td>AMC – Maintenance</td>
</tr>
<tr>
<td>Street lighting</td>
<td>AMC – Electricity</td>
</tr>
<tr>
<td>Pedestrian amenities</td>
<td>ANC – Engineering</td>
</tr>
<tr>
<td>Tree planting</td>
<td>AMC – Parks and Gardens</td>
</tr>
<tr>
<td>Road safety</td>
<td>Traffic Police</td>
</tr>
<tr>
<td>Pedestrian network planning</td>
<td>AMC – Planning (in theory)</td>
</tr>
<tr>
<td>Obstructions / public space policy</td>
<td>AMC – Real Estate</td>
</tr>
</tbody>
</table>

Source: Krambeck 2005
### 11.2.2 The Pedestrian Environment

As a result of this fragmented institutional structure and lack of priorities for pedestrian planning, in general, Ahmedabad is a very inhospitable place for pedestrians. There are few existing walking paths, and new roads are typically constructed without any walking paths at all. Traffic management at intersections (e.g., traffic lights, stop signs, policemen, etc.) is sparse, and pedestrian exposure time at crossings (the time during which most pedestrian fatalities and injuries occur) tends to be very high. An abundance of animal waste, unpaved surfaces, poor drainage, and litter make the pedestrian environment both unattractive and impractical. Finally, according to researchers at the Center for Environmental Planning and Technology, pedestrian-related accidents account for nearly 20% of all traffic accidents (2005). Figures 9 through 12 illustrate the extent of the degraded pedestrian environment in Ahmedabad.

---

#### Figure 8: Pedestrian-Related Laws and Regulations in Ahmedabad

<table>
<thead>
<tr>
<th>Is there a law or regulation for:</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Rarely</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Jaywalking</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>✔ Vendors on sidewalks</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>✔ Parking on sidewalks</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>✔ Driving / riding on sidewalks</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔ Drunk driving</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔ Other Mobile use while driving</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔ Other Driving on wrong side</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ahmedabad Public Agency Survey -- Krambeck 2005
Figure 9: Pedestrians Mix with Bicycles and Motorized Transport at Intersections

Figure 10: Pedestrian Walks alongside Motorcycles in Center of Road
Figure 11: Parked Motorcycles Obstruct Walking Paths

Figure 12: Unmanaged Roundabouts are Very Common in Ahmedabad
It should also be noted that in addition to lack of any kind of coordinated policy program or investment plan for the pedestrian environment in Ahmedabad, the large proportion of the modal share dedicated to motorized two-wheelers, 25%, exacerbates walking conditions tremendously. Two wheelers can invade sidewalks, substitute for walking, threaten crossings because of their inherent maneuverability, make bicycle-use very difficult for other, cause pollution with their two-stroke engines, and generate a substantial amount of noise pollution. The key problem, though, is despite all of these negative side effects of motorized two-wheeler-use, these vehicles provide a substantial amount of mobility to large numbers of people – thus, since these vehicles are here to stay, it is imperative that their use must be better regulated.

In August and September of 2005, more than 340 pedestrians in Ahmedabad were surveyed using the extended Global Walkability Index survey materials and asked about walkability conditions in their neighborhoods, revealing a number of pressing concerns. For example, of the respondents, 43% stated that walking paths in the city are often congested with non-pedestrian traffic, 49% said walking paths are often covered with litter, and 42% believed that existing walking paths are uneven and difficult to walk on. Further, respondents tended to rate general motorist behavior, as well as the safety, security, and convenience of the pedestrian environment as “poor.”

11.2.3 Improving Pedestrian Conditions in Ahmedabad

Pedestrian infrastructure, as far as transport infrastructure is concerned, is relatively simple and inexpensive to build, yet its impact on the quality of life and functioning of the whole urban transport system can be quite significant. Given this, we might assume that reasons
for pedestrian planning neglect rest more closely with unawareness and lack of incentive than with any kind of inability or gross fiscal constraint. So, a logical first step towards improving walkability in Ahmedabad would be to clearly define the problem and generate awareness of walkability as an important issue among city residents and officials. The data generated to define the problem (collected through physical infrastructure, public agency, and pedestrian surveys) could then be used towards developing a targeted investment program to improve walkability in select, high-profile areas, such as areas around schools or transport hubs. The support of local stakeholders should be solicited, to ensure light pressure is continuously applied to city officials to sustain walkability efforts. Also, ideally, a pedestrian infrastructure investment program would be tied to a larger existing project, such as a road upgrading project, or in this case, a pending World Bank urban development and upgrading loan package. Finally, an investment program should also include a policy component to ensure that the infrastructure is maintained, kept clear of obstructions, and so forth.

11.3 *Pilot Process*

Most of these tasks have recently been completed in Ahmedabad – walkability surveys have been conducted in 8 square kilometers of the city with 65 student volunteers from the Centre for Environmental Planning and Technology; presentations have been made to local and state government officials; and the efforts of three local organizations, the Self-Employed Women’s Association (SEWA), the Environmental Planning Collaborative (EPC), and the Center for Environmental Planning and Technology (CEPT) have been coordinated to oversee the development of the initial investment proposal, which will target walking conditions around schools, informal markets (where there tend to be large numbers of
pedestrians), and transport hubs. Finally, the project will be tied to two larger, already established investment projects – a proposal for a BRT corridor, and a 125 kilometer road upgrading project. A selection of materials from this pilot may be found in Appendix E: Selection of Field Test Materials.

11.4 Preliminary Results of Pedestrian and Physical Infrastructure Surveys

Over a period of one week, 65 graduate planning student volunteers conducted over 350 pedestrian surveys (of which 341 were usable) and conducted physical infrastructure surveys in 8 different parts of the city, covering about 2000 square kilometers of urban area and 33 kilometers of road length. Tables 10 and 11 summarize key survey sample characteristics.

<table>
<thead>
<tr>
<th>Characteristic of Sample</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Usable Pedestrian Surveys</td>
<td>341</td>
</tr>
<tr>
<td>Percent Female</td>
<td>38.4%</td>
</tr>
<tr>
<td>Percent Disabled</td>
<td>2.6%</td>
</tr>
<tr>
<td>Percent with Small Children in the Household</td>
<td>43.7%</td>
</tr>
<tr>
<td>Average Age of Respondents*</td>
<td>20-39 years old</td>
</tr>
<tr>
<td>Approx. Percent Low Income*</td>
<td>24.6%</td>
</tr>
<tr>
<td>Approx. Percent Medium Income*</td>
<td>67.4%</td>
</tr>
<tr>
<td>Approx. Percent High Income*</td>
<td>3.2%</td>
</tr>
<tr>
<td>Percent Own Bicycle</td>
<td>25.5%</td>
</tr>
<tr>
<td>Percent Own Motorcycle</td>
<td>58.7%</td>
</tr>
<tr>
<td>Percent Own Car</td>
<td>9.4%</td>
</tr>
<tr>
<td>Average Minutes Spent Walking per Day*</td>
<td>16-30 minutes</td>
</tr>
</tbody>
</table>

*Relative to local median income
### Table 11: Key Characteristics of Physical Infrastructure Survey Sample

<table>
<thead>
<tr>
<th>Characteristic of Sample</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Surveyed Area*</td>
<td>2000 square km</td>
</tr>
<tr>
<td>Total Number of Road Stretches Surveyed</td>
<td>118</td>
</tr>
<tr>
<td>Length Surveyed Road Stretches**</td>
<td>33 km</td>
</tr>
<tr>
<td>Percent with Commercial Uses</td>
<td>87.3%</td>
</tr>
<tr>
<td>Percent with Industrial Uses</td>
<td>3.4%</td>
</tr>
<tr>
<td>Percent with Political Uses</td>
<td>4.2%</td>
</tr>
<tr>
<td>Percent with Other Uses***</td>
<td>33.9%</td>
</tr>
<tr>
<td>Percent with High Income Housing</td>
<td>30.0%</td>
</tr>
<tr>
<td>Percent with Medium Income Housing</td>
<td>37.3%</td>
</tr>
<tr>
<td>Percent with Low Income Housing</td>
<td>46.6%</td>
</tr>
<tr>
<td>Percent with Slum Dwellings / Informal Housing</td>
<td>33.1%</td>
</tr>
</tbody>
</table>

* Eight 500 meter by 500 meter square survey areas
** There are typically multiple stretches surveyed per road
*** Other uses include: vacant land, temple, railway station, public space

Typical respondents were between the ages of 20-39, of middle income, and had small children in their household. More than half owned motorcycles, while only about 26% owned bicycles and 9% owned cars. Interestingly, the average time respondents spent walking per day closely mirrored that found in more car-dependent, industrialized nations – this might be an indication of the inhospitality of the pedestrian environment.

Ahmedabad streets feature a very high degree of mixed use, hence the high proportion of commercial uses, 86%, on surveyed corridors. Also, the city has a healthy, interspersed mix of different housing levels (e.g., low-income and median-income), unlike in many North American or European cities. Note, though, that 33% of the streets surveyed have some form of informal housing – a very high figure that is indicative of the local economy’s dependency on the informal sector.

Since a full analysis of all survey areas is beyond the scope of this paper, two illustrative survey areas are presented: CG Road, a commercial and retail center located in the more
recently developed portion of the city, and Bapu Nagar, a relatively low-income neighborhood in Old Ahmedabad. We might hypothesize, given the socio-economic makeup of these two districts, that walkability will be much better in CG Road. For comparative purposes, data for these areas are presented alongside data from an early field test in DC, specifically from Dupont Circle, a commercial and retail center, and a lower-income neighborhood in the southeast (Figures 13 and 14). Note that the DC data was collected for the purposes of refining the Index methodology rather than be used for other purposes (hence the small sample sizes) – thus, these results are only presented as a frame of reference for interpreting the Ahmedabad data and not for any other quantitative or qualitative purpose.

---

4 Note that the surveys used in DC were earlier iterations from the ones used in Ahmedabad.
Figure 13: Ahmedabad Index Survey Maps (1x1 km grid)

- #59: Bapu Nagar
  (Low-Income Mixed Use)
- #68 CG Road
  (Commercial District)
Figure 14: Washington, DC Index Survey Maps (1x1 km grid)

Table 12 summarizes the characteristics of the Ahmedabad and DC commercial and low-income survey areas.
Table 12: Select Survey Area Characteristics

<table>
<thead>
<tr>
<th></th>
<th>CG Road</th>
<th>Bapu Nagar</th>
<th>Dupont</th>
<th>S.East DC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pedestrians</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Surveys</td>
<td>36</td>
<td>35</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>% Low Income</td>
<td>19%</td>
<td>29%</td>
<td>25%</td>
<td>80%</td>
</tr>
<tr>
<td>% Median Income</td>
<td>58%</td>
<td>71%</td>
<td>42%</td>
<td>20%</td>
</tr>
<tr>
<td>% High Income</td>
<td>3%</td>
<td>0%</td>
<td>33%</td>
<td>0%</td>
</tr>
<tr>
<td>% Own Bicycle</td>
<td>22%</td>
<td>20%</td>
<td>83%</td>
<td>40%</td>
</tr>
<tr>
<td>% Own Motorcycle</td>
<td>56%</td>
<td>71%</td>
<td>17%</td>
<td>0%</td>
</tr>
<tr>
<td>% Own Car</td>
<td>8%</td>
<td>0%</td>
<td>67%</td>
<td>20%</td>
</tr>
<tr>
<td>Avg. Time Spent Walking per Day</td>
<td>16-30</td>
<td>31-60</td>
<td>16-30</td>
<td>&gt;60</td>
</tr>
<tr>
<td><strong>Road Stretches</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Surveys</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Length Surveyed Road Stretches (km)</td>
<td>2.7</td>
<td>4.4</td>
<td>3.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Avg. Number Pedestrians per Surveyed Meter</td>
<td>0.11</td>
<td>0.12</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Percent with Commercial Uses</td>
<td>100%</td>
<td>83%</td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>Percent with Industrial Uses</td>
<td>0%</td>
<td>17%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Percent with Political Uses</td>
<td>57%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Percent with Other Uses</td>
<td>100%</td>
<td>67%</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Percent with High Income Housing</td>
<td>57%</td>
<td>0%</td>
<td>50%</td>
<td>0%</td>
</tr>
<tr>
<td>Percent with Medium Income Housing</td>
<td>71%</td>
<td>50%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>Percent with Low Income Housing</td>
<td>14%</td>
<td>33%</td>
<td>0%</td>
<td>80%</td>
</tr>
<tr>
<td>Percent with Slum Dwellings / Informal Housing</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Crossings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Surveys</td>
<td>12</td>
<td>8</td>
<td>22</td>
<td>2%</td>
</tr>
<tr>
<td>% Marked Crossing</td>
<td>67%</td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>% Pedestrian Bridge</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>% Pedestrian Subway</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>% Pedestrian-Phase Signal</td>
<td>42%</td>
<td>0%</td>
<td>73%</td>
<td>50%</td>
</tr>
<tr>
<td>% No Markings or Pedestrian Signals</td>
<td>33%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Not surprisingly, in both Ahmedabad and Washington, incomes, motorized vehicle ownership, and provision of pedestrian infrastructure such as crossing signals tend to be much greater in commercial areas than in low-income districts, even though the average time spent walking per day tends to be much higher in lower income areas.

Table 13 summarizes a selection of survey findings from commercial and low-income districts in both cities.
### Table 13: Select Survey Results

<table>
<thead>
<tr>
<th>Walking Path Perceptions from Ped. Survey</th>
<th>CG Road</th>
<th>Bapu Nagar</th>
<th>Dupont</th>
<th>S.East DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often Blocked with Obstructions</td>
<td>28%</td>
<td>29%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Often Congested with Non-pedestrian Traffic</td>
<td>44%</td>
<td>51%</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>Often Inadequate for Blind or Disabled People</td>
<td>89%</td>
<td>89%</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Often Poorly Lit at Night</td>
<td>8%</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Often Covered with Litter</td>
<td>22%</td>
<td>11%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Often Uneven and/or Difficult to Walk On</td>
<td>28%</td>
<td>49%</td>
<td>17%</td>
<td>20%</td>
</tr>
<tr>
<td>Sufficient Crossing Opportunities (1-3)*</td>
<td>1.9</td>
<td>1.9</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Degree of Convenience (1-5)</td>
<td>3.4</td>
<td>2.1</td>
<td>4.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Degree of Safety (1-5)</td>
<td>3.6</td>
<td>3.0</td>
<td>4.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Motorists Often Fail to Yield to Pedestrians</td>
<td>39%</td>
<td>23%</td>
<td>58%</td>
<td>20%</td>
</tr>
<tr>
<td>Motorists Often Drive Too Fast</td>
<td>67%</td>
<td>11%</td>
<td>75%</td>
<td>20%</td>
</tr>
<tr>
<td>Motorists Often Drive Through Stops</td>
<td>28%</td>
<td>43%</td>
<td>42%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Physical Infrastructure Survey**

| Average # Trees per kilometer | 50 | 10 | 39 | 33 |
| Average # Street Lights per kilometer | 30 | 20 | 18 | 30 |
| Cleanliness Index (1-5)** | 3.87 | 2.92 | 4.75 | 4.00 |
| Maintenance Index (1-5)** | 1.37 | 1.31 | 5.00 | 3.72 |
| Disability Infrastructure Index (1-5)** | 1.00 | 1.00 | 4.50 | 3.45 |
| Permanent Obstructions Index (1-5)** | 5.00 | 5.00 | n/a | n/a |
| Proportion Surveyed Road w/out Sidewalks | 52% | 84% | 0% | 0% |
| Proportion S'd Crossings w/out Traffic Mgmt | 42% | 100% | 0% | 0% |
| Crossings Safety Index (1-5) | 3.00 | 2.00 | 3.95 | 3.00 |
| Crossings Security Index (1-5) | 4.08 | 3.50 | 3.91 | 3.00 |

* For all scale results, the lowest number is the worst ranking, while the highest number is the best.

**Data Normalized by Pedestrian Count and Surveyed Road Length

\[
\Sigma \left( X_i \times Length_i \times (PedCount_i \ast 10) / \Sigma (X_i \ast Length_i \ast (PedCount_i \ast 10)) \right)
\]

Comparing CG Road, the commercial district, to Bapu Nagar, we find that in general, pedestrian perceptions of walkability tend to be very similar, expect for a few select criterion:

- 49% of respondents in Bapu Nagar believed that surfaces were often uneven or difficult to walk on, while on CG road, only 28% felt this was the case;
- In the commercial district, perceptions of motorist behavior tend to be worse: while 39% of respondents in CG Road felt that motorists often fail to yield to pedestrians and 67% felt that motorists drive too fast, only 23% and 11% of respondents in Bapu
Nagar felt similarly. This may be a reflection of infrastructure provision in these two areas. CG Road was designed with automobiles in mind, with wide roads and intersections designed for the faster movement of automobiles, while Bapu Nagar, located in the Old City, features narrower streets and less separation of pedestrian traffic from automobile traffic, resulting in more pedestrian-friendly behavior.

- Not surprisingly, more trees and streetlights per kilometer are provided in the commercial district than in the lower-income area, and the cleanliness index in the commercial area is higher.
- Also not surprisingly, since there is no traffic management at intersections and fewer street lights, respondents in Bapu Nagar felt crossings were less safe and secure than respondents in CG Road.

11.5 Final Remarks on the Ahmedabad Pilot

11.5.1 Value of the Work

This analysis only represents a fraction of the full dataset compiled during the pilot in Ahmedabad. Because the dataset is site specific (physical infrastructure data is collected per road stretch and intersection, and pedestrian data is collected per survey area), it is very useful for developing targeted investment programs and generating rough cost estimates for infrastructure development. Further, when the pedestrian and infrastructure survey results are combined with results from the public agency survey, decision-makers have a valuable tool for developing effective, long-term policies directed at improving and maintaining the pedestrian environment.
The survey work was relatively simple and inexpensive. Most survey teams were able to complete the survey work and data entry in one day. Costs, including survey materials for 65 volunteers, T-shirts, transportation, and a volunteer dinner totaled USD 222. Use of volunteers for survey work and data entry both kept costs down and generated visibility and excitement for the cause of improving walkability.

The Ahmedabad Pilot may be considered a success, because Index did exactly what it was supposed to do – generate awareness of walkability as an important issue. After the Walkability Workshop, a reporter from the *Times of India* published an article about the Walkability Index (*Appendix E: Selection of Field Test Materials*), which led the state secretary for urban development to invite me to his office in Ghandi Nagar to learn more about the work. Two students from CEPT have decided to write their theses on pedestrian infrastructure upgrading, and a collaboration of the Self-Employed Women’s Association, the Centre for Environmental Planning and Technology, and the Environmental Planning Collaborative was established to write an investment proposal based on survey findings.

11.5.2 Shortcomings

Despite these successes, there were also some problems with the pilot. The quality of the data collected varied considerably – while some student teams produced results of very high caliber, one team went so far as to submit fake results. It took over one month of additional follow-up to correct for these gaps in the data. Further, the pilot, as carried out in Ahmedabad, might be difficult to replicate in other cities, since it the project’s success is so dependent on the drive and character of the project organizer. For example, the investment proposal-writing collaborative, once so eager to begin work, ran out of steam only one
month after my departure—the collaborative has not yet produced a proposal as of time of writing (about 5 months later).

Based on these experiences, I have tried to redesign the Global Walkability Index survey materials such that implementation and quality assurance would be easier to manage (via a vastly simplified data collection and entry process). I have also added more detail to the Index implementation guide, such that the questions and goals are more self-explanatory.

12.0 Conclusion and Next Steps

12.1 Summary of Research

To generate awareness of walkability as an important issue in developing cities, the World Bank (the Bank) hired me as a consultant to develop a walkability index. To accomplish this task, I first generated a list of Index components and variables by studying existing tools for evaluating non-motorized transport and for constructing indices (Appendix A: List of Indices and Evaluative Methodologies Reviewed) and by consulting experts from a variety of related fields (Appendix B: Select List of Consulted Experts). I then created prototypes of the index and survey materials and organized short, initial field tests in Alexandria, VA, and Beijing. Drawing upon lessons learned from these tests, I then organized a Walk the Talk event in Washington, DC, where 17 volunteers and the DC Department of Transportation Pedestrian Planning Coordinator, George Branyan, tested the survey tools in eight different neighborhoods. I then organized an additional field test in Delhi, and with the help of the Bank, I was able to organize tests in Hanoi, Bangkok, Manila, and Karachi. Volunteers provided invaluable feedback from these tests, which were used to further refine the Index components and methodology.
Next, using a grant from the Women’s Transportation Seminar, I took the suggestion of a Bank colleague and organized a full-scale pilot in Ahmedabad, India, in which I enlisted the help of 65 student volunteers from the Centre for Environmental Planning and Technology to conduct survey work in eight neighborhoods. Students presented their findings at a Walkability Workshop, with members from the Self-Employed Women’s Association (SEWA) and the Environmental Planning Collaborative (EPC) in attendance. An article about the Index was published in the Times of India, and a collaborative partnership was formed between CEPT, EPC, and SEWA to use survey findings to draft an investment proposal for incorporation in an upcoming World Bank urban development and upgrading loan project in Gujarat State.

Finally, I organized a four-hour walkability workshop at the Association of Pedestrian and Bicycle Professionals Conference in Chicago, held in October 2005. During this workshop, attendees field tested the revised survey materials and commented on the Index. Combining their feedback with everything I had learned through the field tests and consultations with professors, government officials, and professionals, I have designed the Global Walkability Index as well as a set of extended survey materials for use in devising policy and investment programs, as presented in this thesis. The extended materials arose out of a need to take the results of the walkability index, which are general and used merely to generate awareness of walkability as an important issue, and use them to leverage a more thorough survey of pedestrian conditions, such that results could be used to address real problems.
12.2 Limitations of the Index

In my view, the Global Walkability Index is burdened by at least three significant limitations:

1) The notion of walkability itself is not well understood, paving the way for widespread misunderstanding; 2) The Index requires that most of the data be collected in the field, which in itself presents a myriad of difficulties; and 3) The data collection methodologies had to be kept simple for practical implementation purposes, but their simplicity results in a less-robust Index, diminishing its usefulness as a tool for investment and policy reform.

Limitation 1: What is Walkability?

Something I learned early on in the course of the research is that walkability is itself a nebulous term, and thus its measurement is inherently prone to contention and debate. I remember during one presentation I gave at the World Bank headquarters in DC, there was tremendous debate among the attendees as to what should and should not be included in the Index – a debate which, quite accurately, reflected the tremendous diversity of professional interests represented in the room: air quality management, energy, rights of disabled people, urban planning, transit infrastructure, road safety, and so on. Out of a desire to be able to stand in front of any audience and confidently defend the index’s foundations, I made it a point to consult people from as many different backgrounds as possible, to consult as many evaluative tools as possible, and to conduct as many field tests as possible such that the Index would be not only be applicable in any kind of city throughout the world, but also such that it would stand up to any debate. Needless to say, this has proven impossible -- since everyone who approaches the Index has a different interpretation of walkability, everyone will have a different opinion as to whether the Index truly captures “walkability.” One of the only ways to overcome this issue would have to be through widespread promotion of the
Index and its principles, with a strong education bent on just what it is the Index is trying to achieve: safer, more secure, and more convenient pedestrian environments.

**Limitation 2: The Downside of Field Work**

Many global indices allow for some degree of armchair calculation — that is, they draw upon data that has already been collected for other purposes. But with the Global Walkability Index, data must be collected in the field from every city, since the data necessary to evaluate pedestrian infrastructure in cities is simply not otherwise available. This field work component creates a myriad of challenges in terms of funding, translation, quality assurance, establishing local partners, and keeping the Index up-to-date.

Funding is an issue, because field work requires printing of materials (which may need to be translated), compilation of survey kits, and the work of volunteers (who should be thanked, at the very least, with a dinner or T-shirts) or paid-consultants. Quality assurance, as was discovered during the Ahmedabad pilot, can be a tricky issue. As mentioned previously, data collection materials have been vastly simplified to avoid quality issues — but I would recommend additional testing to determine the effectiveness of the new materials. It may be necessary to assign a paid-consultant to each field project to ensure that data is collected correctly.

Global indices such as the Yale Environmental Sustainability Index or the Economist’s Big Mac Index can be easily conducted without any kind of local buy-in — such is not the case when field work is involved. The field work component means that a local partner must be
established to conduct the survey work, greatly restricting the ease and speed with which the Index can be constructed and updated over time.

Ideally, in the long run, cities will voluntarily provide funding and minor logistical support for Index efforts, thereby side-stepping many of these difficulties. But in the short run, securing funding and promoting the index will be challenging, but necessary priorities.

**Limitation 3: Sacrifice**

One of the most notable limitations in the Index is rooted in the need to sacrifice robustness for simplicity. Earlier iterations of the Index involved detailed survey work that provided valuable data for devising targeted investment programs, but the overwhelming response to these surveys was, despite their value, their resource-intensiveness may preclude many cities from participating in the Index project. Thus, I re-worked the Index surveys to be far simpler, and I redesigned the original survey materials as Extended Surveys -- a simple tool cities can use to collect quantitative and qualitative data about existing pedestrian infrastructure conditions, gather feedback from residents on relevant pressing concerns, and create a clear assessment of exiting institutional capacity and policies for ensuring safe, secure, and convenient pedestrian environments.

### 12.3 Current Stage in Project Development

In Section 3.2: Phasing, I outlined the scope of this work:

**Phase I**

**Step 1** Conduct background research and literature review

**Step 2** Draft survey methods and survey implementation guidebook. Test survey
materials in developed and developing countries to refine methodology.

**Step 3**
Use refined survey materials to conduct full-scale pilot in a select developing city. Analyze results.

**Step 4**
Finalize survey methodology and implementation guidebook.

This paper represents the completion of Phase I, with the additional development of Extended Surveys – tools that enable cities to identify very specific actions that may be taken to improve walkability. The next steps for the Index work, Phase II, may be summarized as follows:

**Phase II**

**Step 5**
Complete rough method for data aggregation – that is, transforming the data into index rankings (to be further refined as data is collected).

**Step 6**
Promote widespread implementation of Index survey materials. Begin to construct Global Walkability Index.

**Step 7**
Develop generic counter-measure guidebook that outlines steps (additional studies, resources that may be consulted, etc.) city planners and leaders can take to improve upon areas deemed insufficient by the Index

**Step 8**
Analyze Index data and produce final report. Establish mechanism for ongoing implementation.

12.4 **Recommendations for Phase II Project Development**

The most crucial first steps in moving from the concept of a Global Walkability Index to its implementation are to generate awareness of the project and to secure funding and support from a large organization. Current initiatives underway include a World Bank proposal for incorporation of the Index tools into Bank transport infrastructure and urban development projects (I have been retained by the Bank to write a project proposal in this regard) and a proposal for incorporation of an Index component in a pan-Asia Global Environment
Facility (GEF) grant project (currently under consideration), to be implemented by the World Bank. Other avenues for advancement include presentations at conferences (the Index is slated to be presented at the Vélo Mondial 2006 conference in South Africa), and heavily promoted pilot projects.

One idea for a pilot comes from the Environmental Planning Collaborative (EPC), based in Ahmedabad. EPC has expressed interest in using the Index tools to carry out a Six-Mega-City study in India. Should grant funding become available to compensate EPC for its efforts, the results of this work could be widely promoted and sold to other governments as a means to push lagging cities to improve pedestrian infrastructure or as a means for other cities to showcase their formidable efforts in improving walkability.

Regarding the Extended Survey Materials, these tools were originally designed expressly for use by World Bank Task Team Leaders working on non-motorized transportation projects, such as Shomik Mehndiratta, who at the time was managing a non-motorized transport infrastructure upgrading project in Hanoi. But because the survey tools are simple to use, publishing them for widespread use would be suitably helpful for a number of cities to use on their own. In fact, representatives from the Clean Air Initiative (Asia) and Gtz Sustainable Urban Transport Program (SUTP) have already offered to post these materials on their websites.

After my contract for the Global Walkability Index work expires in June 2006, I will pass the torch onto someone else, who will work under the direction of Jitendra (Jitu) Shah, Lead Environmental Specialist with the World Bank East Asia Environmental Services Unit.
12.5 Final Remarks

In sum, the Global Walkability Index is the first attempt at creating a universal tool for evaluating pedestrian environments in cities throughout the world. I am very grateful for having been given the opportunity to take a lead role in the Index's development, and although there are some limitations with the materials presented (as discussed), I am satisfied with the outcome. That said, if I could do things all over again, knowing what I know now, I might have done a few things differently.

First and foremost, I would have started the project by stating I would be developing a simple set of survey tools for a Walkability Index in addition to a more detailed set of tools for use in developing investment and policy proposals – by not starting with this objective from the beginning, much confusion ensued about the role of the index, how detailed it should be, and so on.

Second, the development of the Index was an iterative process, its foundations constantly being re-shaped by feedback and comments -- I feel this process could have been more systematically managed from the beginning, with standardized questionnaires and a greater degree of transparency.

Third, I would have liked to have looked further into incorporating other non-motorized modes of transport into the project (e.g., the Bikability Index) – these ideas were discussed, but dismissed early on because the complexity they would add.
Fourth, I would have liked to have completed an additional full-scale pilot – then, results could have been combined with the Ahmedabad results to develop the first, concrete Index rankings. Though, given time and funding constraints, an additional pilot would not have been possible – unless there had been another person assigned to do this work.

Finally, during the course of the research, I worked as a full-time research assistant on an unrelated project, and I took on a full graduate course load – not that it would have been possible to do things any differently in this regard, it would have been beneficial for the project if I could have devoted more of my energies to its development – for example, I would have been able to organize a full-scale pilot in Boston. Nevertheless, I have learned a great deal through this work and will carry the experience with me long after I graduate.
13.0 References


Arlington, Virginia, Department of Environmental Services.


APPENDIX A
List of Indices and Evaluative Methodologies Reviewed
Reviewed Pedestrian Audit and Index Methodologies

Most of the methodologies reviewed were based on either quantitative or qualitative data and reflected either supply side factors (e.g., infrastructure provision) or demand side concerns (e.g., surveys of pedestrians). Very few of the methodologies combined all four of these aspects in a way that would be suitable for the Global Walkability Index (GWI).

In Appendix A, comments have been provided on the viability of existing methodologies for use in generating a GWI. The comments are not intended to show inherent weaknesses in the methodologies themselves – each was designed for a specific purpose other than the GWI – rather, the comments are intended to show how the study of each methodology contributed to the development of the final GWI.
<table>
<thead>
<tr>
<th>ID</th>
<th>Instrument Name</th>
<th>Purpose</th>
<th>Method</th>
<th>Comments</th>
<th>Source</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedestrian Location Identifier</td>
<td>Tool that assists state and local jurisdictions in identifying suburban locations where investments in pedestrian infrastructure improvements will yield the highest increases in pedestrian travel</td>
<td>Specific GIS tasks are described for using spatial data to identify areas with potentially high demand for pedestrian infrastructure.</td>
<td>The level of GIS data necessary to complete the analysis is often unavailable in developing cities.</td>
<td>Washington State DOT</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Pedestrian Potential Index</td>
<td>Used to prioritize pedestrian improvement projects. Measures potential pedestrian demand</td>
<td>Points are added together. 7 variables focus on proximities and policies.</td>
<td>Quality of existing infrastructure not considered.</td>
<td>Portland Planning Dept.</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Pedestrian Environmental Factor</td>
<td>Measure of pedestrian friendliness</td>
<td>Add up points for a total score out of 12 points. There are four variables: sidewalk continuity, ease of street crossing, distance between intersections, and grade.</td>
<td>Demand side factors, such as how heavily used the studies corridors are, are not considered.</td>
<td>Parsons Brinkerhoff</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pedestrian Performance Measures</td>
<td>LOS evaluations that describe the degree of accommodation for pedestrians along a given corridor</td>
<td>Points are added together and then converted to LOS using a scale. 16 variables include crossing width, auto LOS, maintenance, barriers, etc.</td>
<td>LOS can be too subjective for an index -- some quantitative factors should be included.</td>
<td>Linda Dixon, TRB</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Walking Permeability Indices</td>
<td>Assesses degree to which walking is a significant mode of transport</td>
<td>Direct distance between origin and destination divided by actual distance between origin and destination.</td>
<td>Results may be difficult to translate into investment or policy decisions.</td>
<td>Allen Andrew, World Transport Policy and Practice</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Walkability Index</td>
<td>Measures neighborhood walkability</td>
<td>Add up points and divide by 20. Index will be between 0.45 and 2.00. 13 variables include population density, benches, sociability, curb cuts, width, etc.</td>
<td>Includes both demand and supply side factors, quantitative and qualitative measures. A good basis. Additional variables may be needed.</td>
<td>Chris Bradshaw, International Pedestrian Conference</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Walkability Checklist</td>
<td>Used to decide whether a neighborhood is pedestrian-friendly</td>
<td>Points are added together. 5 variables / survey questions include: &quot;Do you have enough room to walk safely,&quot; &quot;Was it easy to cross streets,&quot; &quot;Did drivers behave well?&quot; etc.</td>
<td>Entirely demand-side survey -- US DOT lacks supply-side analysis or quantitative factors.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Pedestrian Level-of-Service</td>
<td>Provides pedestrian LOS.</td>
<td>A matrix is used to determine an LOS (A-F) for each criterion. 8 criteria include security, directness, sidewalk, etc.</td>
<td>LOS can be too subjective for an index -- some quantitative factors should be included.</td>
<td>City of Fort Collins</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Qualitative LOS</td>
<td>Measures the qualitative aspects of environment that affects pedestrian experience to supplement more quantitative approaches</td>
<td>Each variable is weighted using constant-sum comparison method. Method is based on a survey asking respondents to rank the relative importance of each variable. Weighted variables are combined to produce a rating from 0-5, corresponding to LOS A-F.</td>
<td>Data derived entirely from pedestrian surveys -- more supply-side analysis would be welcome.</td>
<td>Jotin Khisty, TRB</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Pedestrian Deficiency Index</td>
<td>Used to prioritize pedestrian environment improvement projects. Measures deficiencies.</td>
<td>Most questions are based on a point system -- points are added together. Variables include 55th percentile speed and roadway width.</td>
<td>Supply-side analysis, lacking demand-side inputs.</td>
<td>Portland Planning Dept.</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Pedestrian Sketch-Plan Method</td>
<td>Develop sketch-plan method for estimating pedestrian travel-demand projects for links, nodes, and zones, based on vehicle volumes.</td>
<td>Peak people per hour (PPH) = (peak vehicles per hour - through movement trips) ÷ ([VPH turning movements] + [1.5 default average vehicle occupancy]) ÷ (5 trips per person - 20 percent drive-through, etc.)</td>
<td>May not be universally suitable in cities in all countries; lacks factors relating to pedestrian infrastructure provision.</td>
<td>James Ercolano, TRB</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Work Mode-Choice Model</td>
<td>Examines mode choice between bus, walk, bicycle, ride-sharing, and drive alone.</td>
<td>Complex statistical formula, based on such variables as walking distance to work, season, volume, etc.</td>
<td>Mode choice would be a small component of a GWI</td>
<td>George Kocur, TRB</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Pedestrian Infrastructure Prioritization Decision System</td>
<td>Ranks and prioritizes areas that have latent pedestrian demand.</td>
<td>Comprises open-ended responses and user-weighted scores. Variables include population density, land use types, and ease of walking.</td>
<td>Open-ended responses would Washington State DOT be difficult to incorporate into an index.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>ID</td>
<td>Instrument Name</td>
<td>Purpose</td>
<td>Method</td>
<td>Comments</td>
<td>Source</td>
<td>Reference</td>
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<tr>
<td>14</td>
<td>Florida Pedestrian Level of Service</td>
<td>Measures factors that correlate with pedestrians' perceptions of safety and comfort for street segments (not intersections).</td>
<td>Regression analysis used to weight the variables, which include width of sidewalk, vehicle traffic volume, vehicle speed, presence of on-street parking, etc.</td>
<td>Quantitative supply-side analysis without incorporation of demand-side factors.</td>
<td>Florida DOT</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Community Assessment Tool</td>
<td>Data used to develop plan for improving cyclability and walkability of communities.</td>
<td>Comprises open-ended responses and user-weighted scores. Elements include transportation, land-use development, schools and crime-prevention.</td>
<td>Open-ended responses would be difficult to incorporate into an index</td>
<td>National Center for Bicycling &amp; Walking</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Walkability Checklist</td>
<td>Determines how walkable a community is</td>
<td>Comprises open-ended responses and user-weighted scores. Elements include room for walking, crossings, motorist behavior, etc.</td>
<td>Open-ended responses would be difficult to incorporate into an index</td>
<td>US DOT</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Space Syntax</td>
<td>Pedestrian volume modeling tool for pedestrian safety</td>
<td>Special software intended to be used with local GIS base maps, census data, and crash data.</td>
<td>Data required for this analysis may not be readily available in many cities.</td>
<td>University of California Traffic Safety Center</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>PedSafe</td>
<td>Audit tool for pedestrian safety</td>
<td>Responses are given weights, which are then summed. Variables include presence of footpaths, vehicle speeding, etc.</td>
<td>Safety is one of a few factors to be considered in the GWI.</td>
<td>University of Queensland</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>Fort Collins Level of Service</td>
<td>Performance-based LOS measures for pedestrian mode of travel</td>
<td>LOS is based on five standards: directness, continuity, street crossings visual interest and amenities, and security.</td>
<td>All good components for the GWI, though, lacks safety. More quantitative components would be helpful.</td>
<td>Fort Collins, CO</td>
<td>6</td>
</tr>
<tr>
<td>20</td>
<td>Kansas City Walkability Plan</td>
<td>Performance-based LOS measures for pedestrian mode of travel</td>
<td>LOS is based on same five standards as Fort Collins model. Incorporates diagrams and figures to assist with evaluation work.</td>
<td>LOS can be too subjective for an index -- some quantitative factors should be included.</td>
<td>Kansas City, MO</td>
<td>6</td>
</tr>
<tr>
<td>21</td>
<td>Gainesville LOS Performance Measures</td>
<td>Pedestrian LOS evaluations</td>
<td>Methodology applicable to corridors. Criteria include provision of basic facilities, conflicts, amenities, motor vehicle LOS, etc.</td>
<td>LOS can be too subjective for an index -- some quantitative factors should be included.</td>
<td>Gainesville, FL</td>
<td>6</td>
</tr>
<tr>
<td>22</td>
<td>Sweden Accessibility Index</td>
<td>Accessibility index for pedestrians</td>
<td>GIS data incorporated. Factors include sidewalk type, amenities, presence of stairs, onclination of sidewalk segment, directness, etc.</td>
<td>Sufficient GIS data can be difficult to obtain in many cities.</td>
<td>Chalmers University</td>
<td>6</td>
</tr>
<tr>
<td>23</td>
<td>2005 Environmental Sustainability Index</td>
<td>Benchmarks the ability of nations to protect the environment over the next several decades.</td>
<td>ESI score is the equally weighted average of 21 indicators (comprising 76 variables)</td>
<td>Methodology for aggregating data as index rankings may be suitable for GWI</td>
<td>Yale University</td>
<td>7</td>
</tr>
<tr>
<td>24</td>
<td>Economist Intelligence Unit's Quality-of-Life Index</td>
<td>Index that ranks cities based on their quality of life</td>
<td>Subjective life-satisfaction surveys are linked to objective determinants of the quality if life across countries. Regression analysis of qualitative survey responses are used to generate coefficients that are used for quantitative data. There are 9 quality-of life factors.</td>
<td>Both quantitative and qualitative elements are effectively combined.</td>
<td>Economist Intelligence Unit</td>
<td>8</td>
</tr>
</tbody>
</table>
References for Indices and Evaluative Methodologies Reviewed


APPENDIX B
Select List of Consulted Experts
## Walkability Project: Consulted Experts (Contact Info Omitted)

<table>
<thead>
<tr>
<th>Last</th>
<th>First</th>
<th>Organization</th>
<th>Type of Assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baker</td>
<td>Judy</td>
<td>World Bank TUDDR</td>
<td>Random spatial selection methodology</td>
</tr>
<tr>
<td>Blair</td>
<td>Robin</td>
<td>Los Angeles County MTA</td>
<td>Urban planning</td>
</tr>
<tr>
<td>Bliss</td>
<td>Tony</td>
<td>World Bank TUDTR</td>
<td>Pedestrian and road safety</td>
</tr>
<tr>
<td>Branyan</td>
<td>George</td>
<td>District of Columbia DOT</td>
<td>Municipal pedestrian planning programs</td>
</tr>
<tr>
<td>Briggs</td>
<td>Erica</td>
<td>Ann Arbor Chamber of Commerce</td>
<td>Pedestrian planning and advocacy</td>
</tr>
<tr>
<td>Burningham</td>
<td>Sally</td>
<td>World Bank SASEI</td>
<td>Practical implementation issues</td>
</tr>
<tr>
<td>Carruthers</td>
<td>Robin</td>
<td>World Bank TUDTR</td>
<td>Theoretical perspective</td>
</tr>
<tr>
<td>Chavez</td>
<td>Roberto</td>
<td>World Bank TUDUR</td>
<td>Link to Bank urban development initiatives</td>
</tr>
<tr>
<td>DelVecchio</td>
<td>Regina</td>
<td>Michael Baker Jr., Inc.</td>
<td>Urban planning</td>
</tr>
<tr>
<td>Fang</td>
<td>Ke</td>
<td>World Bank SASEI</td>
<td>Incorporation into India urban dev't project</td>
</tr>
<tr>
<td>Gakenheimer</td>
<td>Ralph</td>
<td>Massachusetts Institute of Technology</td>
<td>Urban planning perspective</td>
</tr>
<tr>
<td>Graffieux</td>
<td>Pierre</td>
<td>World Bank LCSFT</td>
<td>Urban public transport</td>
</tr>
<tr>
<td>Guttkunda</td>
<td>Sarah</td>
<td>World Bank ENV</td>
<td>Assistance with Washington pilot</td>
</tr>
<tr>
<td>Harshadeep</td>
<td>Nagaraja Rao</td>
<td>World Bank SASES</td>
<td>General help and support</td>
</tr>
<tr>
<td>Jones</td>
<td>Michael</td>
<td>Alta Planning and Design</td>
<td>Urban planning</td>
</tr>
<tr>
<td>Kessides</td>
<td>Christine</td>
<td>World Bank TUDUR</td>
<td>Urban Transport Indicator Project</td>
</tr>
<tr>
<td>King</td>
<td>Michael</td>
<td>Nelson Nyagaard</td>
<td>Professional pedestrian planning</td>
</tr>
<tr>
<td>Knecht</td>
<td>Barbara</td>
<td>Barbara Knecht Inc.</td>
<td>Disabled pedestrians; photos</td>
</tr>
<tr>
<td>Kosteleier</td>
<td>Don</td>
<td>Ada County Highway District, Boise, ID</td>
<td>Transportation planning</td>
</tr>
<tr>
<td>Kruckemeyer</td>
<td>Ken</td>
<td>Massachusetts Institute of Technology</td>
<td>Urban spatial layout and design</td>
</tr>
<tr>
<td>Landman</td>
<td>Wendy</td>
<td>WalkBoston</td>
<td>Pedestrian planning and advocacy</td>
</tr>
<tr>
<td>Lewis</td>
<td>Jennifer</td>
<td>The Louis Berger Group</td>
<td>Transportation planning</td>
</tr>
<tr>
<td>Lockre</td>
<td>Abhijit</td>
<td>Environmental Planning Collaborative</td>
<td>Urban planning in developing cities</td>
</tr>
<tr>
<td>Loufty</td>
<td>Mohammed</td>
<td>World Bank (JPA)</td>
<td>Disability accessibility</td>
</tr>
<tr>
<td>Mehdiratta</td>
<td>Shomik</td>
<td>World Bank EASTR</td>
<td>Practical implementation issues</td>
</tr>
<tr>
<td>Pardo</td>
<td>Carlos F.</td>
<td>GTZ SUTP</td>
<td>General assistance and SUTP support</td>
</tr>
<tr>
<td>Penalosa</td>
<td>Enrique</td>
<td>Former Mayor of Bogota</td>
<td>Comments on index principles</td>
</tr>
<tr>
<td>Roberts</td>
<td>Peter</td>
<td>World Bank TUDTR</td>
<td>Analytical perspective</td>
</tr>
<tr>
<td>Ryz</td>
<td>Karyn</td>
<td>City of Carmel, Indiana</td>
<td>Urban planning</td>
</tr>
<tr>
<td>Schipper</td>
<td>Leon (Lee)</td>
<td>World Resources Institute</td>
<td>Global and environmental perspective</td>
</tr>
<tr>
<td>Shah</td>
<td>Jitendra</td>
<td>World Bank EASES</td>
<td>Index concept and project management</td>
</tr>
<tr>
<td>Swami</td>
<td>Shivanand</td>
<td>Centre for Environmental Planning and Tech.</td>
<td>Transportation planning in developing cities</td>
</tr>
<tr>
<td>Veit</td>
<td>Sebastian</td>
<td>World Bank EWDEN</td>
<td>Disability accessibility</td>
</tr>
<tr>
<td>Wineberg</td>
<td>Jessica</td>
<td>Bicycle Federation of WI</td>
<td>Pedestrian and bicycle planning professional</td>
</tr>
<tr>
<td>Zhang</td>
<td>Zhihong</td>
<td>World Bank GEF</td>
<td>Global Environment Facility (GEF)</td>
</tr>
</tbody>
</table>
APPENDIX C
GWI Survey Materials and Guidebook
The Global Walkability Index (GWI) comprises two kinds of surveys — a public agency survey, to be administered to department(s) responsible for urban and transportation planning, and a set of field surveys. These surveys may be conducted in any order.

Use provided survey forms to collect data. For your convenience, all of these forms may be filled electronically (using provided dynamic PDF files), should you choose to enter the data using a tablet PC or PDA. Regardless of data recording method (paper or electronic), results must be submitted electronically.

Upon completion of the data collection work, survey teams should submit the following:

1) **Consultant Contact Information**
   One contact information form for each survey team member.

2) **Public Agency Survey**
   Single public agency data collection form.

3) **Field Surveys**
   At least 8 separate forms, one for each survey area.
   City map that indicates survey areas and individual surveyed road stretches.
   Photographs of each surveyed stretch (for quality assurance purposes).

Questions about the physical infrastructure survey may be directed to: ______________ at the following e-mail address: _____________________.


GLOBAL WALKABILITY INDEX
PUBLIC AGENCY SURVEY

Agency Selection
The survey team may use its best judgment to determine which public agencies would be most able to answer the five survey questions. Most likely, the urban and transportation planning agencies would be the most helpful.

Calculation of Results
Results are assigned points as according to the following table:

<table>
<thead>
<tr>
<th>Question</th>
<th>Point Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-5 Scale; Non-Existent = 1</td>
</tr>
<tr>
<td>2</td>
<td>One point for each box checked</td>
</tr>
<tr>
<td>3</td>
<td>Divide percentage by 10</td>
</tr>
<tr>
<td>4</td>
<td>Yes = 5, No = 1</td>
</tr>
<tr>
<td>5</td>
<td>3 for each ‘usually’ to 1 for each ‘rarely’, divided by 2.</td>
</tr>
</tbody>
</table>

Quality Assurance
Using the space provided, survey teams should provide contact information for all persons interviewed. Additional sheets may be used, if necessary.
GLOBAL WALKABILITY INDEX

FIELD SURVEYS

Materials
Survey teams will need to take the following materials with them to the data collection sites.

- Map outlining the survey area and proposed survey stretches;
- Camera (preferably digital);
- Extra data collection forms;
- Piece of 1-meter length string (to estimate walking path widths);
- Clipboard and pencils; and
- Implementation guidebook.

Survey Area Selection
Survey areas are 500m by 500m, and are selected using a random spatial sampling method, which is described in the following pages. One sheet per survey area should be used. Within each survey area, all main public roads (excluding roads such as alleys, relatively minor residential streets, etc.) should be surveyed. Each lengths (or stretch) of surveyed road receives an individual ID number, as indicated on the data collection form. If the character of a single road changes dramatically along its length, it may be divided up into sub-stretches. If there are more than 10 stretches in a survey area, additional field data collection sheets may be used.

Time of Day Considerations
For consistency, all surveys should be conducted during local peak travel times, to be predetermined by the survey team leader.

Filling in Data Collection Forms & Performing Calculations
Each square on the data collection form should be filled in with a Level-of-Service (LOS) measurement (scale of 1 to 5), according to the principles laid out in this implementation guide. The dynamic PDF file provided will automatically calculate the results and present a final average for each survey area.

A Notes box is provided on each form for survey teams to note any usual findings or potential sources of bias.

Quality Assurance
For quality assurance purposes, teams are asked to photograph a cross section each surveyed stretch of road.
GLOBAL WALKABILITY INDEX
FIELD SURVEYS — SURVEY AREA SELECTION

Step 1
Lay a 500 meter by 500 meter grid on top of a city map. Map and grid scales shall be uniform across cities — in this case, we have used 1km x 1km squares for illustrative purposes. Block out squares that fall beyond the city border or in areas inappropriate for conducting surveys (e.g., lakes, parks, private property, etc.).

Step 2
Generate a random number table. In this example, we generated numbers along a normal distribution from 1-93 (there are 93 unblocked squares on the map).
Step 3
Transpose randomly generated numbers from table to the map, as shown in the diagram.

Step 4
Although the sampling method will have a random component, we want to be certain that specific types of neighborhoods are covered by the survey. Pre-select four survey squares that fall within:
1) A high-income neighborhood with mostly housing; 2) A low income neighborhood with mostly housing, a transport hub (e.g., rail station), and a commercial district.
Step 5
Mark these pre-selected areas on the city map.

Step 6
To ensure that the Index is fair, the remaining squares shall be randomly selected. We used the same random number table we had generated previously. Starting from the left, if a number on the table appeared in our map, then that corresponding square would be selected (see diagram). The number of additional squares should equal the total number of available squares divided by 10 (the answer is rounded down), minus the four pre-selected squares. (Note: technically, in the case, then, there should be five additional squares)
Step 7
Based on selections, make individual maps that can be used in the field to conduct surveys. For the purposes of constructing Index rankings and identifying general strengths and weaknesses, every major public road within each square should be surveyed — alleys, private drives, very minor residential roads, etc. are excluded.
GLOBAL WALKABILITY INDEX

FIELD SURVEYS — DATA COLLECTION GUIDELINES

1 Walking Path Modal Conflict
To what extent do pedestrians mix with other modes, such as bicycles, motorcycles, or cars?

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Significant conflict that makes walking impossible.</td>
</tr>
<tr>
<td>2</td>
<td>Significant conflict that makes walking possible, but dangerous and inconvenient.</td>
</tr>
<tr>
<td>3</td>
<td>Some conflict — walking is possible, but not convenient.</td>
</tr>
<tr>
<td>4</td>
<td>Minimal conflict, mostly between pedestrians and non-motorized vehicles.</td>
</tr>
<tr>
<td>5</td>
<td>No conflict between pedestrians and other modes.</td>
</tr>
</tbody>
</table>

2 Security from Crime
To what degree are the walking paths, pedestrian bridges, and pedestrian subways perceived to be secure from crime (pick-pocketing, mugging, unprovoked attack, etc.)? To answer this question, it may be helpful to ask a few pedestrians, vendors, policemen, etc. in the area what their perceptions are, particularly at night.

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environment feels very dangerous — pedestrians are highly susceptible to crime.</td>
</tr>
<tr>
<td>2</td>
<td>Environment feels dangerous — pedestrians are at some risk of crime.</td>
</tr>
<tr>
<td>3</td>
<td>Difficult to ascertain perceived degree of security for pedestrians.</td>
</tr>
<tr>
<td>4</td>
<td>Environment feels secure — pedestrians at minimal crime risk.</td>
</tr>
<tr>
<td>5</td>
<td>Environment feels very secure — pedestrians at virtually no risk of crime.</td>
</tr>
</tbody>
</table>

3 Crossing Safety
There are three key factors to consider when evaluating how safe it is to cross the street:

- Exposure to other modes
  - Are all other modes at a complete stop when pedestrians are crossing?
- Exposure time
  - This refers to the amount of time spent waiting and crossing the street — it is during this time that a pedestrian will most likely get hurt. The longer this time is, the less safe the environment is for pedestrians.
- At signalized intersections, the degree to which sufficient time is allocated for pedestrians (including persons with children and the elderly) to cross.

The following tables are intended to provide some guidance in assigning a LOS measurement to this variable.
Exposure to Other Modes

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very dangerous – there is significant risk of accident with other modes</td>
</tr>
<tr>
<td>2</td>
<td>Dangerous – pedestrian faces some risk of being hurt by other modes</td>
</tr>
<tr>
<td>3</td>
<td>Difficult to ascertain dangers posed to pedestrian</td>
</tr>
<tr>
<td>4</td>
<td>Safe – pedestrian is mostly safe from accident with other modes</td>
</tr>
<tr>
<td>5</td>
<td>Very safe – other modes present no danger to pedestrian</td>
</tr>
</tbody>
</table>

Exposure Time

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maximum – Extremely long waiting period, crossing time greater than 40 seconds</td>
</tr>
<tr>
<td>2</td>
<td>Relatively long – Long waiting period, crossing time between 20 and 30 seconds</td>
</tr>
<tr>
<td>3</td>
<td>Difficult to ascertain dangers posed to pedestrian</td>
</tr>
<tr>
<td>4</td>
<td>Relatively short – Reasonable waiting period, crossing time between 10 and 20 seconds</td>
</tr>
<tr>
<td>5</td>
<td>Minimal – Virtually no time spent waiting, crossing time less than 10 seconds</td>
</tr>
</tbody>
</table>

Sufficient Time to Cross at Signalized Intersections

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not enough time – No pedestrian has sufficient time to cross</td>
</tr>
<tr>
<td>2</td>
<td>Not quite enough time – Barely enough time for most people, insufficient for elderly</td>
</tr>
<tr>
<td>3</td>
<td>Sufficient time for most pedestrians to cross, not quite enough time for elderly.</td>
</tr>
<tr>
<td>4</td>
<td>Just enough time – Just enough time for elderly or persons with children to cross</td>
</tr>
<tr>
<td>5</td>
<td>Ample time – More than enough for elderly or persons with children to cross</td>
</tr>
</tbody>
</table>

Motorist Behavior

Motorists (drivers of cars, buses, motorcycles, auto-rickshaws, etc.) pose the greatest danger to pedestrians. Thus, the degree to which cities can manage motorist behavior will largely impact the safety of the pedestrian environment. The following table may be used as a guide for this variable.

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motorized travel is totally chaotic; vehicles <em>never</em> yield to pedestrians.</td>
</tr>
<tr>
<td>2</td>
<td>Most motorists cannot be expected to obey traffic laws and rarely yield to pedestrians.</td>
</tr>
<tr>
<td>3</td>
<td>Motorists sometimes obey traffic laws and may yield to pedestrians.</td>
</tr>
<tr>
<td>4</td>
<td>Motorists usually obey traffic laws and sometimes yield to pedestrians.</td>
</tr>
<tr>
<td>5</td>
<td>Motorists obey traffic laws and almost always yield to pedestrians.</td>
</tr>
</tbody>
</table>
GLOBAL WALKABILITY INDEX
FIELD SURVEYS — DATA COLLECTION GUIDELINES

Amenities
Pedestrian amenities, such as benches, street lights, public toilets, and trees greatly enhance the attractiveness and convenience of the pedestrian environment, and in turn, the city itself. When assigning an LOS measure to this variable, consider the following factors:

Coverage
If the local climate calls for such measures (e.g., sub-tropical), are there awnings, arcades, trees, or other forms of coverage that protect pedestrians from the elements? Following are some examples (letters in circles represent photo credits, which are placed at the end of this guide):

- Temporary Awning
- Permanent Awning
- Arcade
- Trees

Trees and Street Lights
Are there trees and street lights at regular intervals? Street lights ensure safety at night (if lights are present, survey team may wish to question pedestrians as to whether the lights actually work), and trees provide a natural barrier from traffic, improve air quality, provide some degree of shelter from the elements, and improve the attractiveness of the pedestrian environment.

Benches, Public Toilets, Pedestrian Signage, and Other Amenities
The degree to which the municipal government provides pedestrian amenities reflects the degree to which it respects the pedestrian environment’s role in the smooth functioning of the city. Thus, roads that are well-endowed with amenities should receive higher scores for this variable than those without.

Disability Infrastructure and Sidewalk Width
Disability infrastructure typically services all pedestrians, not just those who are disabled. For example, curb ramps are convenient not just for wheelchair access, but also for persons with baby carriages, shopping carts, or luggage. Similarly, for wheelchair access, effective walking path width (net of obstructions or portions of disrepair) should be, at a minimum, 1 meter wide. This minimum width services all pedestrians, alleviating bottlenecks; easing access for those with small children, parcels, or walking canes; and improving the overall convenience of the walking path. The following tables and diagrams provide some guidance on how to evaluate disability infrastructure and sidewalk width.
Disability Infrastructure
The following diagrams provide some guidance on how to judge disability infrastructure provision. Acous-
tic pedestrian signals might also be considered.

1. No infrastructure for disabled persons is present.
2. Limited infrastructure for disabled persons is available, but is not in usable condition.
3. Infrastructure for disabled persons is present but in poor condition and not well placed.
4. Infrastructure for disabled persons is present, in good condition, but poorly placed.
5. Infrastructure for disabled persons is present, in good condition, and well placed.

Effective Width
Use a 1-meter piece of string to determine whether effective width (net of obstructions) is sufficient.

Maintenance and Cleanliness
Maintenance of pedestrian infrastructure is just as important as having any infrastructure at all, since, for example, poorly maintained sidewalks can be completely unusable. A clean pedestrian environment is not only more pleasant and convenient for pedestrians (no need to circumnavigate piles of rubbish, for example), but it also shows the city’s respect for the pedestrian.

Maintenance and Pavement Quality
1. Separate paving for walking path is not present.
2. Paving is mostly dirt, covered with mud, very poorly maintained.
3. Some paving is present and provides a somewhat smooth walking surface in some areas. Not particularly well-maintained.
4. Walking path is paved and walkable, but not very well maintained. Tiles missing, very uneven surface, etc.
5. Provides a smooth walking surface and is very well maintained.
Cleanliness

1. Rubbish completely obstructs walking path, making walking impossible. Rubbish significantly degrades surrounding environment.

2. Rubbish partially obstructs walking path, making walking difficult and significantly degrades surrounding environment.

3. Some rubbish degrades quality of walking environment and is a minor obstacle to walking.

4. Some rubbish degrades quality of walking environment but is not an obstacle.

5. Walking path is clean.

Obstructions

Permanent obstructions (e.g., telephone poles or trees placed in the center of the walking path), are typically the result of insufficient or ineffective urban design guidelines. Unwelcome temporary obstructions (e.g., parked cars) are often the result of insufficient or ineffective public space policy. Welcome temporary obstructions (e.g., vendors, sidewalk cafes) should be allocated space such that they both enhance the pedestrian environment without restricting the effective width of walking paths. All obstructions, to some degree, impact effective width and thus should be regulated. The following images provide some guidance on how to evaluate obstructions.

Permanent Obstructions

1. Pedestrian traffic is completely blocked by permanent obstructions.

2. Pedestrians are significantly inconvenienced. Effective width is < 1 meter.

3. Pedestrian traffic is mildly inconvenienced; effective width is ≤ 1 meter.

4. Obstacle presents minor inconvenience. Effective width is > 1 meter.

5. There are no permanent obstructions.
Temporary Obstructions

1. Pedestrian traffic is completely blocked by temporary obstruction.
2. Pedestrian traffic is significantly inconvenienced by obstruction but can still walk on walking path. Effective width is <1m, preventing wheelchair access.
3. Pedestrian traffic is mildly inconvenienced; effective width is ≤1m.
4. Obstacle presents minor inconvenience and may be welcomed by some residents.
5. Obstruction is welcomed by most and enhance pedestrian activity.

Availability of Crossings
When there are no opportunities provided for crossing streets, pedestrians tend to jaywalk, increasing their risk of injury or harm. Ideally, crossing opportunities, when in the form of pedestrian bridges or subways (less desirable for elderly and the disabled), signalized crossing, or other form, there should be crossings at least every 300 meters to be considered acceptable. A LOS rating of 5 means that there are ample opportunities to cross the street, and a rating of 1 means that there are no opportunities for very long distances.

Pedestrian Count
Count the total number of people walking in the street (alongside other traffic modes) and on walking path using a traffic counting method. Stand in one place (mark this place on a map), and count the number of pedestrians on one side of the street over a period of 5 minutes. Record number.

Length of Surveyed Stretch
Measure the surveyed length of street in kilometers, using your map.
Photographs and Images

a) Knecht, Barbara. Barbara Knecht, Inc.
b) Krambeck, Holly (Author).
e) Freeport New York News.  
   <http://www.freeportnynews.com/Vil%20News%202002/020716_Mayor%20ignores %20mess.htm>
g) Dept of Housing Renewal & Environmental Health Services, Leeds, UK.  
h) Northwest South Philly – Neighborhood Organizations and Resources for Southwest Center City.  
   <http://www.southphillyblocks.org/christianstreet/michelle_cutner/> 
   May not be reprinted without permission – e-mail: editor@combatlaw.org 
   May not be reprinted without permission – e-mail: erickso@worldnet.fr 
n) Pedestrian and Bicycle Information Center Image Library.  
   <http://www.pedbikeimages.org/index.cfm> 
q) Wegmann, Jake. Massachusetts Institute of Technology
<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td></td>
</tr>
<tr>
<td>Family Name</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td></td>
</tr>
<tr>
<td>Street Address</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td></td>
</tr>
<tr>
<td>State / Province</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td></td>
</tr>
<tr>
<td>Postal Code</td>
<td></td>
</tr>
<tr>
<td>Phone Number</td>
<td></td>
</tr>
<tr>
<td>E-mail Address</td>
<td></td>
</tr>
</tbody>
</table>
Survey Team Names: ____________________________

1) Please rate degree of municipal funding and resources devoted pedestrian planning.
   - Enough to sustain a high-quality program in long-term
   - Sufficient for short term, but not the long term
   - Neutral
   - Insufficient to achieve meaningful goals
   - Non-existent

2) Please check the pedestrian-related urban design guidelines that are already well-established. Feel free to add any relevant guidelines that are not included in the list.
   - Sidewalk pavement type
   - Placement of benches and similar amenities on walk paths
   - Sidewalk widths
   - Design for disabled persons
   - Other

3) Attach available data on pedestrian fatalities and injuries to survey materials. Enter estimated proportion of traffic fatalities involving pedestrians in 2004.

4) Have there been public outreach efforts (by this or other agency) to educate pedestrians or drivers on road and pedestrian safety?
   - Yes
   - No

5) Is there a law or regulation for any of the following items? If so, is the law or regulation enforced? Feel free to add any relevant laws or regulations that are not included in this list.
   - Jaywalking
   - Vendors on sidewalks
   - Parking on sidewalks
   - Driving / riding on sidewalks
   - Drunk driving
   - Other
   - Other
   - Is there a law or regulation for: Usually Sometimes Rarely

City: ____________________________
### Field Data Collection

#### Survey Area Name: [__________]

#### Survey Area #: [__________]

#### Peak Hour: [Yes/No]

#### Survey Team Names:

<table>
<thead>
<tr>
<th>Surveyed Road Stretch</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>(Σ(x<em>length</em>10*count))/#/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Walking Path Modal Conflict</td>
<td></td>
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<td>2) Security from Crime</td>
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<tr>
<td>3) Crossing Safety</td>
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<tr>
<td>4) Motorist Behavior</td>
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<tr>
<td>5) Amenities (Cover, benches, public toilets, street lights)</td>
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<tr>
<td>6) Disability Infrastructure and Sidewalk Width</td>
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<tr>
<td>7) Maintenance and Cleanliness</td>
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<tr>
<td>8) Obstructions</td>
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<tr>
<td>9) Availability of Crossings</td>
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<tr>
<td>10) Pedestrian Count</td>
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<tr>
<td>11) Length of Surveyed Stretch (km)</td>
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</tr>
</tbody>
</table>

#### Unweighted Average

#### Notes

99 of 135
## Public Agency Contact Information

### Public Agency Contact #1

<table>
<thead>
<tr>
<th>Agency Name</th>
<th>Agency Address</th>
<th>Contact Name</th>
<th>Contact Position</th>
<th>Contact Phone</th>
<th>Contact E-mail</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

### Public Agency Contact #2

<table>
<thead>
<tr>
<th>Agency Name</th>
<th>Agency Address</th>
<th>Contact Name</th>
<th>Contact Position</th>
<th>Contact Phone</th>
<th>Contact E-mail</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Public Agency Contact #3

<table>
<thead>
<tr>
<th>Agency Name</th>
<th>Agency Address</th>
<th>Contact Name</th>
<th>Contact Position</th>
<th>Contact Phone</th>
<th>Contact E-mail</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Contact Information Form for Each Survey Team Member</td>
<td></td>
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<tr>
<td></td>
<td>Public Agency Survey and Contact Information Form</td>
<td></td>
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<tr>
<td></td>
<td>8+ Field Survey Forms</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Map Indicating Surveyed Areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Photographs of Surveyed Area Cross Sections and Walking Paths</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
APPENDIX D
Extended Survey Materials
GLOBAL WALKABILITY INDEX
EXTENDED SURVEY MATERIALS

In this section, you will find a Physical Infrastructure Survey, Public Agency Survey, and a Pedestrian Survey.

Each survey is preceded by implementation guidelines and directions. Although you may conduct these surveys in any order you wish, we do ask that you adhere to the following guidelines:

1) Use provided field recording sheets to collect data. For your convenience, all of these forms may be filled electronically (using the attached files), should you choose to enter the data using a tablet PC or PDA.

2) Regardless of data recording method (paper or electronic), you must submit your results electronically. The survey data may be typed into the provided, user-friendly PDF sheets. By clicking the “Submit by E-mail” button that appears on each PDF sheet and then selecting “Send Data File” from pop-up menu, your computer will automatically send our analysts the data files they need to process the collected data.

3) By the end of the survey, you should submit the following:

   a. **Consultant Contact Information**
      i. PDF Form, submitted via “Submit by E-mail” button that appears at top of form.

   b. **Physical Infrastructure Survey**
      i. Individual field data PDF forms, submitted via “Submit by E-mail” button that appears at top of forms. It is important that the survey area be indicated in the e-mail subject heading or in the data file name.
      ii. City map with clearly identified surveyed areas.
      iii. City map with special points drawn on surveyed areas (or list of points and their GPS coordinates)
      iv. Digital photos, with clearly identifiable file names

   c. **Public Agency Survey**
      i. Individual field data PDF forms, submitted via “Submit by E-mail” button that appears at top of forms. It is important that the survey area be indicated in the e-mail subject heading or in the data file name.
      ii. Additional data or maps collected from agencies (optional)

   d. **Pedestrian Survey**
      i. Individual field data PDF forms, submitted via “Submit by E-mail” button that appears at top of forms. It is important that the survey area be indicated in the e-mail subject heading or in the data file name.
      ii. Map with survey locations clearly marked (include GPS coordinates, when possible)
<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td></td>
</tr>
<tr>
<td>Family Name</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td></td>
</tr>
<tr>
<td>Street Address</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td></td>
</tr>
<tr>
<td>State / Province</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td></td>
</tr>
<tr>
<td>Postal Code</td>
<td></td>
</tr>
<tr>
<td>Phone Number</td>
<td></td>
</tr>
<tr>
<td>E-mail Address</td>
<td></td>
</tr>
</tbody>
</table>
GLOBAL WALKABILITY INDEX

PART I: PILOT PHYSICAL INFRASTRUCTURE SURVEY

Introduction
The attached survey is one component of a larger study that comprises three parts: 1) a physical infrastructure survey; 2) a public agency survey; and 3) a qualitative survey to be administered to city residents.

The physical infrastructure survey shall be used to collect raw data on the availability and quality of pedestrian infrastructure. The survey may be filled out by hand (one sheet per street), or using a portable electronic device, such as a tablet PC or a Palm PC. Regardless of recording method, we expect that all data eventually be entered in the Excel spreadsheet provided.

In addition to filling out the survey, we ask that the Consultant also provide feedback on how the physical infrastructure survey could be improved.

Tools
The following tools will be necessary to complete the attached survey:
* Map that can be drawn on to mark observations;
* Tape measure or laser measuring device (e.g., meter-long piece of string);
* Digital camera;
* Street map marked with survey area;
* Clipboard, writing instrument, and enough survey sheets for each street covered in the study, or portable tablet computer / Palm PC.

Study Area
The Consultant shall select the survey area based on an arbitrarily drawn boundary, which in this case would be a 1.0 km by 1.0 km square around a pre-selected landmark, such as City Hall, as its center. The consultant selects 5 km of street length within the survey area, ensuring that street sample features a variety of widths and uses. Minor alleys, parks, cemeteries, etc. should be excluded from the survey sample. Crossings are evaluated using a separate form. Choose sample crossings that fall along surveyed corridors. Aim to survey as many crossings as possible.

Time of Day
All surveys must be conducted during peak travel hours, unless otherwise indicated.

Time Frame
We do not expect completion of this pilot physical infrastructure survey to take more than two business days.

Final Products
Although the Consultant shall record field data using the field data template provided, we expect final results to be recorded in the provided PDF form. The Consultant shall also submit a street map with the survey area clearly marked.

Questions
Should the Consultant have any questions about the physical infrastructure survey, please contact:
________________________ at: __________________________
1 - 5) Before you begin...
Use a separate field data recording sheet for each stretch of road surveyed. Should the character of a road change dramatically within the survey area (such that final results may be skewed), additional sheets may be used for each portion of road. For each surveyed stretch, indicate the name of the road (when available) and the surveyed portion's beginning and ending GPS coordinates (when available). Also, mark the surveyed portion of the streets on a map. For each sheet, indicate the time of day and the date, as well as whether the survey is being conducted during peak travel hours.

6) Adjacent Land Use
Indicate the primary use of adjacent land: commercial / retail, industrial, political / cultural (e.g., museums), high/medium/low-income residential, informal settlement, or other.

7) Road Length
Measure road length in meters using a reliable map.

8) Average Traffic Speed

<table>
<thead>
<tr>
<th>Points</th>
<th>Speed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 – 10 km / hour</td>
<td>Gridlock</td>
</tr>
<tr>
<td>2</td>
<td>10 – 30 km / hour</td>
<td>Very slow moving traffic</td>
</tr>
<tr>
<td>3</td>
<td>30 – 70 km / hour</td>
<td>Traffic moving at reasonable speed</td>
</tr>
<tr>
<td>4</td>
<td>70 – 120 km / hour</td>
<td>Fast moving traffic</td>
</tr>
<tr>
<td>5</td>
<td>120 + km / hour</td>
<td>Very fast moving traffic</td>
</tr>
</tbody>
</table>

9) Cross Section
Count the number of driving lanes (for cars, buses, trucks, etc.), car parking lanes, bicycle or motorcycle lanes, and median strips.

10, 12) People Walking in Street / on Walking Path
Count the number of people walking in the street (alongside other traffic modes) / on walking path using a traffic counting method. Stand in one place (mark this place with GPS unit or draw on a map), and count the number of pedestrians on one side of the street over a period of 5 minutes. Record number.

11) Walking Path Width
Using a tape measure or other measuring device, record the most common width of the walking path (sidewalk, special pedestrian pavement, lane, etc.). If no sidewalk or similarly marked walking path is present, simply write “0” on the field data sheet.

13, 14) Trees and Street Lights
As you walk, count the number of trees (public and private) and street lights you pass on one side of the street and write the total count on the field data sheet. In the end, these numbers will be divided by the total surveyed segment length to derive a figure for Index calculations. If tree and street light placement seems consistently repetitive, you may estimate the total number.
15) Cleanliness
Rate the general cleanliness of the surveyed street area based on the following 5-point scale (if quality varies, use your best judgment to determine which rating would best help identify areas that need improvement):

1. Rubbish completely obstructs walking path, making walking impossible. Rubbish significantly degrades surrounding environment.
2. Rubbish partially obstructs walking path, making walking difficult and significantly degrades surrounding environment.
3. Some rubbish degrades quality of walking environment and is a minor obstacle to walking.
4. Some rubbish degrades walking quality of walking environment but is not an obstacle.
5. Walking path is clean.

16) Maintenance and Pavement Quality
Photograph and rate the pavement quality of the surveyed walking paths based on the following 5-point scale (if quality varies, use your best judgment to determine which rating would best identify areas needing improvement):

1. Separate paving for walking path is not present.
2. Paving is mostly dirt, covered with mud, very poorly maintained.
3. Some paving is present and provides a somewhat smooth walking surface in some areas. Not particularly well-maintained.
4. Walking path is paved and walkable, but not very well maintained. Tiles missing, very uneven surface, etc.
5. Provides a smooth walking surface and is very well maintained.

17) Pedestrian Infrastructure for Disabled Persons
Rate the quality of infrastructure for blind persons (e.g., acoustic signals and textured blind paths) and wheelchair-bound persons (e.g., curb ramps) based on the following 5-point scale:

1. No infrastructure for disabled persons is present.
2. Limited infrastructure for disabled persons is available, but is not in usable condition.
3. Infrastructure for disabled persons is present but in poor condition and not well placed.
4. Infrastructure for disabled persons is present, in good condition, but poorly placed.
5. Infrastructure for disabled persons is present, in good condition, and well placed.
18) Coverage
Are there awnings or arcades that protect pedestrians from the sun and rain (see examples below)? If so, estimate what proportion of the surveyed area (one side of the street) has such coverings. A typical response might be: "Arcade: 25%"

19) Road Length without Sidewalks
On map, mark stretches of road where there are no sidewalks, as well as which side(s) these stretches fall on (a GPS device may also be used, where appropriate).

20) Permanent and Temporary Obstructions / Obstacles
Permanent obstacles, such as telephone poles planted directly in the center of the walking path or electric transformers that block pedestrian traffic should be carefully noted. Similarly, temporary obstacles, such as parked cars on walking path that block pedestrian traffic should be carefully noted. The following pictures may be used as guides.

Permanent Obstacles

1. Pedestrian traffic is completely blocked by permanent obstructions.
2. Pedestrian traffic is significantly inconvenienced by obstruction but can still walk on walking path. Effective width is <1m, preventing wheelchair access.
3. Pedestrian traffic is mildly inconvenienced; effective width is < or = 1 meter.
4. Obstacle presents minor inconvenience. Effective width is > 1 meter.
5. There are no permanent obstructions.
Temporary Obstacles

Pedestrian traffic is completely blocked by temporary obstruction.

Pedestrian traffic is significantly inconvenienced by obstruction but can still walk on walking path. Effective width is <1m, preventing wheelchair access.

Pedestrian traffic is mildly inconvenienced; effective width is < or =1 meter.

Obstacle presents minor inconvenience and may be welcomed by some residents.

Obstruction is welcomed by most and enhance pedestrian activity.

21) Conflicts between Pedestrians and Other Modes

Photograph and assign a rating to degree of pedestrian conflict with other modes (e.g., bicycles, buses, cars, motorcycles, rickshaws), according to the following 5-point scale:

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Significant conflict that makes walking impossible.</td>
</tr>
<tr>
<td>2</td>
<td>Significant conflict that makes walking possible, but dangerous and inconvenient.</td>
</tr>
<tr>
<td>3</td>
<td>Some conflict – walking is possible, but not convenient</td>
</tr>
<tr>
<td>4</td>
<td>Minimal conflict, mostly between pedestrians and non-motorized vehicles</td>
</tr>
<tr>
<td>5</td>
<td>No conflict between pedestrians and other modes</td>
</tr>
</tbody>
</table>

Be sure to photograph the conflict, such that analysts can understand the source of the modal conflict.

22) Pedestrian Congestion

Rate the degree of pedestrian congestion on the walking path, using the following 1-5 point scale:

1  2  3  4  5

23) Pedestrian Signage

Are there pedestrian-oriented way-finding signs, such as maps? Respond by writing "none" or "some," or "ample." Use your best judgment.
24) Other Pedestrian Infrastructure Amenities
List available amenities that are provided at regular intervals along surveyed road segment. Examples include; rubbish bins, benches, and public toilets.

25) Open Sewers
Note whether there are open sewers along the surveyed road by writing "yes" or "no."

CROSSINGS SURVEY
In addition to walking corridors, crossings play an important role in pedestrian safety and convenience. The Consultant shall select crossings (at intersections or along road stretches) on surveyed corridors and answer the following questions about them. Although it is not necessary to survey every crossing, we ask that the Consultant survey a significant proportion of them.

a-d; 1) Before you begin...
As with the previous survey, indicate the time of day and the date, as well as whether the survey is being conducted during peak travel hours. Number the crossings you will evaluate and indicate their location on a map.

2, 3) Types, Locations
Note the type of all surveyed crossings (even those not at road intersections). The following photos illustrate the basic types of intersections:

Also, Indicate whether the crossing is at a road intersection or between road intersections.

4) Average Traffic Speed
Average traffic speed affects the risk of fatality and injury of the pedestrian. Estimate the actual (as opposed to posted) speed based on the following criteria:

<table>
<thead>
<tr>
<th>Points</th>
<th>Speed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 - 10 km / hour</td>
<td>Gridlock</td>
</tr>
<tr>
<td>2</td>
<td>10 - 30 km / hour</td>
<td>Very slow moving traffic</td>
</tr>
<tr>
<td>3</td>
<td>30 - 70 km / hour</td>
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</tr>
<tr>
<td>4</td>
<td>70 - 120 km / hour</td>
<td>Fast moving traffic</td>
</tr>
<tr>
<td>5</td>
<td>120 + km / hour</td>
<td>Very fast moving traffic</td>
</tr>
</tbody>
</table>
5) Number of Lanes to Cross
Indicate the total number of motor-vehicle traffic lanes, including parking lanes, that must be crossed (across widest road segment, if there is more than one to choose from).

6, 7) Average Time Spent Waiting and Crossing
Indicate the average time the pedestrian is made to wait and given (as opposed to actual time spent) to cross the street. If there are multiple crossings at an intersection, evaluate the crossing that spans the widest street.

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 seconds – 1 minute</td>
</tr>
<tr>
<td>2</td>
<td>1 – 2 minutes</td>
</tr>
<tr>
<td>3</td>
<td>2 – 3 minutes</td>
</tr>
<tr>
<td>4</td>
<td>3+ minutes</td>
</tr>
</tbody>
</table>

8) Sufficient Time to Cross
Sometimes the amount of time available to cross a street (break between cars, time allotted by traffic signal, etc.) is insufficient, particularly for people with small children or elderly. Indicate whether time available to cross is sufficient for a typical healthy adult; elderly person, disabled person, or person with small children; or no one at all to cross.

9) Safety
Describe the quality of each crossing in terms of safety from traffic accidents, using the following criteria:

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very dangerous – there is significant risk of accident with other modes</td>
</tr>
<tr>
<td>2</td>
<td>Dangerous – pedestrian faces some risk of being hurt by other modes</td>
</tr>
<tr>
<td>3</td>
<td>Difficult to ascertain dangers posed to pedestrian</td>
</tr>
<tr>
<td>4</td>
<td>Safe – pedestrian is mostly safe from accident with other modes</td>
</tr>
<tr>
<td>5</td>
<td>Very safe – other modes present no danger to pedestrian</td>
</tr>
</tbody>
</table>

10) Security
Describe the quality of each crossing in terms of security from crime (mostly applies to subways), using the following criteria:

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environment feels very dangerous – pedestrians are highly susceptible to crime</td>
</tr>
<tr>
<td>2</td>
<td>Environment feels dangerous – pedestrians are at some risk of crime</td>
</tr>
<tr>
<td>3</td>
<td>Difficult to ascertain perceived degree of security for pedestrians</td>
</tr>
<tr>
<td>4</td>
<td>Environment feels secure – pedestrians at minimal crime risk</td>
</tr>
<tr>
<td>5</td>
<td>Environment feels very secure – pedestrians at virtually no risk of crime</td>
</tr>
</tbody>
</table>

11) Traffic Management
Indicate whether there is a traffic signal, pedestrian phase signal, traffic police, or no traffic management system at the crossing (across widest road).
DIGITAL PHOTOGRAPH CHECK LIST

For each surveyed street, you should at least have photographs of all of the following items:

- Pavement
- Street Cross Section (taken from center of road crossing)
- Walking Path Cross Section (taken from center of walking path)
- Permanent Obstructions
- Temporary Obstructions
- Modal Conflict (or lack thereof)
Photographs and Images

a) Knecht, Barbara. Barbara Knecht, Inc.
b) Krambeck, Holly (Author).
i) Purser, Robert. http://www.citymayors.com/development/india_urban1.html. May not be reprinted without permission – e-mail: editor@combatlaw.org
q) Wegmann, Jake. Massachusetts Institute of Technology
GLOBAL WALKABILITY INDEX
PHYSICAL INFRASTRUCTURE SURVEY (roads, walking paths, amenities)

Part I: Survey Area
1) Survey area #
2) Date (dd/mm/yyyy)
3) Time
4) Peak travel time?
5) Road name (or other identifier) (mark on map)
6) Surrounding land use (check all that are the most prevalent)

Part II: Road
7) Length (meters)
8) Average traffic speed
9) Number of driving lanes
   Number of parking lanes
   Number of bicycle / motorcycle lanes
   Number of median strips
10) People walking in street (not on walking path) -- 5 minute count

Part III: Walking Path
11) Width (most commonly occurring) in meters
12) People walking on walking path -- 5 minute count
13) Trees (total number on one side)
14) Street lights (total number on one side)
15) Cleanliness
16) Maintenance and Pavement Quality
- 1 -- Separate paving for walking path not present
- 2 -- Paving is mostly dirt, covered with mud; poor condition
- 3 -- Some paving; partly smooth; poor condition
- 4 -- Paved and walkable; not well maintained
- 5 -- Smooth walking surface; well maintained

17) Infrastructure for disabled (ramps, blind paths, etc.)
- 1 -- No infrastructure for disabled persons available
- 2 -- Limited infrastructure available, not in usable condition
- 3 -- Infrastructure present but in poor condition
- 4 -- Infrastructure present, in good cond., but poorly placed
- 5 -- Infrastructure is present, in good condition, well placed

18) Coverage type (check all that apply)
- Temporary awning
- Permanent awning
- Arcade
- Trees
- None

19) Road length without sidewalk

20) To what degree do obstructions (items that make effective walking path width less than 1 meter wide) affect overall walkability of road? List types of obstructions (e.g., parked cars).
- 1 -- Walking is completely impossible
- 2 -- Pedestrians are very inconvenienced
- 3 -- Pedestrians are mildly inconvenienced
- 4 -- Minor inconvenience, but obstruction may be welcome
- 5 -- Pedestrian environment is enhanced by obstructions
- There are no obstructions

Part IV: Amenities and Environment

21) Conflicts between pedestrians and other modes (bicycles, etc.)
- 1 -- Significant conflict; walking is impossible
- 2 -- Significant conflict; walking possible, but dangerous
- 3 -- Some conflict -- walking is possible, but not convenient
- 4 -- Minimal conflict, mostly btw. pedestrians and bicycles
- 5 -- No conflict between pedestrians and other modes

22) Pedestrian congestion (1-5 point scale -- see guide)

23) Pedestrian signage (crossings, maps, directions) 1-5 point scale.

24) List available amenities (e.g., rubbish bins, benches, toilets, etc.)

25) Open sewers?
GLOBAL WALKABILITY INDEX
PHYSICAL INFRASTRUCTURE SURVEY (crossings)

a) Survey area #

b) Date (dd/mm/yyyy)


c) Time

   ○ 6:00 - 9:00
   ○ 9:01 - 12:00
   ○ 12:01 - 15:00
   ○ 15:01 - 18:00
   ○ 18:01 - 21:00

d) Peak travel time?

   ○ Peak
   ○ Non-Peak

1) Crossing ID #

2) Type (s)

   ○ Zebra / other marking
   ○ Overpass
   ○ Subway
   ○ No marking

3) Location

   ○ Road intersection
   ○ Non-Intersection

4) Avg. Traffic Speed

   ○ 0 - 10 km/hr
   ○ 10 - 30 km/hr
   ○ 30 - 70 km/hr
   ○ 70-120 km/hr
   ○ 120+ km/hr

5) Number of lanes to cross (across widest road segment)

6) Average time spent waiting to cross the street (across widest road segment)

   ○ 0 - 1 min.
   ○ 1 - 2 min.
   ○ 2 - 3 min.
   ○ 3+ min.

7) Average time given to cross the street (across widest road segment)

   ○ 0 - 1 min.
   ○ 1 - 2 min.
   ○ 2 - 3 min.
   ○ 3+ min.

8) Time is sufficient for X to cross -- check all that apply.

   ○ Typical healthy adult
   ○ Person with small children
   ○ Disabled/elderly person
   ○ No one

9) Safety from traffic accident

   ○ 1 -- Very dangerous
   ○ 2 -- Dangerous
   ○ 3 -- Unsure
   ○ 4 -- Safe
   ○ 5 -- Very safe

10) Security from crime

   ○ 1 -- Very dangerous
   ○ 2 -- Dangerous
   ○ 3 -- Unsure
   ○ 4 -- Safe
   ○ 5 -- Very safe

11) Traffic Management

   ○ Regular Traffic Signal
   ○ Pedestrian Phase Signal
   ○ Traffic Police
   ○ None
# Global Walkability Index

1) **Crossing ID #**

2) **Type(s)**

   - [ ] Zebra / other marking
   - [ ] Overpass
   - [ ] Subway
   - [ ] No marking

3) **Location**

   - [ ] Road intersection
   - [ ] Non-Intersection

4) **Avg. Traffic Speed**

   - [ ] 0 - 10 km/hr
   - [ ] 10 - 30 km/hr
   - [ ] 30 - 70 km/hr
   - [ ] 70 - 120 km/hr

5) **Number of lanes to cross**

   (across widest road segment)

6) **Average time spent waiting**

   to cross the street (across widest road segment)

   - [ ] 0 - 1 min.
   - [ ] 1 - 2 min.
   - [ ] 2 - 3 min.
   - [ ] 3+ min.

7) **Average time given to cross**

   the street (across widest road segment)

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   - [ ] 3+ min.

8) **Time is sufficient for X to cross**

   -- check all that apply.

   - [ ] Typical healthy adult
   - [ ] Person with small children
   - [ ] Disabled/elderly person
   - [ ] No one

9) **Safety from traffic accident**

   - [ ] 1 -- Very dangerous
   - [ ] 2 -- Dangerous
   - [ ] 3 -- Unsure
   - [ ] 4 -- Safe
   - [ ] 5 -- Very safe

10) **Security from crime**

    - [ ] 1 -- Very dangerous
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11) **Traffic Management**

    - [ ] Regular Traffic Signal
    - [ ] Pedestrian Phase Signal
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GLOBAL WALKABILITY INDEX
PART II: PUBLIC AGENCY SURVEY

Introduction
The attached survey is one component of a larger study that comprises three parts: 1) a physical infrastructure survey; 2) a public agency survey; and 3) a qualitative survey to be administered to city residents.

The public agency survey shall help us gather information about walkability that is not obtainable through physical infrastructure surveys or interviews with pedestrians, such as pedestrian fatality statistics and institutional capacity for pedestrian planning.

There are three different kinds of agencies included in the survey (in some cities, these may overlap):
- Agency responsible for transportation planning
- Agency responsible for city planning
- Agency responsible for traffic safety

The Consultant shall approach all four types of agencies and ask the questions provided in the attached survey. Questions denoted by a * may be appropriate only for cities in more developed countries. We ask that the Consultant use his or her best judgment in determining which questions to ask.

In addition to filling out the survey, we ask that the Consultant also provide feedback on how the survey could be improved.

Time Frame
We do not expect completion of the public agency surveys to take more than three business days.

Final Products
Regardless of field recoding method, the final survey (which may be filled in electronically) and additional data sets must be submitted electronically to: ____________________________

Questions
Should the Consultant have any questions about the physical infrastructure survey, please contact: ____________________________
GLOBAL WALKABILITY INDEX
PUBLIC AGENCY SURVEY

Part I: Agency Responsible for Transportation Planning

1a) Is there a specific non-motorized planning program / department?
   - Yes
   - No

1b) If there is a specific non-motorized planning program / department / point person, then please provide a brief description. Include activities and number of full and part time staff.

*2) If there is a specific non-motorized planning program / department, please rate program funding.
   - Enough to sustain high-quality program in long-term
   - Sufficient for short term, but not the long term
   - Neutral
   - Sufficient only to meet very few program goals
   - Totally insufficient

*3) Are pedestrian networks included in the city master plan or transportation plan?
   - Yes
   - No

4a) Please state the proportion of all trips (to work, shopping, school, etc.) that are made via:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Proportion</th>
<th>Year(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Motorized two-wheeler</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Rail-based public transit</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Public bus</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Informal transit</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

4b) How were above proportions derived (rough estimates based on visual observations, traffic counts, surveys, etc.)?
GLOBAL WALKABILITY INDEX

Part II: Agency Responsible for City Planning

1) Please check the pedestrian-related urban design guidelines that are already well-established. Feel free to add any relevant guidelines that are not included in the list.

   - Sidewalk pavement type
   - Placement of benches and similar amenities on walk paths
   - Sidewalk widths
   - Design for disabled persons
     - Other
     - Other
     - Other

2) Please check the building front guidelines that are already well-established. Feel free to add any relevant guidelines that are not included in the list.

   - Strict build-to lines
   - Arcade/sidewalk coverage requirements
     - Other
     - Other

3) Which public agency/agencies are responsible for:

   Licensing of street activities (e.g., vending, busking)
   - Sidewalk construction
   - Sidewalk infrastructure maintenance
   - Sidewalk cleaning
   - Street lighting
   - Pedestrian amenities (e.g., benches)
   - Tree planting
   - Road safety
   - Pedestrian network planning
   - Obstructions/public space policy
4) Please rate the relative importance of the provision of pedestrian infrastructure and services in your agency.

- Very important — walking is a high priority
- Somewhat important
- Neutral
- Somewhat unimportant
- Not important — walkability is almost never considered

5) On a city map, please indicate concentrations of employment, low income residences, and high income residences. Please describe the connections between these areas, noting any particular barriers such as highways with few crossings.

Part III: Agency Responsible for Traffic Safety and Law Enforcement

1) Does the agency maintain data on pedestrian fatalities and injuries? If so, please attach.

- Yes
- No

2) Is there a law or regulation for any of the following items? If so, is the law or regulation enforced? Feel free to add any relevant laws or regulations that are not included in this list.

<table>
<thead>
<tr>
<th>Is there a law or regulation for:</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Rarely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaywalking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendors on sidewalks</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Parking on sidewalks</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Driving / riding on sidewalks</td>
<td></td>
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<tr>
<td>Drunk driving</td>
<td></td>
<td></td>
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<tr>
<td>Other</td>
<td></td>
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<td></td>
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<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enforced?
- Yes
- No
- Sometimes
- Rarely

3) Have there been public outreach efforts (by this or other agency) to educate pedestrians or drivers on road and pedestrian safety? If so, please describe.

- Yes
- No

4) Does the department maintain location data for pedestrian fatalities / road accidents? If so, please describe and attach for most recent year available.

- Yes
- No

5) Does the department maintain location data for street crimes (counle the agency, for example, pinpoint specific high crime locations on a map based on data inputs)?

- Yes
- No
### Part IV: Contact Information

**Agency Responsible for Public Transportation**

<table>
<thead>
<tr>
<th>Agency Name</th>
<th>Agency Address</th>
<th>Contact Name</th>
<th>Contact Position</th>
<th>Contact Phone</th>
<th>Contact E-mail</th>
<th>Notes</th>
</tr>
</thead>
</table>

**Agency Responsible for City Planning**

<table>
<thead>
<tr>
<th>Agency Name</th>
<th>Agency Address</th>
<th>Contact Name</th>
<th>Contact Position</th>
<th>Contact Phone</th>
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**Agency Responsible for Traffic Safety**

<table>
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GLOBAL WALKABILITY INDEX

PART III: PEDESTRIAN SURVEY

Introduction
The attached survey is one component of a larger study that comprises three parts: 1) a physical infrastructure survey; 2) a public agency survey; and 3) a qualitative survey to be administered to city residents.

The pedestrian survey shall help us gather information about walkability that is not obtainable through physical infrastructure surveys or interviews with public agencies, such as nighttime lighting conditions, walking trip purposes, etc.

Implementation
To avoid complications with printed survey translation and illiteracy, these surveys shall be conducted verbally. Surveys shall be conducted directly with the target population – walkers – by conducting spot-interviews in select locations. Clipboard teams of at least two local Consultants shall conduct surveys together.

The surveyed population might include: pedestrians, vendors, local merchants, traffic safety police, office workers, maintenance workers, etc. Surveys may be conducted on the street, in offices and shops, etc. Surveys may also be sent to people via e-mail, should those persons work or reside in the surveyed area.

Be certain to mark survey locations on map.

It is very important that the pedestrian survey questions pertain to the roads studied in the Part I Physical Infrastructure survey.

In addition to filling out the pilot survey, we ask that the Consultant also provide feedback on how the survey could be improved.

Time Frame
We do not expect completion of the pedestrian surveys to take more than two business days.

Final Products
Regardless of field recoding method, the final survey results must be submitted electronically to ____________________, using the provided Excel sheet.

Questions
Should the Consultant have any questions about the pedestrian survey, please contact: ____________________ at: ____________________
GLOBAL WALKABILITY INDEX
PEDESTRIAN SURVEY

Part I: Respondent Description
Answer the first three questions using visual inspection:
1) Gender:
   ○ Female
   ○ Male
2) Disabled:
   ○ Yes
   ○ No
3) Have small children (living with you at present):
   ○ Yes
   ○ No

Ask the respondent the following questions (may ask these questions last):
4) Age
5) Income Level (do you earn significantly less or more than local median?):
   ○ Low
   ○ Medium
   ○ High
6) Neighborhood where home is located (currently):
7) Do you own (in this city):
   ○ Bicycle
   ○ Motor two-wheeler
   ○ Car

Part II: Walking Profile
8) How much time do you spend per day walking (minutes)?
9) How long, on average do you spend walking to work each day?
10) How long does it take you to take transit to work (total trip)?
11) How long does it take to walk to nearest transit stop from home?
12) List top three places you usually walk to:

Part III: Convenience
Show respondent map with 0.5 km radius drawn around survey point. The following questions refer to this area:
13) On a scale of 1-5, how convenient are walk paths in this area (1 = very bad)?
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5
14) Are walking paths in this area:
   a) Rarely
   b) Sometimes
   c) Often
   d) Blockied with obstructions (e.g., poles, parked cars)
   e) Congested with non-pedestrian traffic (e.g., bicycles)
   f) Adequate for blind or disabled people
   g) Poorly lit at night
   h) Covered with litter
   i) Uneven and hard to walk on

15) Do you have to walk very far out of your way just to cross the street:
   ○ Rarely
   ○ Sometimes
   ○ Often

Part IV: Safety and Security
Show respondent map with 0.5 km radius drawn around survey point. The following questions refer to this area:
16) On a scale of 1-5, how safe is it to walk in this area? (1 = dangerous)
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5
17) On a scale of 1-5, how secure is it to walk in this area? (1 = dangerous)
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

18) Do motorists in this area:
   a) Fail to yield to people crossing the street
   b) Drive too fast
   c) Drive through red traffic lights and stop signs

19) List three things the city should do to improve walkability

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APPENDIX E

Selection of Field Test Materials
WASHINGTON, DC: FIELD TEST
Selected Survey Areas (Random Spatial Sample)

WASHINGTON, DC: FIELD TEST
Survey Volunteers
WASHINGTON, DC: FIELD TEST
World Bank Youth to Youth (Y2Y) Newsletter Article, Page 3

Enjoy & Until Next time...
- Tina George & Samantha Constant
Y2Y Communications Chairs 2005

Y2Y August Events Calendar

1) Speakout! Session with Jim Adams, VP, OPCS
When: Monday, August 8, 2005, 12:30-2:00 pm
Where: MC-8-W150
Thank you for signing up for the Jim Adams Speak Out session last week. Mr. Adams had to rearrange due to an unforeseen scheduling conflict. We hope you can make the alternative date. Once again, Mr. Adams will be speaking to the community about his long and accomplished career at the Bank, including his role as Country Director for Uganda and Tanzania during formative years in their development, and how young people such as ourselves should approach a career in this field. This session is a great opportunity for the Community to speak freely to a member of the senior management who is always full of intelligent insight, witty stories and sage advice. The new date will be August 8th 12:30-2:00pm. Please RSVP here to attend the session.

2) Next Y2Y Steering Committee Meeting
When: First Wednesday of the Month: Aug 3, 6:30-7:30 pm Where: MC-9-401
Y2Y invites members to attend Steering Committee meetings every first Wednesday of the month. The second meeting in the series will be held on Wednesday Aug 3, 2005 from 6:30 pm to 7:30 pm at MC-9-401. These meetings will provide an update on the progress of initiatives over the previous month and upcoming projects. It will also provide a platform to learn more about how you can get involved with Y2Y activities or start up new initiatives. Please RSVP here to attend the session.

* If you would like to be involved with these events, please contact Divya Gupta

Pilot in DC: 'Walk the Talk!'

Did you know that as many as 50% of all work trips are made by foot in developing cities? Or in some cities, that more than 65% of all urban traffic accidents result in pedestrian injuries and fatalities?

Although a significant number of trips are made by foot in developing cities, pedestrian infrastructure, amenities, and services are often neglected in municipal planning and budgets. As a first step towards encouraging and helping city planners understand the scope and extent of local pedestrian conditions, the TUDTR Unit has been developing a Global Walkability Index, which would reveal not only which developing cities are doing a good job and which ones require significant improvements, but also identify specific actions cities can take to improve their pedestrian infrastructure, as well as related policies and services.

To get the project off the ground, Y2Y and TUDTR organized a 'Walk the Talk' pilot survey event on Saturday, July 23, where Y2Y Members, and volunteers from across the Bank and DC learned how walkability indexes of cities are created. After a scrumptious breakfast of mango lassis, french toast, and cilantro scrambled eggs at Teaism, volunteers (who also received Walk the Talk T-Shirts) were sent out to eight very different DC neighborhoods. Volunteers used GPS units, powers of observation, and...strings...to evaluate the quality of pedestrian infrastructure in each neighborhood (within a preselected 1km x 1km block), in addition to conducting interviews with people on the street. At the end of the day, when volunteers reported back at Teaism, they were remarkably (and unbelievably) excited about finding things like discontinuous sidewalks or particularly dangerous intersections.

George Branyan, the D.C. Department of Transportation Pedestrian Planning Coordinator (and former Peace Corp volunteer), also joined the group and, so impressed was he with the caliber of the volunteers and the surveys, that he has asked to use data we collected to improve walking conditions in DC. Go volunteers!

Should anyone be interested in learning more about the Global Walkability Index project or wish to contribute, dash an e-mail to: Holly Krambeck, TUDTR or Jitu Shah, Lead Env Specialist, EASEN.

-- Contributed by Holly Krambeck, TUDTR

Get Involved

1) Join the Y2Y Team for Youth, Sport Development & Peace

The UN has for many years understood the importance that sport can play as a development tool and has attempted to mainstream sport in its programs and activities. An inter-agency working group on the issue was set up recently, and 2005 was named the UN International Year of Sport. Y2Y's Youth, Sport, Development & Peace Team will work to raise awareness of the positive impact that sport can play in the Bank's work and develop new ideas for potential implementation. Click here for the Terms of Reference (TOR)
AHMEDABAD, INDIA: PILOT
Selected Survey Areas (Random Spatial Sample)

AHMEDABAD, INDIA: PILOT
Sample Survey Maps
AHMEDABAD, INDIA: PILOT
Survey Volunteers from the Centre for Environmental Planning & Technology
AHMEDABAD, INDIA: PILOT
Investment Proposal Collaboration

- Information, data, and expertise related to vendor rights campaign
- Logistical support in turns of conducting additional surveys
- Advocacy and publicity support
- Review of final proposal

Environmental Planning Collaborative (EPC)
- Assurance that project compliments road improvement project
- Cost estimates for infrastructure proposal
- Review of final proposal

Center for Environmental Planning and Technology (CEPT)
- Organize and implement phases I and II of proposed project, under guidance of Prof. Swamy.

World Bank Intern (Holly Krambeck)
- Report on progress of project for Bank and thesis advisors
- Walkability Index results and analyses
AHMEDABAD, INDIA: PILOT
Article from the Times of India (4 September 2005; Page 3)

In A'bad, taking a walk can be torturous

‘Walkability index’ shows congested roads, no space for pedestrians

By Tina Parekh
TIMES NEWS NETWORK

Ahmedabad: Have you ever considered walking a 10-minute distance in the city? Don't be embarrassed if you haven't. Most areas have no footpaths, and on the ones which have, you would have to jostle for space with stray cattle and garbage!

To know exactly how much the city lacks in terms of walking spaces, a student of Massachusetts Institute of Technology (MIT) Holly Krambeck interning with the World Bank is now determining its 'walkability index'.

"As a first step towards encouraging and helping cities improve their pedestrian infrastructure, the World Bank has developed a walkability index (WI), which would reveal not only which developing cities are doing a good job and which ones require significant improvements, but also identify specific actions cities can take to improve their pedestrian infrastructure, as well as related policies and services," Krambeck told TNN.

But why Ahmedabad? "The World Bank team has chosen to begin work in Ahmedabad, because there is a pending Bank-aided urban development and upgrading project that will begin later this year, for which it may be possible to incorporate survey results as an investment component and because Ahmedabad planners and officials are unusually receptive to this kind of non-motorised travel advocacy," Krambeck explained.

Pavement-dwellers have encroached on pedestrian territory.

She is getting assistance from students of planning of Centre for Environmental Planning & Technology (CEPT) University. CEPT students divided themselves in nine teams. Among areas surveyed were CG Road, Kalupur, Bapunagar, Vastral, Bodakdev, Shahibaug and Vadaj where they examined physical infrastructure, interviewed pedestrians and civic bodies' officials.

On Saturday a 'walkability workshop' was organised at CEPT where students presented their survey findings and general pedestrian conditions and needs in the city discussed.

Most of them found that roads are congested, with non-existent parking area and pedestrian walkways or footpaths. The footpaths have been badly damaged, with most of them occupied with garbage and cattle, deterring people from walking across them.

A student Karamchand Nanda, who surveyed Kalupur, said, "The Relief Road is completed congested and so is the road outside the railway station. People told us they couldn't risk walking on those roads."

Those who surveyed upmarket Shahibaug too had the same story to tell. "Footpaths have become virtual dumpyards. There are no control on traffic movement," a student of the team said.

"The share of pedestrians in Indian cities, particularly in Ahmedabad, is very high. Although a significant number of trips are made by foot, pedestrian infrastructure, amenities and services are typically neglected in municipal planning," Krambeck said.

"Inadequate planning for pedestrians has many negative consequences, the most notable being unnecessary fatalities and injuries. In fact, pedestrians are victims of 70 per cent of traffic casualties in developing countries."

She will work out the index on the basis of various indicators after compiling the survey results.
CHICAGO, IL: FIELD TEST
Selected Survey Areas (pre-selected by Chicago Planning Commission)
CHICAGO, IL: FIELD TEST
Sample Survey Maps – Area #1 Harrison Street