THE GLOBAL WALKABILITY INDEX:
TALK THE WALK AND WALK THE TALK[1]

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[1] Disclaimer: This paper represents preliminary findings of an internship report and a filed test conducted in one city. This does not represent views of the World Bank.

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, a walkability index to rank cities across the world based on the safety, security, and convenience of their pedestrian environments was devised.

This task was accomplished by, generating 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, prototypes of the index and survey materials and field tests in cities throughout the world.

Results from these tests 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), 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 were also developed.

The Index has three limitations: 1) The notion of walkability is not well understood, paving the way for widespread misunderstanding; 2) The Index requires data to be collected in the field; and 3) The simplicity of data collection methodologies for practical purposes results in a less-robust Index, and may diminish its usefulness as a tool for investment and policy reform.

1.0 Introduction

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). With 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. 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). 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. 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. 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.

Most developing countries cities do not make pedestrian planning a priority and 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 is trying to devise a kind of "walkability index," which would rank cities across the world based on the safety, security, and convenience of their pedestrian environments. The following sections describe how this index was developed, data collection methodologies, findings from initial field tests and a full-scale pilot, and 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;

- Identify specific pedestrian-related shortcomings, provide comparison with other cities, and recommendations for next steps to improve pedestrian conditions; and
- Provide city officials with an incentive to address walkability issues.

3.0 Research Scope and Organization

3.1 Definition of Walkability

There are many different ways to consider "walkability." 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, the project would consider walkability only in its most basic sense: the safety, security, economy, and convenience of traveling by foot. The 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

The Walkability Index is a multi-phase 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 on-going 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 was primarily motivated by developing countries pedestrian issues and 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 comprises of three components: safety and security, convenience, and degree of policy support.

Component 1: Safety and Security

This first component determines the relative safety and security of the walking environment, e.g., the odds a pedestrian would be hit by a motor vehicle? What safety measures are in place at major crossings and intersections? How safe would the pedestrians feel along walking paths from crime?

Component 2: Convenience and Attractiveness

The second component reflects the relative convenience and attractiveness of the pedestrian network, e.g., whether the 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

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;
- Evaluation of three different econometric methods for compiling indices;
- 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;
- 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[2], which was presented 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.

[2] 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)

Component		Indicator		Variable	Source
Safety & Security	1	Pedestrian Fatalities and Injuries	1	Proportion of road accidents that resulted in pedestrian fatalities (most recent year aval.)	2
			2	Proportion of road accidents that resulted in pedestrian injuries (most recent year avail.)	2
	2	Modal Conflict	3	5-minute interval count of pedestrians walking in street among other modes	1
			4	Pedestrians concerned about modal conflict on walking path	3
			5	Walking path modal conflict Level of Service from 1 to 5 (1-5 LOS)	1
			6	Pedestrians who do not feel safe from road accidents	1
	3	Crossing Safety	7	Crossing safety 1-5 LOS (surveyed crossings = sc)	1
	4	Crossing Exposure	8	Average time waiting to cross (sc)	1
			9	Judgement: sufficient time given for healthy adult to cross (sc)	1
			10	Judgement: sufficient time given for person with small children to cross (sc)	1
			11	Judgement: sufficient time given for elderly / disabled people to cross (sc)	1
	5	Traffic Management at Crossings	12	Type (e.g., ped-phase signal) as function of # lanes and avg. traffic speed (sc)	1
	6	Security	13	Perception of security from crime 1-5 LOS	3
			14	Proportion of walkable roads with street lights	3
			15	Pedestrians who do not feel streets are well lit at night	3
			16	Security of crossings (particularly subways) 1-5 LOS	1
	7	Safety Rules and Laws	17	Existence of relevant pedestrian safety laws and regulations	2
			18	Enforcement of relevant pedestrian safety laws and regulations	2
	8	Pedestrian Safety Education	19	Presence of pedestrian safety education programs	2
	9	Motorist Behavior	20	Yielding to pedestrians	3
			21	Safe driving speed in heavily pedestrianized areas	3
			22	Running red traffic lights and stop signs	3
Convenience & Attractiveness	10	Trees	23	Average number of trees per km of road	1
	11	Cleanliness	25	Cleanliness of walking paths 1-5 LOS	1
			25	Pedestrians inconvenienced by lack of cleanliness of walking paths	3
			26	Presence of open sewers along walking paths	1
	12	Quality and Maint. of Walking Path Surface	27	Quality and maintenance of walking path surface material 1-5 LOS	1
			28	Pedestrians inconvenienced by poor walking path surface quality and maintenance	3
			29	Proportion of roads without sidewalks	1
	13	Disability Infrastructure	30	Existence and quality of facilties for blind and disabled persons 1-5 LOS	1
	14	Coverage	31	Proportion of walking paths that are covered (e.g., arcades) with climate weight	1
	15	Obstructions	32	Permenant and temporary obstacles on walking paths 1-5 LOS	1
			33	Pedestrians inconvenienced by obstructions	3
	16	Availability of Crossings	34	Sufficeint safe and convenient opportunities available to cross streets	3
	17	Walking Path Congestion	35	Pedestrian congestion 1-5 LOS	1

	18	Pedestrian Amenities	36	Amenities (e.g., benches, public toilets) 1-5 LOS	1
			37	Pedestrian wayfinding signage 1-5 LOS	1
	19	Connectivity	38	Connectivity between residential and employment centers 1-5 LOS	2
	20	Overall Convenience	39	Pedestrian perception of convenience -- rating	3
Policy Support	21	Planning for Pedestrians	40	Presence and quality of pedestrian planning program	2
			41	Incorporation of pedestrian plans in transportation or city master plan	2
			42	Relative importance of pedestrians in city planning (agency self-rating)	2
			43	Degree of centralization among bodies responsible for different aspects of ped. planning	2
	22	Relevant Design Guidelines	44	Presence of relevant urban design guidelines	2
			45	Presence of relevant building design guidelines	2

Data Sources: 1 Physical Infrastructure Survey; 2 Public Agency Survey; 3 Walker Survey; 4 City Background Research

The simplification of the Index was based on feedback from previous Index and included those elements deemed the most important indicators of walkability. The new Index compromises thoroughness for practicality, and 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)

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

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*. See *Appendix A: Global*

Walkabilty Index Survey Materials and Implementation Guide for a full description and justification of the Index variables.

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 *woonerf*s[3], 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 *walking paths* have been included in lieu of the presence traditional sidewalks.

5.0 Data Collection Methodology

The quality of the data collection methodology would largely determine the overall quality and usefulness of the Walkability Index. While it is desirable that the data collection methods are thorough, they should also be simple to ensure widespread, error-free implementation. A set of public agency and a field survey was also developed for collecting data (see Table 2 and *Appendix C: Index Survey Materials*).

It is important that these surveys are conducted by local populations to prevent undue bias in results, and attain a walkability index that ranks cities on pedestrian facilities and services, *relative to their local political and economic condition*s, rather than an index that merely mirrors GDP rankings. For example, an American conducting a walkability survey in Washington, DC, may give the city very low marks for safety and security, while an Indian from Mumbai might give Washington very high marks, given the substantial different levels of infrastructure development between the two cities.

[3] "*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." (Wickipedia: "Woonerf" <http://en.wikipedia.org/wiki/Woonerf>)

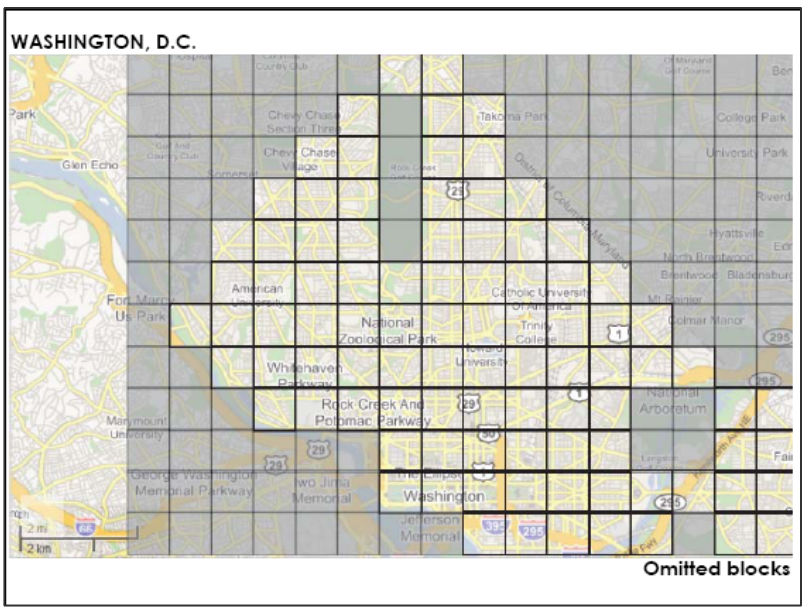
5.1 *Implementation Guide*

A simple guidebook to help teams in different cities conduct the surveys in a consistent manner (*Appendix C: Index Survey Materials*) was developed. 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

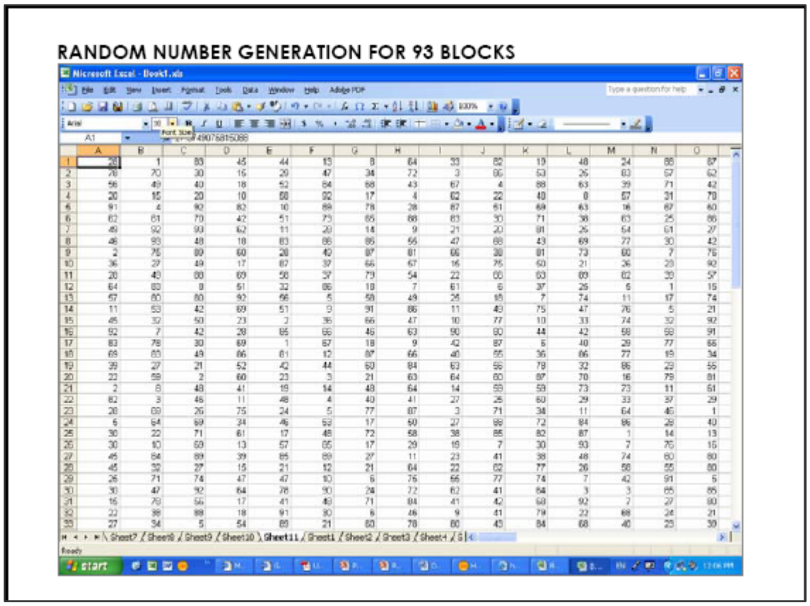
6.1 *Survey Area*

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. A random spatial survey area selection is employed:

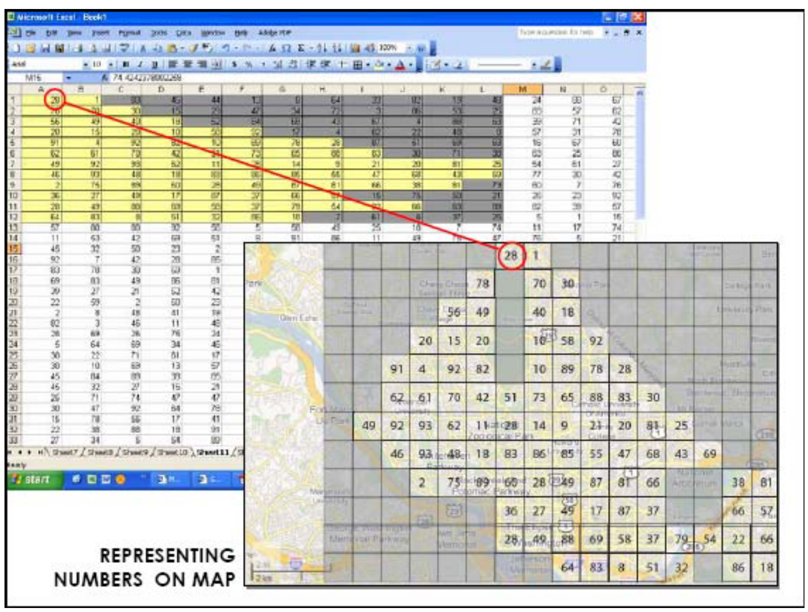


Step 1

Lay a 500 meter by 500 meter grid on top of a city map. Map and grid scales needs to be uniform across cities. A 1km x 1km squares is used 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.).



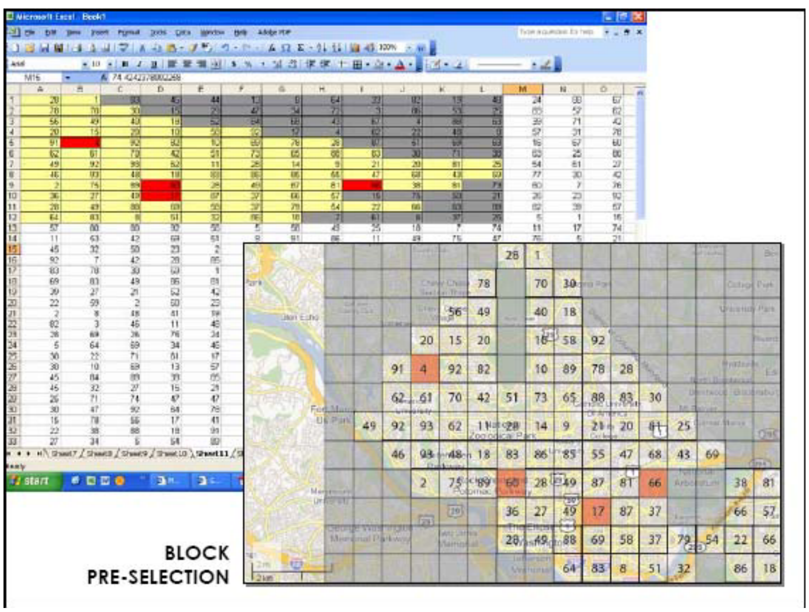
Step 2
Generate a random number table. In this example, numbers are generated along a normal distribution from 1-93 (there are 93 unblocked squares on our map).



Step 3
Transpose randomly generated numbers from table to the map, as shown in the diagram.

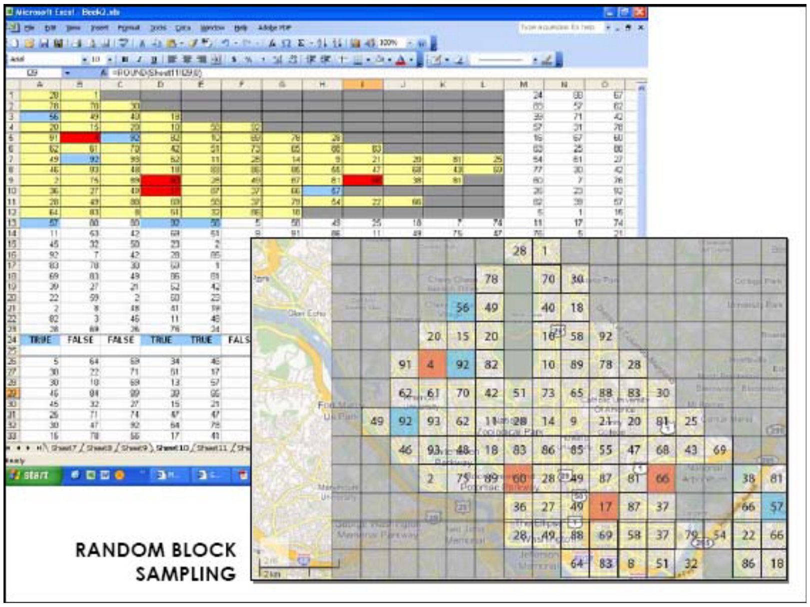
Step 4

Although the sampling method will have a random component, 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.



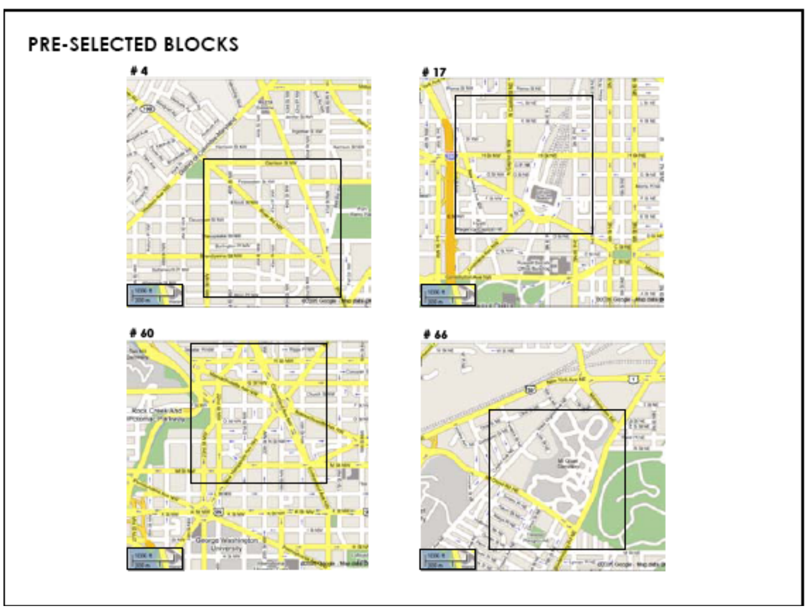
Step 5

Mark these pre-selected areas on the city map.



Step 6

To ensure that the Index is fair, the remaining squares should be randomly selected. The random number table previously generated is used. 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: 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. Surveying whole areas give a sense of general walkability for a whole neighborhood, as opposed to an isolated road that may or may not be of important. However, a drawback of the random spatial sample could inherently not cover all areas in the city and may miss important corridors. Since this is the case for all cities, and 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 -- the less-detailed the surveys are -- the more this issue may be mitigated.

In terms of drawing a city boundary, developed areas contiguous to the city center should be considered. That is, satellite neighborhoods and neighborhoods separated from the city by agricultural land or significant natural or manmade barriers should 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 a workday 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, and where volunteers were willing to examine the methodology and provide feedback. Table 3 summarizes these efforts:

Table 3: Global Walkability Index: Field Test Record

Time	Location	Organizer	Work Completed
6.2005	Alexandria, VA	Holly Krambeck *Author*	Physical: 2 km road length surveyed
7.2005	Beijing, PRC	Yang Chen *World Bank Intern*	Physical: 1 km road length surveyed Pedestrian: 10 people surveyed
7.2005	Washington, DC	Holly Krambeck *Author*	Physical: 7.5 km road length surveyed Pedestrian: 44 people surveyed Public agency survey completed
7.2005	Hanoi, Vietnam	Le Sy Hoang *World Bank Consultant*	Physical: 1 road surveyed
7.2005	Bangkok, Thailand	Pat Suwanathada *World Bank Consultant*	Physical: 2 roads surveyed
8.2005	Manila, Philippines	Herbet Fabian *Asian Development Bank*	Physical: 10 roads surveyed
8.2005	Karachi, Pakistan	Ahmad Saeed *IUCN Pakistan*	Physical: 1.5 km road length surveyed Public agency survey completed
8.2005	Delhi, India	Jacob Wegmann *MIT*	Physical: 4 km road length surveyed Pedestrian: 4 people surveyed
8.2005	Ahmedabad, India	Holly Krambeck *Author*	Physical: 20 km road length surveyed Pedestrian: 342 people surveyed Public agency survey completed
10.2005	Chicago, IL	Holly Krambeck *Author*	Physical: 2.5 km road length surveyed Pedestrian: 12 surveyed

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 were used 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 were among the many changes that were made over time to overcome this hurdle.

Initial tests of the pedestrian survey conducted in Washington DC and Beijing 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 was too formal and academic, and not necessarily suitable for a survey 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 choices, rather than fill-in-the-blank and electronic questionnaire were developed for easy data entry 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 were covered by the survey questions. For example, a tester in Hanoi noted that at crossings, it was not enough to measure the amount of time given to cross a street and whether that time was sufficient. Comments such as these were used to further refine the survey content, such that the questions were more universally applicable, and captured 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 would be difficult to develop an Index methodology in specific terms. Thus, the following paragraphs describe how to construct the Index with additional data.

For the public agency portion of the survey, points were assigned to each response, summed, and then normalized across results from all cities with a z-score (Figure 3 shows a filled-in public agency form and point allocation is summarized in Table 4).

Figure 3: Sample Filled-In Public Agency Survey

1) Please rate degree of municipal funding and resources devoted pedestrian planning.	○ Enough to sustain a high-quality progr am in long-term ○ Sufficient for short term, but not the long term ○ Neutral ◉ Insufficient to acheive 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 ____ ☐ Other ____ ☐ 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 reguulation enfoced? Feel free to add any relevant laws or regulations that are not included in this list.	(see below)

Is there a law or regulation for:	Enforced? Usually	Sometimes	Rarely
☒ Jaywalking	☐	☐	☒
☒ Vendors on sidewalks	☐	☐	☒
☒ Parking on sidewalks	☐	☐	☒
☒ Driving / riding on sidewalks	☐	☒	☐
☐ Drunk driving	☐	☐	☐
☒ Other Littering	☐	☐	☒
☐ Other ____	☐	☐	☐
☐ Other ____	☐	☐	☐

Table 4: Point Allocation for Public Agency Surveys

Question	Point Assignments	Sample (Figure 3)
1	1-5 Scale; Non-Existent = 1	2
2	One point for each box checked	1
3	Divide percentage by 10	2.5
4	Yes = 5, No = 1	1
5	3 for each 'usually' to 1 for each 'rarely', divided by 2.	3
Total		9.5

Figure 4, taken from the survey materials in *Appendix A*, shows a blank field data collection form.

Figure 4: Field Data Collection Form

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

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 an average of 8 stretches per surveyed area), additional sheets may be used for more than 10 stretches. 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 can 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 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 calculated and used in the derivation of the Index. Note that all of the calculations were done automatically using a dynamic PDF form, which was supplied to all surveyors. Figure 5 presents an example of a filled out Field Data form:

Figure 5: Example of Filled-In Field Data Collection Form for One Survey Area

Surveyed Road Stretch	1	2	3	4	5	6	7	8	9	10	(Σ(x*length*10*count))/#)/10
1) Walking Path Modal Conflict	3	4	4	3	4	5	4				51.1
2) Security from Crime	5	5	5	4	4	5	4				58.9
3) Crossing Safety	2	2	1	5	4	3	1				40.6
4) Motorist Behavior	2	2	2	3	4	2	1				34.4
5) Amenities (Cover, benches, public toilets, street lights)	4	4	4	3	3	2	3				40.8
6) Disability Infrastructure and Sidewalk Width	1	1	1	1	1	1	1				13.1
7) Maintenance and Cleanliness	3	3	2	3	3	4	3				41.6
8) Obstructions	2	5	4	3	3	2	2				38.6
9) Availability of Crossings	3	4	5	2	4	2	3				40.9
10) Pedestrian Count	25	62	3	30	46	50	10				
11) Length of Surveyed Stretch (km)	0.5	0.25	0.25	0.45	0.55	0.35	0.65				
										Unweighted Average	40

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 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 and needs further discussion. Weights ensure that variables of less significance do not skew the overall index rankings. The problem lies in determining which issues were most important. For example, some women's groups may believe that variables related to security would receive the greatest weights, whereas groups representing disabled persons might believe that variables related to infrastructure such as ramps and blind paths would be weighted more heavily. A number of global indices, such as the 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. In the future, if such an Index is made 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. Thus, the results should be presented as categories, such as in the following illustrative example (Table 5):

Table 5: Combined Walkability Index (Individual Scores Based on 1-20 Point Scale)

	Safety	**Security**	**Health**	**Convenience**	**Policy**	**Overall**
(weight)	*0.3*	*0.2*	*0.1*	*0.3*	*0.1*	*1.0*
City A	1	1	1	1	1	1.0
City B	10	8	8	9	5	8.6
City C	18	12	3	10	14	12.5
City D	20	20	20	20	20	20.0

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 method helps city planners to readily identify areas for improvement, rewards cities for areas where they are doing well, and provide 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.

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, 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 was developed. The Extended Surveys are a simple tool cities could 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.

These materials are beyond the scope of this paper and thus not presented.

11.0 Conclusion and Next Steps

11.1 Limitations of the Index

The Global Walkability Index has 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, and their simplicity results in a less-robust Index, which may diminish its usefulness as a tool for investment and policy reform.

Limitation 1: What is Walkability?

In the course of the research, it was discovered that walkability is a nebulous term, and thus its measurement is inherently prone to contention and debate. There is a tremendous debate among experts as to what should and should not be included in such an Index – a debate which, quite accurately, reflected the tremendous diversity of interests in this complex issue. In order to lay a good foundation for such an index, people from diverse backgrounds were consulted, various evaluative tools were reviewed, and field tests in different cities were conducted. This would generate an Index that would be applicable in any kind of city throughout the world and would *stand up to any debate*. Needless to say, this could prove impossible at this early stages of the development because the approaches and opinions to the Index would tend to have a different interpretation of "walkability.", One of the ways to overcome this issue would be through widespread promotion of the Index and its principles, with a strong education bent on the Index trying to achieve a 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 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) or 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 additional testing to determine the effectiveness of the new materials is recommend. A consultant to each field project to ensure that data is collected correctly and consistently may be necessary.

Global indices such as the Yale Environmental Sustainability Index or the Economist's Big Mac Index could be easily conducted without much 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 limitation 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, the Index surveys were revised to be far simpler, and 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.

11.2 *Current Stage in Project Development*

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 reader should note that a full-scale pilot of the Index was implemented in Ahmedabad, India in August 2005, but the results of this pilot are beyond the scope of this paper.

11.3 *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. Other avenues for advancement include presentations at conferences and pilot projects in selected cities.

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