



# Walkability in Asian Cities

*Assessment of Pedestrian Infrastructures and Services in Four Areas in Bhaktapur City*



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## I. Background

Walking (including variations such as canes, walkers and wheelchairs) can be considered the most basic form of transport, for the following reasons:

- It is universal. Virtually everybody walks, and virtually all trips include walking links.
- It is very affordable. Economically and socially disadvantaged people tend to rely heavily on walking for transport.
- It provides connections between other modes of transport. Automobile, transit and air travel trips all depend on walking.
- It provides additional benefits, including exercise and enjoyment.

Walking is a largely unmeasured and grossly underappreciated component of the urban transportation system. Transportation data often focus exclusively on car and transit trips, ignoring pedestrian travel, even when it is an important component, i.e., walking to a transit stop or from a parking area (Litman, 2007). Consequently, walkability has been under emphasized or ignored as a vital form of urban transportation.

Walking is an important marker of vibrant urban spaces. According to a survey conducted for Kathmandu Valley Mapping Project in 2001, a large section of population in Kathmandu Valley prefers to walk. In fact, 18.1 percent of daily trips are made entirely on foot, and of the nearly 56.5 percent of the commuters who use different modes of public transport, a large percentage walk as part of their daily commute.

Modes of Transport	Average Peak Hour Modal Split				% of daily passenger travel
	No. of Vehicles	No. of Passengers	% Vehicles	% Passengers	
Public Transportation	5289	93872	19.3	63.5	56.5
Motorcycles	11633	15123	42.5	10.2	5.8
Pass. Car + Taxi	4457	7593	16.3	5.1	5.3
Bicycle	5996	5996	21.9	4.1	4.3
<b>Pedestrian</b>		<b>25349</b>		<b>17.1</b>	<b>18.1</b>
Total	27375	147933	100	100	100

**Table I. Modal Split in Kathmandu Valley**

However despite this big number of pedestrians, Kathmandu Valley claims to have one of the highest mortality from pedestrian accidents in South Asia. There is no single day that passes without the news of road accidents claiming lives of the people. Recent Metropolitan Traffic Police Division (MTPD) statistics suggest that road accidents in Kathmandu Valley for the fiscal year 2008/2009 witnessed record-high in the last 17 years. The road crash fatalities in 2008/2009 reached 137 deaths followed by 127 in the year 2004/2005. Based from MTPD's

data, a total of 1,594 deaths are recorded in their statistics since they started their database system in 1993.

Walkability is the overall support for the pedestrian environment. This has grown increasingly important as the world urbanizes and motorized modes of transport restrain travel on foot. There are many aspects in the pedestrian environment that contribute to the overall concept of a walkable community. This concern encompasses virtually every aspect of the pedestrian experience.

This report investigates walkability and aims to assess the pedestrian infrastructures and services in Bhaktapur City based from the methodology developed by the Clean Air Initiatives for Asian Cities. It is recommended that more research is needed to push for answers and transform improvements on pedestrian infrastructures and services into policy to realize its full benefits.

## **II. The Pedestrian Environment in Kathmandu Valley**

Kathmandu Valley is one of the worst Asian cities for pedestrians, according to a new walkability survey by CAI-Asia Center and Clean Energy Nepal. The extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area are taken into consideration to determine road walkability.

### **A. Lack of Traffic Lights**

The lack of traffic lights on the roads has been identified as a major cause of road accidents in Kathmandu Valley. According to the traffic police, last month recorded a 19.35 percent rise in road accidents compared to the same period last year. Traffic police recorded 372 road accidents in the month of April 2010.

The traffic light system was introduced in 1995 to minimise road accidents. However, the lights installed at 10 major intersections in Kathmandu are not fully operational due to excessive load-shedding. Power outage is to blame for the sorry state of traffic lights installed at Singha Durbar, Putalisadak, Maitighar, Thapathali, New Baneshwor, Kalimati, Tinkune, Kesharmahal and Kalanki.

A few Japanese volunteers had installed solar system for traffic lights at Thapathali and Maitighar, but due to lack of maintenance, the system is not working either. Traffic light is perceived to be the best way to manage traffic where the number of vehicles is increasing by the day. Besides this, the job of traffic police has become even more difficult due to lack of human resources. Against the quota of 1,050 traffic policemen, only 888 are working.

### **B. Ignored Road Dividers**

The MTPD has revealed that 72 per cent of road accidents in Kathmandu Valley were caused by wrong use of road dividers.

According to data, 114 road accidents occurred in the Valley from April to June 2010- 84 in Kathmandu, 26 in Lalitpur and 4 in Bhaktapur. Seven persons died and fifteen were seriously injured in Kathmandu, while six persons were critically injured in Lalitpur.

A traffic policeman said youngsters were the major violators of traffic rules. They ignore road dividers to the extent that nowadays they have started jumping over dividers to cross the road.

The cemented road dividers were placed on the road after previous road safety measures failed to deter traffic violators. First, MTPD marked the road to divide it, then it used retro-reflective safety device, cat's eye, then plastic cones, but still the traffic violators didn't care.

### III. Bhaktapur City: Location, History and its People

Located 1320 meter above sea level on the eastern rim of Kathmandu Valley, Bhaktapur is 12 kilometer east of Kathmandu, capital of Nepal. This royal kingdom, also known as Bhadgaon or 'the city of devotees', was built in the shape of a conch shell spread out over a ridge which rises up between Hanumante river to the South and its small tributary, Kasan Kusi river, to the North.

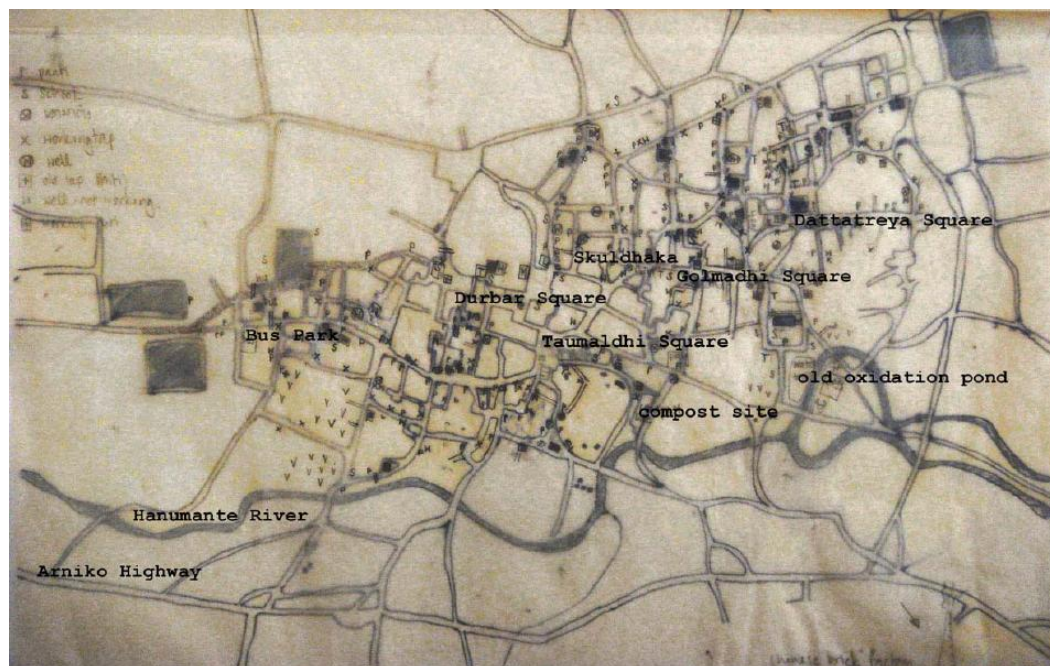


Figure I. Map of Bhaktapur City

Today the city's southern edge is more clearly defined by Arniko highway, built in the early 60's to connect Kathmandu with Tibet, and its northern edge marked by the Kathmandu-Narkagot road. The main road through Bhaktapur still coincides with the city's historical trade route between India and Tibet. Most commercial and retail outlets are situated long this curving West-East road which leads from its mini bus park in the west to Nasamana, passing Potters' square through Taumalghi, Skuldhaka, Golmachi and Dattatreya, with its famous five-storey Nyatapola

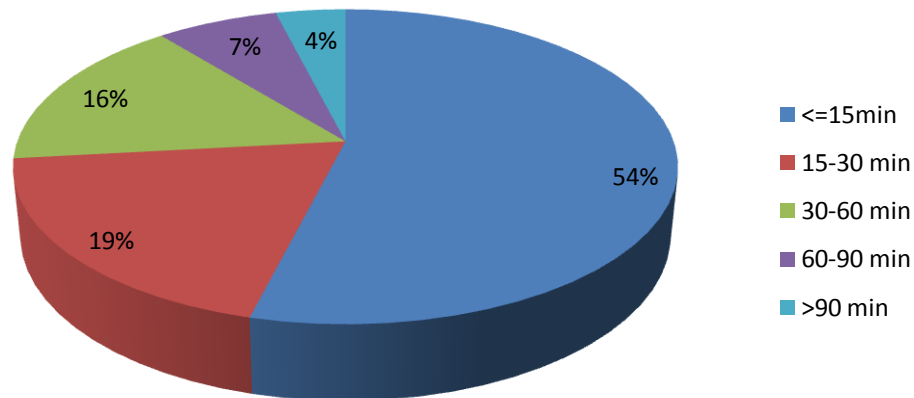
Temple, before exiting the town's eastern periphery. Most activities are concentrated around Sukuldhaka while tourists wandering spiraled out from Durbar Square, the Malla Royal Center, to join in with this main thoroughfare

### **Governance in Bhaktapur City**

Bhaktapur is the headquarters of Bhaktapur district in Bagmati Zone within Central Development Region of Nepal. Within Bhaktapur Municipality itself (previously known as the Nagar Panchayat), the city is divided into 17 wards, which elect one representative each to the Municipality. Local inhabitants, however, still very much distinguish themselves into 24 toles, the traditional divisions within built up area of the town.

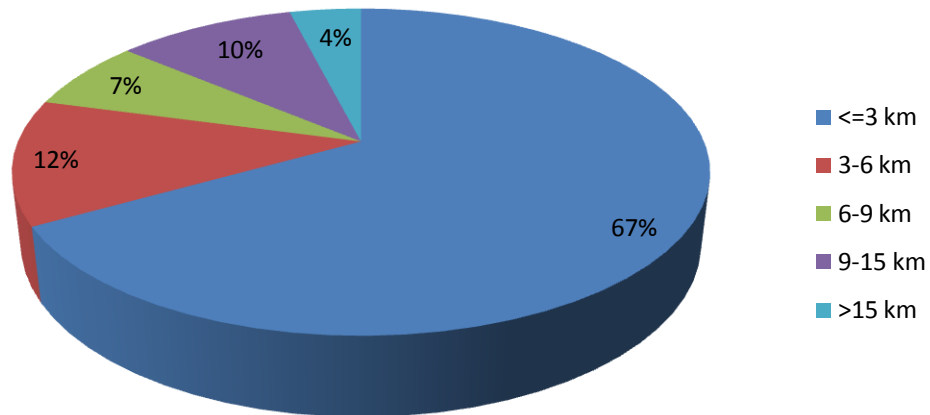
### **IV. Who Walks in Bhaktapur City?**

Bhaktapur is the smallest among the three big towns (includes Patan and Kathmandu) in Kathmandu Valley. Bhaktapur's old neighborhoods are usually centered on a small square (lachi), with a public water source, temples, and usually a local Ganesh shrine. The Municipality has given priority to heritage conservation and environmental improvement that has resulted to a ban on polluting industries and heavy vehicles in the city center.



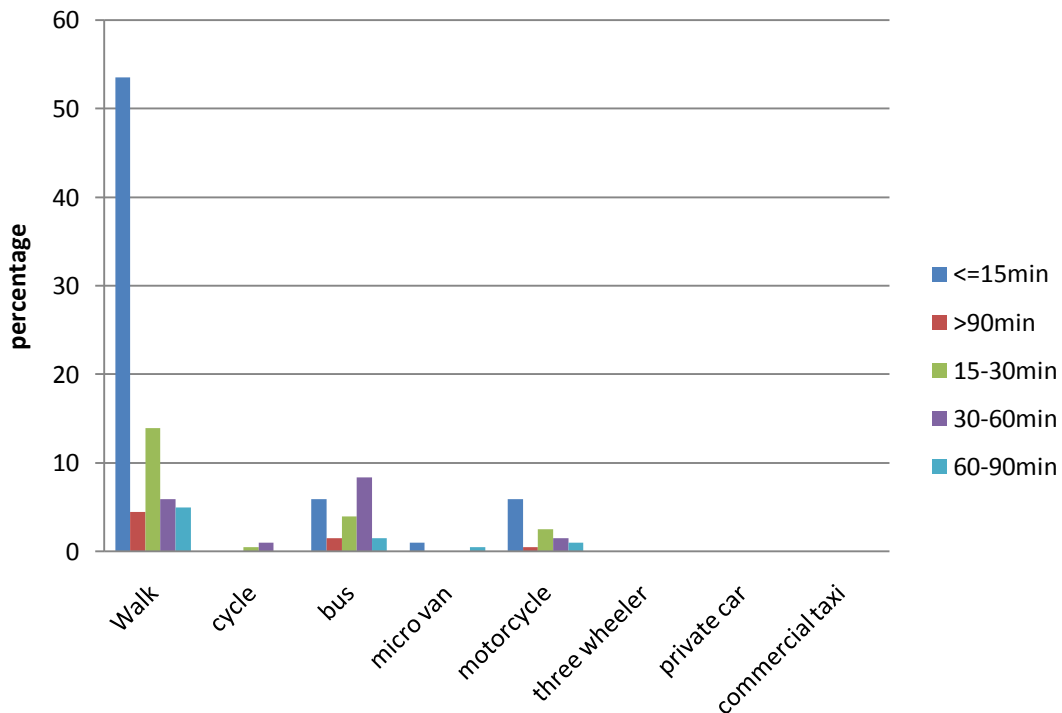
**Table II. Average Travel Time from Residence to Main Destination**

At least 54 percent from the 202 respondents that were interviewed revealed that they spend <=15 minutes of walking in one direction going to their destination. This accounts to more than half of the total sample. Bhaktapur is designed to be pedestrian-friendly streets with short medieval alleys that connect the junctions.

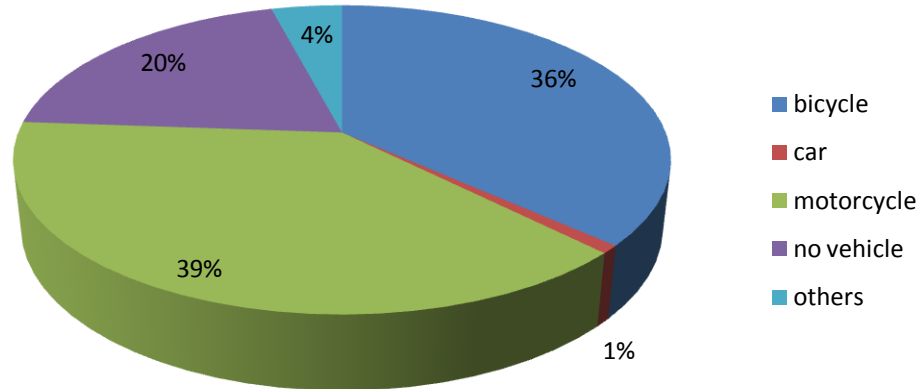


**Table III. Average Travel Distance from Residence to Main Destination**

Less than 3 kilometers of distance is covered by majority of the pedestrians walking. This is a staggering number of pedestrians who are walking in Bhaktapur when compared to about 8 percent of the sample using bus as their mode of transport (See Table 3).



**Table IV. Modes of Transport commonly used per day and the Average Travel Time spent on each Mode of Transport**



**Table V. Type of Vehicle family owns**

Majority of the sample in Bhaktapur are choice transit riders who can drive and does have a vehicle, but chooses to walk from residence to their main destination. Researchers found that about 39 percent of the population owned a motorcycle, followed by 36 percent who owned a bicycle. The captive transit rider who does not have a vehicle or cannot drive comprises of 20 percent.

## V. Walkability Index in Asian Cities

Walkability is a measure of how friendly an area is to walking. Walkability has many health, environmental, and economic benefits. However, evaluating walkability is challenging because it requires the consideration of many subjective factors.

Factors affecting walkability include, but are not limited to: land use mix; street connectivity; residential density (residential units per area of residential use); "transparency" which includes amount of glass in windows and doors, as well as orientation and proximity of homes and buildings to watch over the street; plenty of places to go to near the majority of homes; street designs that work for people, not just cars and retail floor area ratio.

One of the best ways to quickly determine how walkable a block, corridor or neighborhood is to count the number of people walking, lingering and enjoying a space. The diversity of people, and especially the presence of children, seniors and people with disabilities, denotes the quality, completeness and wholesomeness of a walkable space.

To this end, the Clean Air initiative for Asian Cities (CAI-Asia Center) is conducting a walkability survey to collect data about our city's pedestrian environment. This project seeks to measure the safety, security and convenience of the pedestrian environment. This also aims to understand pedestrian concerns regarding aspects of specific pedestrian sidewalks that make walking a pleasant and unpleasant experience. The results of the survey will generate an index



that will compare pedestrian environment between different cities and areas within a city. The walkability index uses “Walkability” in its most basic sense by defining it as, “the safety, security, economy, and convenience of traveling by foot”. This index ranking can help decision makers make targeted solutions to improve the walkability of footpaths.

The Walkability Project was first implemented in Kathmandu City with the initiatives from CAI-Asia Center, Clean Air Network Nepal, Clean Energy Nepal and Fk Norway early this year. This has opened possibilities in other municipalities particularly in Bhaktapur City wherein government authorities are now interested to manage urban issues in pedestrianisation.

The following sections describe the data collection methodologies, findings from the full scale field tests and the next steps.

### **A. Project Objectives**

As a first step towards encouraging and helping cities improve their pedestrian infrastructure, we are developing a Walkability Index in Asian Cities to reveal the best practices from developing cities as well as identify areas which require significant improvements. This will help cities identify specific actions that they can take to improve their pedestrian infrastructures as well as related policies and services.

The overarching goal of this project is to improve pedestrian’s safety and mobility and promote walking as a sustainable transport by making the walking experience more enjoyable.

Specifically, this project aims to:

1. Generate awareness of walkability as an important issue in developing cities.
2. Document the public interest to address walkability issues.
3. Help city planners understand scope and extent of local pedestrian conditions, relative to other cities.
4. Provide city planners with the information necessary to identify specific pedestrianrelated shortcomings, as well with recommendations for next steps.

## **VI. The Walkability Survey in Bhaktapur City**

The Walkability Survey is implemented by the Clean Air Initiatives for Asian Cities (CAI-Asia Center) based in Manila, Philippines. CAI-Asia operates in eight country networks with a common vision of better air quality for Asia.

Consistent with its aim to improving the pedestrian infrastructures and services in Nepal, the Clean Energy Nepal (CEN) in coordination with the Clean Air Network Nepal has produced another set of Walkability Ambassadors in Bhaktapur last May 21, 2010. Around ten volunteers consisting of students attended the training to collect data about the city’s pedestrian environment.

The training provided the results of the walkability project in Kathmandu City and a detailed methodology on how to perform the pedestrian audit. The Walkability report in Kathmandu City identified specific pedestrian related shortcomings that proved to be useful to Kathmandu's sustainable urban transport project of the Asian Development Bank. As a result, the Kathmandu Metropolitan City (KMC) recently closed the Hanumandhoka Durbar Square from all kinds of vehicles as part of the government's initiative to preserve the monument zones and reestablish the World Heritage Site as pedestrian friendly area.

The overarching goal of the walkability project is to improve pedestrian's safety and mobility and promote walking as a sustainable transport.

The Walkability Ambassadors were deployed in four areas; commercial business district, residential, educational and public transport and performed the pedestrian infrastructure audit last May 2010. Interview surveys were collected to assess pedestrian's opinions on safety and road conditions. Field survey forms were also collected to examine road stretches around the city that includes availability of walking paths, motorist behavior, amenities, obstructions, security from crime among others.

About 202 pedestrian interviews were conducted to analyze travel behavior (time that pedestrians spend for each travel mode), pedestrian preference in terms of infrastructures, degrees of exposure to air pollution and socioeconomic profiles.

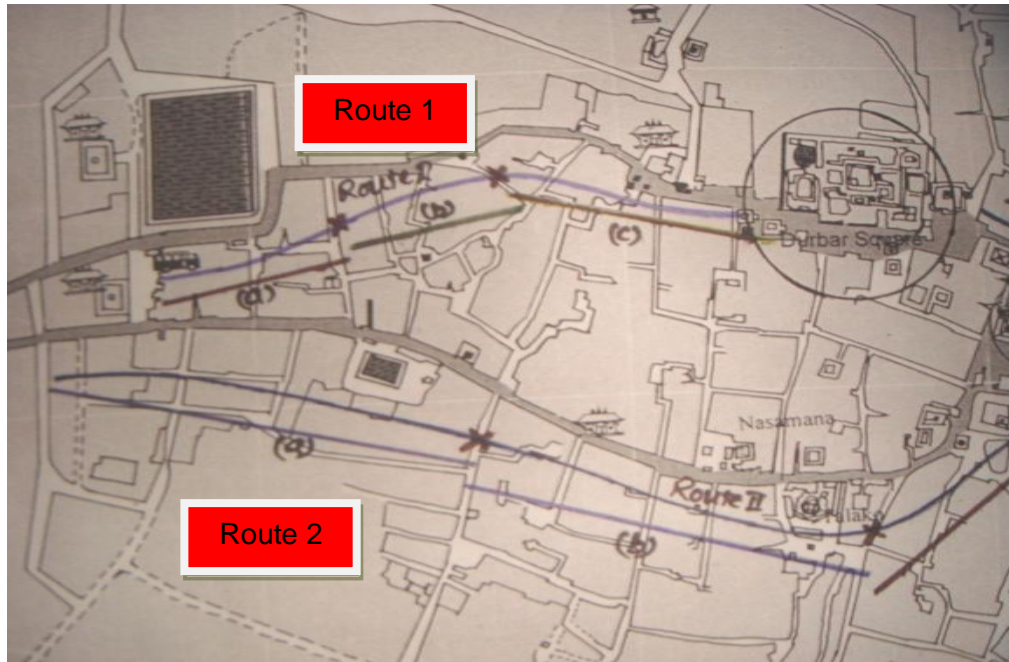
In the next month, CEN will hold a local consultation with concerned officials from the city government to disseminate the results of the walkability survey and come up with specific recommendations for improved planning and investment in pedestrian infrastructures. The implementation of the walkability project in Bhaktapur is possible through the generous assistance from Bhaktapur Municipality and District Development Committee. This exemplifies a best practice of partnership wherein city government and non-government organizations work together to pursue the same goal.

For the commercial area, the following road stretches were surveyed.

Route 1. Na (Guhye Pokhari up to Durbar Square Entrance Gate)

Route 2.

- a. New Mini Bus Park to Bansagopal to Nasamana
- b. Nasamana to Taumadhi Square
- c. Taumadhi Square to Sukuldhoka-Golmadhi
- d. Golmadhi to Dattatraya temple-Chyamasing

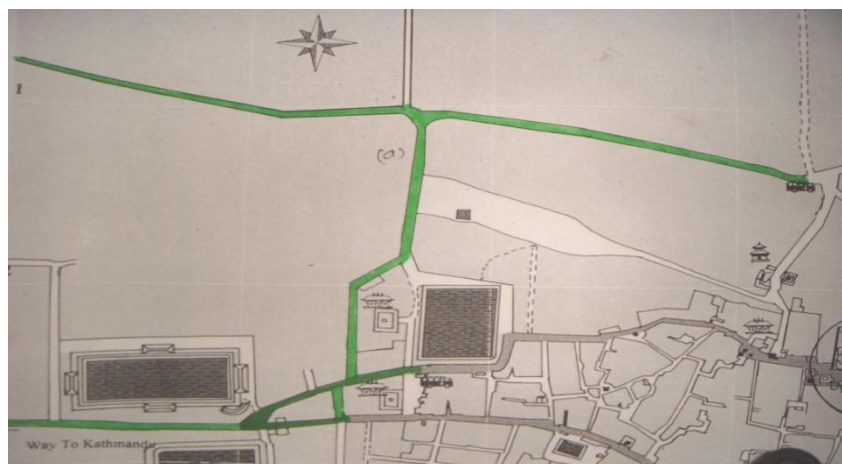


**Figure II. Commercial Area**

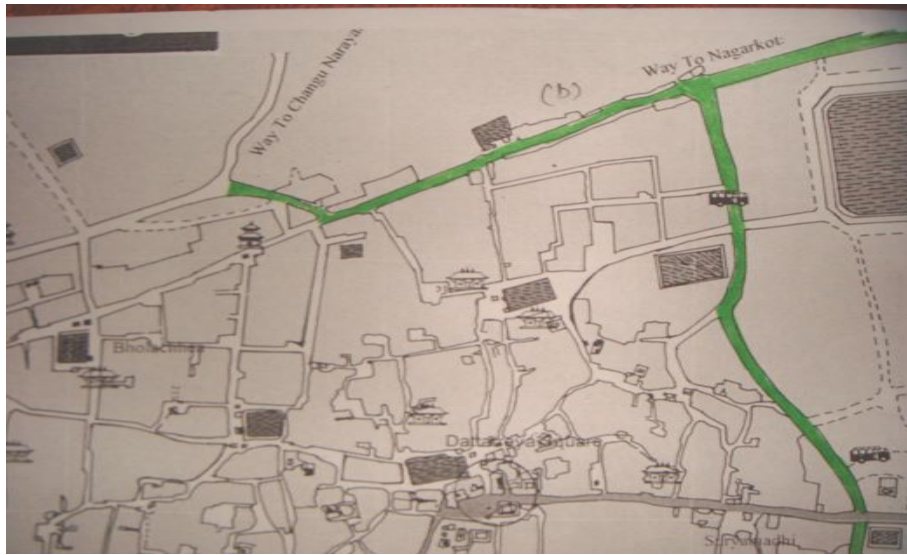
The survey in Public Transport terminals aims to determine the accessibility of the terminal from the context of public transport users. The target public transport facilities include trip interchanges between modes.

Road Stretches:

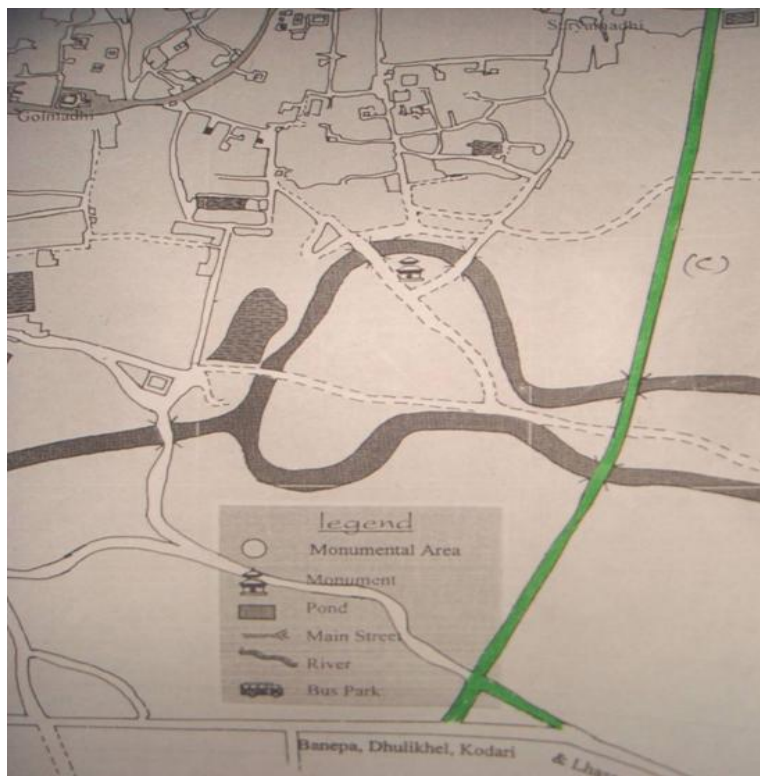
- a. Dudhpati area (Siddha Pokhari) – Telecom Office – Post Office – Nepal Electricity Office – Bhaktapur Hospital – Nepal Red Cross Society – Bhaktapur Cancer Hospital - Byasi
- b. Changu Narayan bus stop - Nagarkot bus stop (Kamalvinayak)
- c. Kamalvinayak – Chyamasingh - Jagati



**Figure III. Public Transport Area (Road Stretch a)**



**Figure IV. Public Transport Area (Road Stretch b)**



**Figure V. Public Transport Area (Road Stretch c)**

Educational Areas focused on KHWOPA College and Learners Academy that have substantial impact of traffic in the city traffic in the city. In these areas, there are high pedestrians, cyclists and public transport users that link with bus stops and schools.

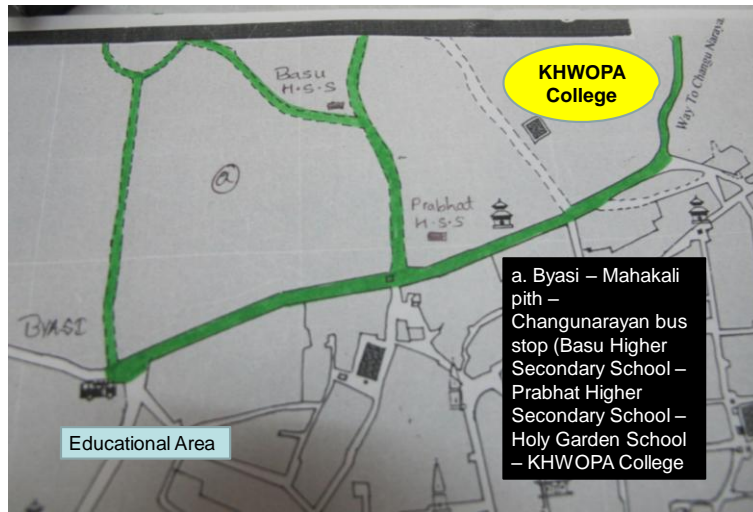


Figure VI. Educational Area (Road Stretch 1)

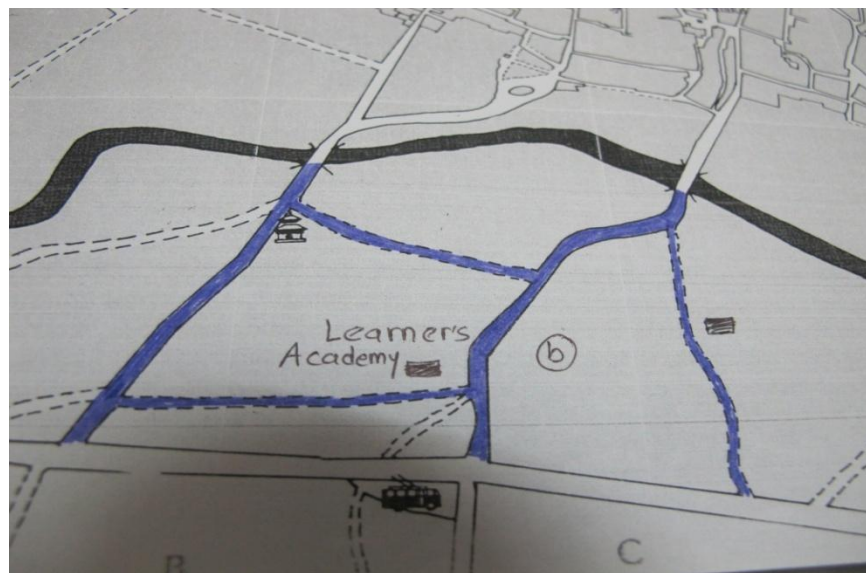


Figure VII. Educational Area (Road Stretch b)

b. Suryavinayak Area (outskirt area from core area of Bhaktapur Municipality)



**Figure VIII. Educational Area (Road Stretch c)**

c. Jhagati and Bhelekhel Area (Wiseland Secondary School – Vidhya Vikash English Secondary School – Adarsha Azad Higher Secondary School – Proyima Intl. Academy – Vidhya Arjan Secondary School)



**Figure IX. Residential Area**

Residential areas focused on the following road stretches;

- a) Tekhacho – Mulakhu – Bansagopal
- b) Ramghat (Ram Mandir) – Mangalachhen – Lakulachhen – Pottery Square
- c) Byasi – Yalachhen – District Administration Office – Tripura Sundari Temple – Araniko Sabha bhawan – Durbar Square area
- d) Golmadhi – Chasukhel – Kwachhen – Tibukchhen

- e) Bholachhen – Yaachhen – Manalaxmi temple – Nagpokhari- Sukuldhoka
- f) Kamalvinayak junction – Navadurga College/School – Navadurga temple – Ga chhe - Taulachhen

This covers major residential zones (both high income and low income) in order to assess the pedestrian facilities. The pedestrian route taken by the majority of people (public transport users) from their homes to access the public transportation terminals was investigated.

## **VII. Data Collection**

The methodology for the survey has been taken from Global Walkability Index developed by Holly Krambeck as an Intern in the World Bank. This has been slightly modified to accommodate complete route assessments and has been revised to be made simpler and cost effective. Currently the survey is also ongoing and planned in Singapore, Hyderabad, Metro-Manila, Jakarta, Jogjakarta, and Colombo.

During the first quarter of this year, CANN, CEN and CAI- Asia Center conducted the walkability survey in Kathmandu City wherein it revealed that about 94 percent of all the surveyed road stretches has no existing facilities for persons with disabilities. In terms of improvements in pedestrian facilities, this came out as the utmost priority perceived by majority of the respondents, followed by improved street lighting and wider, level and clean sidewalks. Currently, this initiative is extended to Bhaktapur City as a result of a recognized need from the Municipality.

The Walkability Surveys will focus on the following components:

1. Safety and Security - this first component determines the relative safety and security of the walking environment.
  - Can pedestrians safely travel by foot?
2. Convenience - this second component reflects the relative convenience and attractiveness of the pedestrian network.
  - How attractive and convenient is the pedestrian environment?
3. Policy Support - this third component looks at the degree to which municipal governments support improvements in pedestrian infrastructure and related service.
  - To what degree does the government support improvement in pedestrian infrastructure, safety?
4. Study area selection
  - City boundary and Street selection
5. Time of day considerations

The objective of the walkability survey is to compare streets and cities. Hence the surveys will be conducted during peak hours (4-8 pm), since this may provide the best results as more pedestrian activity happens during this hour.

The first two survey components are largely observational and each variable is based on the survey team's observations using scoring criteria. The third component, 'Policy Support' is assessed based on interviews with officials concerned.

The Walkability Survey will consist of three focal areas;

1. Field Walkability Survey – is used to collect raw data on the availability and quality of pedestrian infrastructure. This includes a summary of pedestrian counts or the number of people walking on the street, a description of the area such as width of road, motorized traffic conditions and other characteristics that is visible on the road and which needs attention.

Photos are also taken for each surveyed stretch as well as general photos of area.

2. Pedestrian Interview Survey - wherein pedestrians can voice their opinions on current conditions and suggest on improvements. This will cover perception of safety, quality of mode transfers and quality of infrastructure.

3. Government and Stakeholder Survey - shall be used to collect important data that is not obtainable through physical infrastructure surveys, such as city population and population density, pedestrian fatalities and injuries over time and by income class.

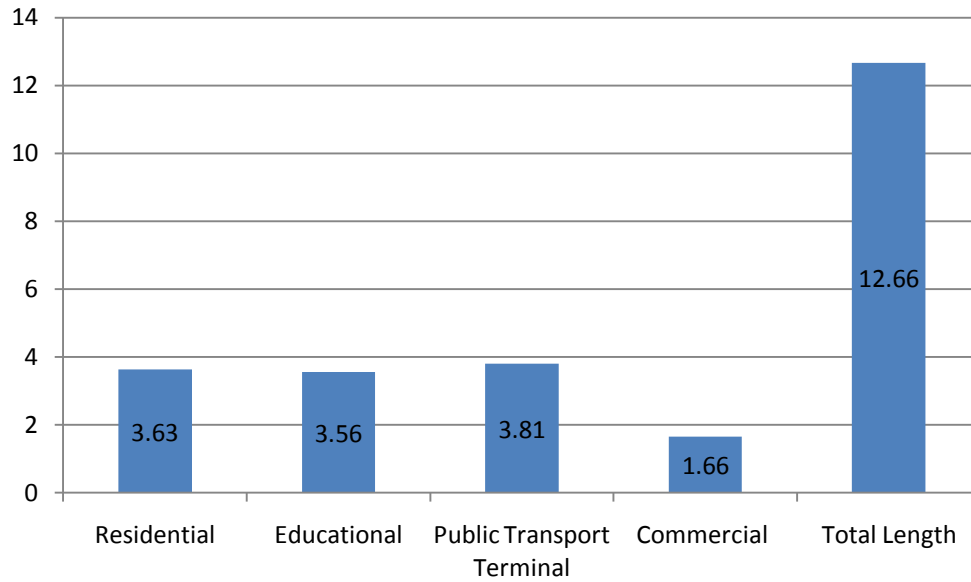
The surveys are to be carried out in following areas: (a) Commercial, (b) Public Transport Terminal, (c) Educational, and (d) Residential. The components on safety and security, convenience and policy support are analyzed from the survey results.

## **VIII. Bhaktapur City Survey Results**

### **A. Field Survey Results**

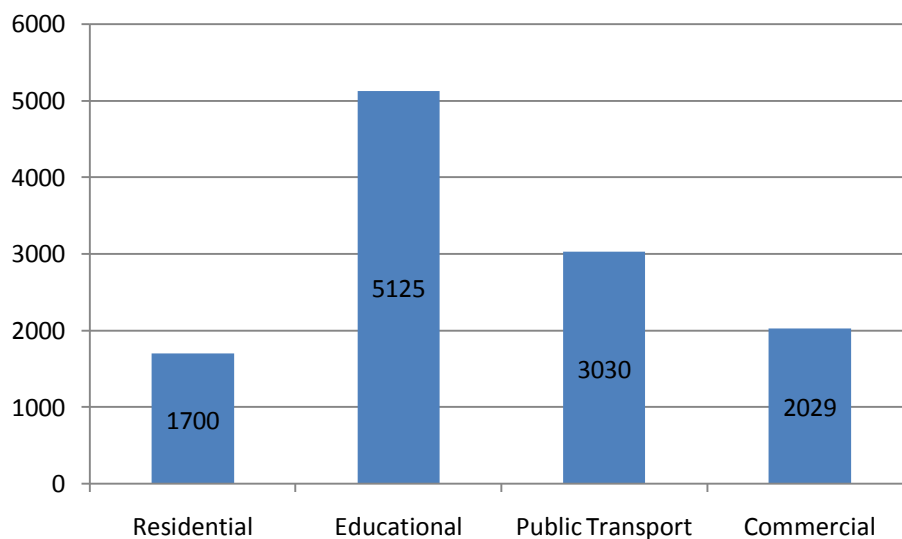
The field survey was conducted in four areas, commercial, public transport, educational and residential covering a total of 68 road stretches with a combined length of 12.66 kilometers (See Table VI).





**Table VI. Total length of Surveyed Roads in Kilometers**

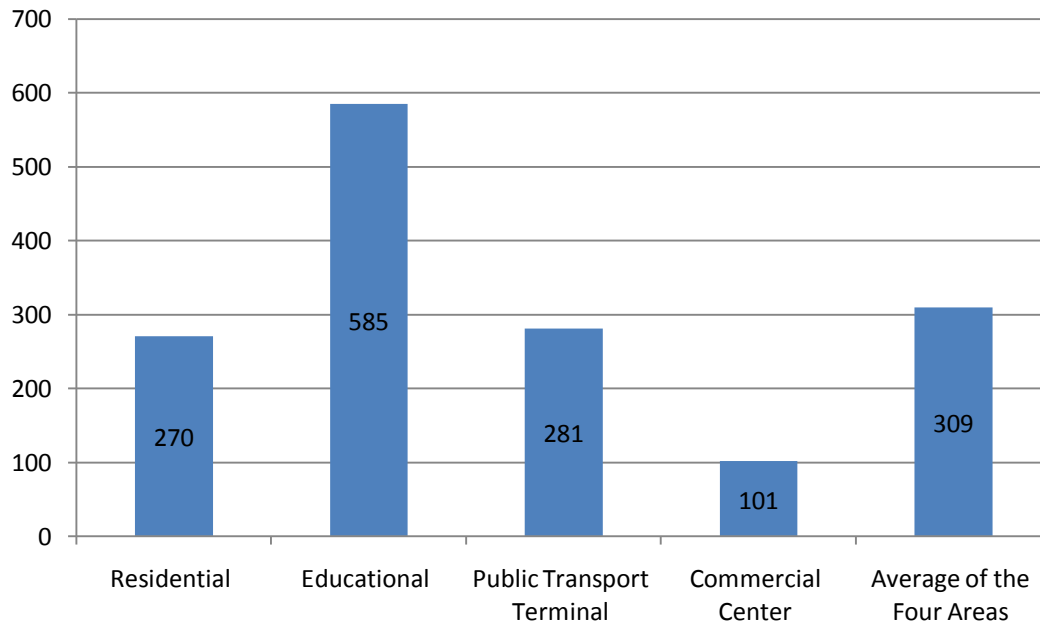
The total number of people walking in the streets on both sides is tallied within 15 minutes. This is to measure the density of pedestrians in an area. Based on survey results, the educational area (Road Stretch from Jhagati and Bhelekhel Area (Wiseland Secondary School – Vidhya Vikash English Secondary School – Adarsha Azad Higher Secondary School – Proyima Intl. Academy – Vidhya Arjan Secondary School)) has the highest number of pedestrian users with 5,125 commuters using that road stretch in one day while the Public Transport has 3,030 road users (see Table VII).



**Table VII. Pedestrian Count**

The Walkability scores of the four areas are found in Table VIII below, with the educational areas obtaining the highest score despite having the most number of pedestrian counts.

The average walkability index in Bhaktapur City is 309, while Kathmandu city obtained a score of 559. A low ranking index suggests that a city is more walkable with indicators of walkability such as sidewalks on streets and interconnected streets with good transit services.



**Table VIII. Walkability Index of Bhaktapur City**

### What we found out?

#### *Educational Areas*

Based on the collected field survey forms, it was observed that pathways are not present in Survaniyak area (Ram Mandir to Barahisthan) and shops are found on the side roads. This increases the possibility of pedestrian accidents since it forces walkers to use the main road going to their destinations. Also, pedestrian obstructions mostly come from furniture that is deposited by furniture shop owners at the side of the road. Roads are paved but the pathways remain congested and in poor conditions. Free crossing is possible in most part of the surveyed road stretches but parking of vehicles on pathways still obstruct majority of the pedestrians.

The presence of an open drainage system near Bidhya Arjan School (Bhelukel to Jagati) affects the daily life of the local people, producing foul smell and increasing the possibility of accidents.

There is no efficient traffic facility that allows efficient movement of people within the road stretches from Byasi to KHWOPA College. Furthermore, there are no sufficient pathways available since buses park on the side of the roads which makes walking difficult.

### *Public Transport Terminal*



The road stretch from Dudhpati area (Siddha Pokhari) up to Byasi has no proper parking spaces allotted for vehicles and footpaths are lacking. Vehicles are also using the footpaths as parking grounds in Changi Narayan Bus park and Nagarkot Bus park.

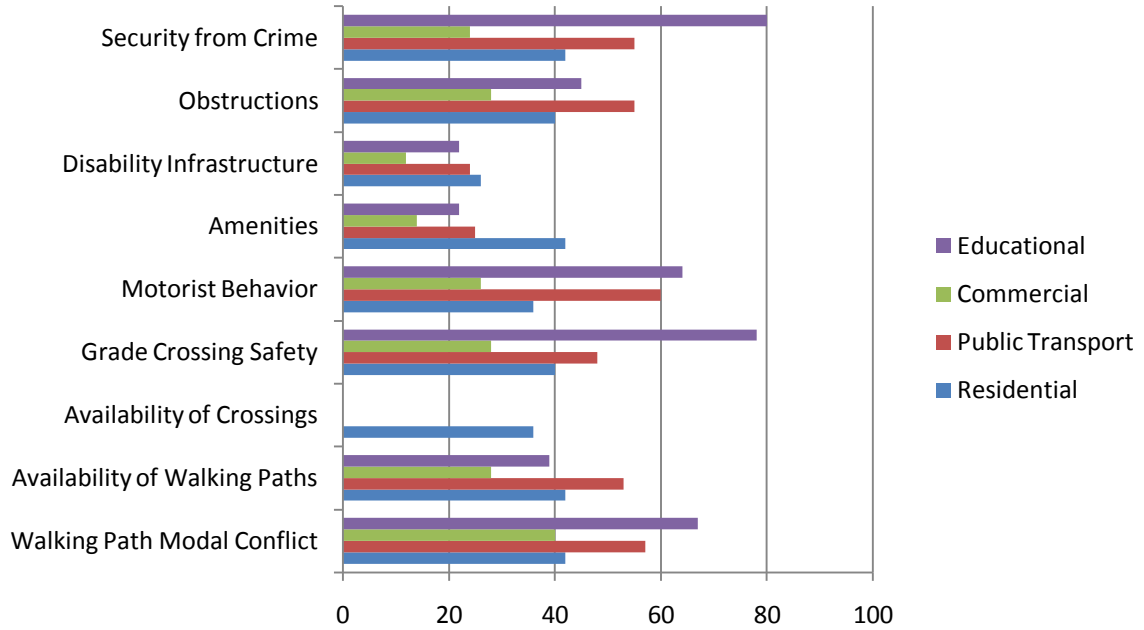
The road stretch from Kamalvinayak to Jagati is under construction and creating re suspended dust.

### *Commercial Areas*

The commercial areas that were covered for the field survey stretches from Na Pokhari up to the entrance gate of Durbar Square. Since the Durbar Square is a fully pedestrianised area, we deem that it was not necessary to conduct the road audit inside the city core. It was observed that in the surveyed roads, there is lack of parking areas for motor vehicles and cars and the footpaths for walking did not allow sufficient space for pedestrians to move comfortably (narrow pedestrian paths).

### *Residential Areas*

The residents complain of a bad smell from the river within the Tekhacho to pottery square road stretch. The roads are narrow which are very typical of Bhaktapur roads. However, it was observed that most road stretches in this part are well maintained and cleaned.



**Table IX. Aggregate Score for Bhaktapur City and Four Survey Areas by Variable**

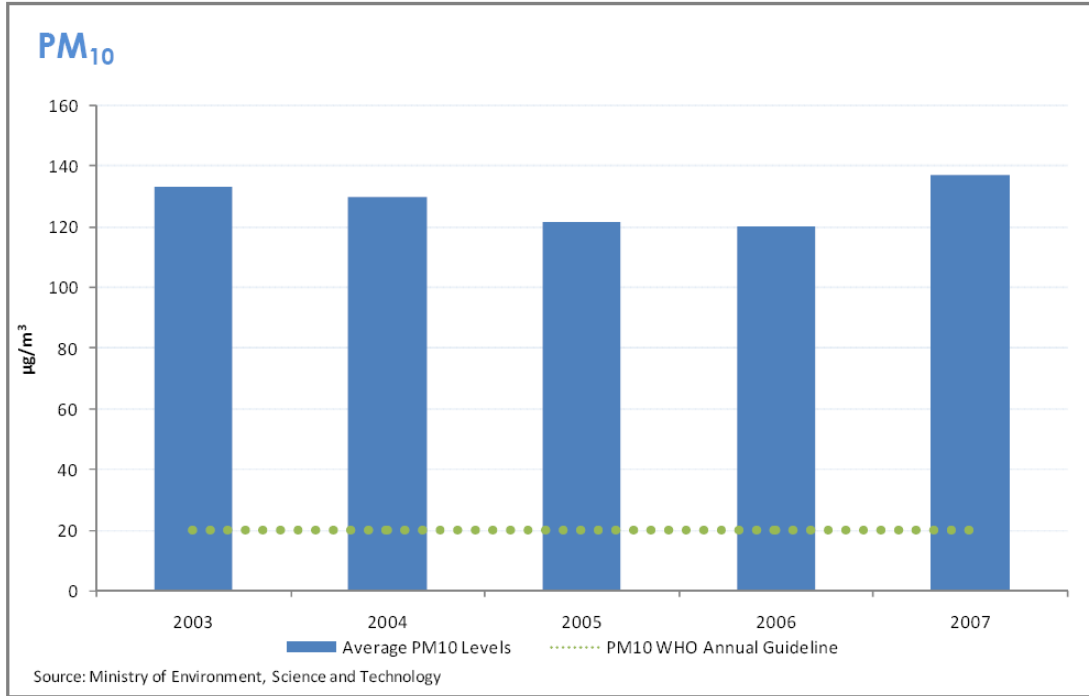
The educational area received the highest score in this variable (security from crime) wherein this area feels secure with minimal crime risk. The highest number of obstructions in pedestrian paths can be found in public transport areas but it should be noted that in this area, motorists usually obey the traffic laws and sometimes yield to the pedestrians.

### B. Pedestrian Preference Survey Results

In our conduct of pedestrian preference survey from 202 respondents across all areas, it was revealed that 60 percent of commuters’ daily trips are made entirely on foot, of which 16 percent of this population sample walks for more than 30 minutes in one direction for a major trip.

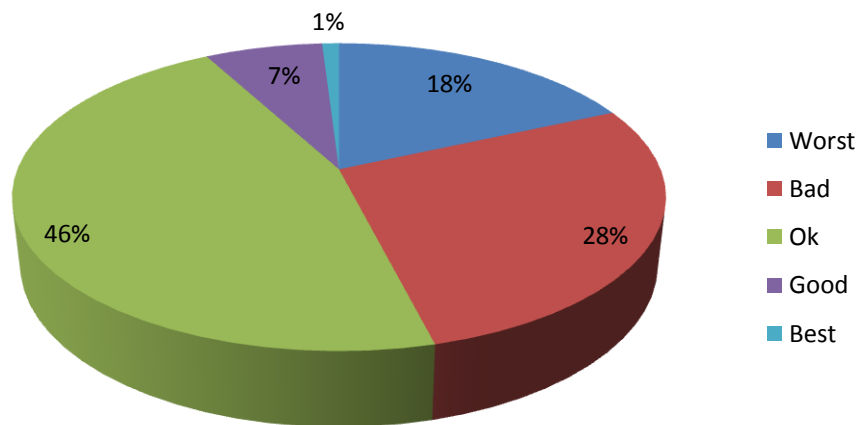
In this daily trips made, 57.4% of the respondents said that walking is perceived to have the highest exposure to air pollution, affecting health and visibility. According to CANN study in 2008, the ambient concentration of Particulate Matter (10 ug/m<sup>3</sup>) in Kathmandu city is 120 ug/m<sup>3</sup>, five times higher than the World Health Organization standards. Except for 2006, PM<sub>10</sub> levels are generally higher than the national standard (120µg/m<sup>3</sup>), and consistently exceed WHO guidelines (20µg/m<sup>3</sup>) (See Table X).

The main source of PM<sub>10</sub> in the ambient air of Kathmandu Valley is smoke from vehicles, dusty and unpaved roads and burning of tires during bandhs. This particle pollution contains microscopic solids or liquid droplets, small enough to get deep into the lungs and cause serious health problems.



**Table X. Trends in PM<sub>10</sub> levels in cities in Kathmandu Valley between 2003 and 2007**

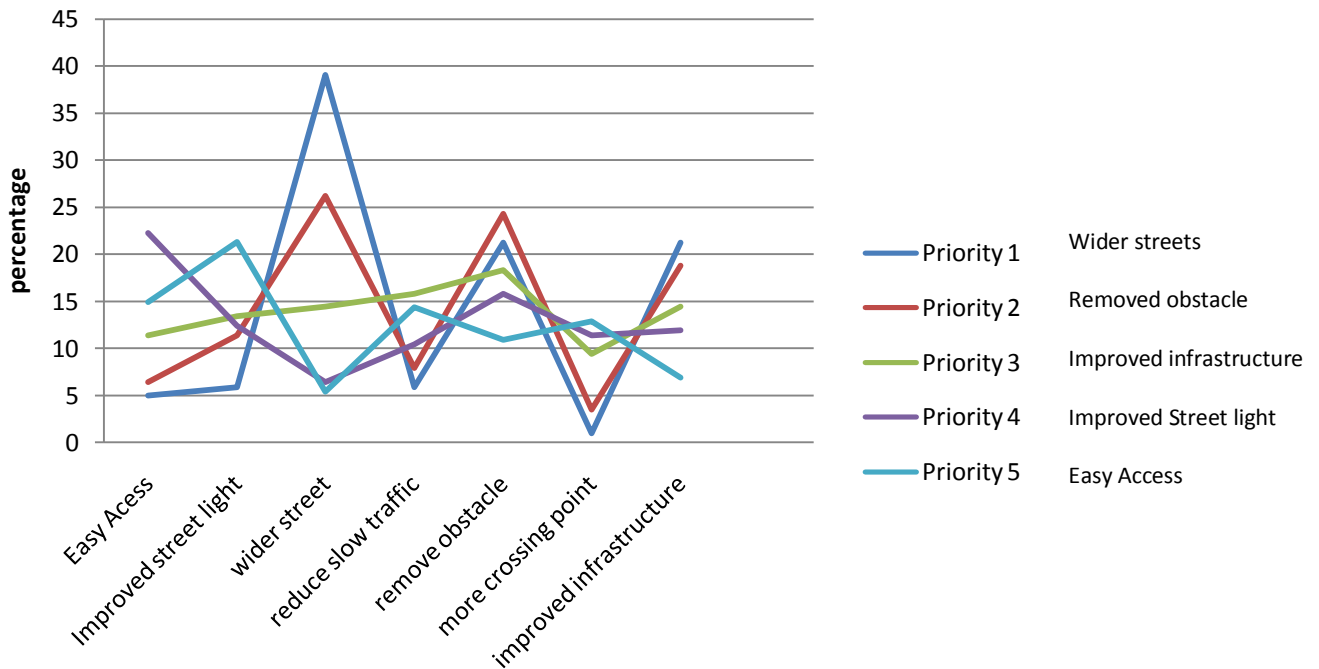
Walkability takes into account the quality of pedestrian facilities, roadway conditions, land use patterns, community support, security and comfort for walking. Walkability can be evaluated at various scales. When we asked pedestrians to rate the existing pedestrian facilities in the city, 46 percent said that the existing infrastructures in the city are okay (See Table XI).



**Table XI. Rating of Pedestrian Facilities**

Increased walkability has proven to have many other individual and community health benefits, such as opportunities for increased social interaction, an increase in the average number of friends and associates where people live, reduced crime (with more people walking and watching over neighborhoods, open space and main streets), increased sense of pride, and increased volunteerism. One of most important benefits of walkability is the decrease of the automobile footprint in the community. Carbon emissions can be reduced if more people choose to walk rather than drive. Walkability has also been found to have many economic benefits, including accessibility, cost savings both to individuals and to the public, increased efficiency of land use, increased livability, economic benefits from improved public health, and economic development, among others<sup>1</sup>.

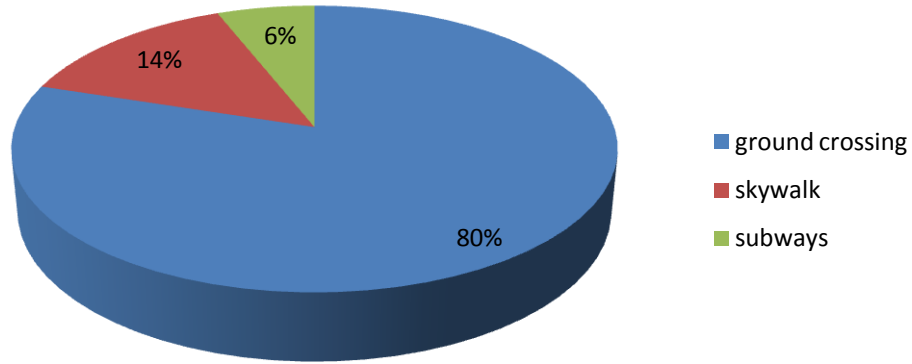
When respondents were asked about their top five priorities in improvement of pedestrian facilities in Bhaktapur, it revealed that wider streets received the utmost priority, with removed obstacles coming in as second, followed by easy access to other transit transfers (See Table XII).



**Table XII. Priority Improvement on Pedestrian Facilities**

<sup>1</sup> [Todd Littman, "Economic Value of Walkability", Transportation Research Board of the National Academies, Vol. 1828, 2003.](http://www.vtpi.org/walkability.pdf)  
 Litman, Todd Alexander (2004-10-12). "Economic Value of Walkability" (PDF). Victoria Transport Policy Institute.  
<http://www.vtpi.org/walkability.pdf>.

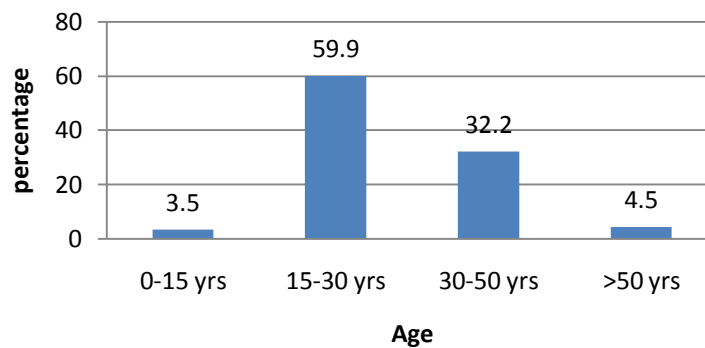
In terms of pedestrian preference for crossing, 80% of the respondents favor ground crossings as opposed to skywalks (14%) and subways (6%) (See Table XIII). About 86.4% of the total respondents said that the average distance that they are willing to walk to access the crossing is less than 50 meters.



**Table XIII. Pedestrian Preference for Crossing**

The respondents said that if no improvement in the pedestrian infrastructures is initiated, 32.2% of the population sample will shift to walking as a mode of transport.

The survey results were captured from 202 population samples across commercial, residential, public transport and educational areas. About 60 percent of the sample ranges from 15 to 30 years of age with an average of 5000 to 10000 Nepalese rupees as the household income.



**Table XIV. Age Distribution of the Population Sample**

## What is the government saying?

### 1. Bhaktapur Municipality

Bhaktapur Municipality rated the existing pedestrian facilities in the city as good since the Municipality has managed to make Bhaktapur the best-preserved and least polluted city in Nepal due to its pedestrianisation of the city core.

However, the Planning Committee mentioned that there is no yearly budget allocation system for pedestrian infrastructure or sidewalks development till this date. Budget is granted as per needed condition. The lack of pedestrian facilities-related design or guidelines could have supported the budget release for pedestrian improvements.

Under existing laws, Bhaktapur Municipality, the Local Users Group and District Development Committee are mandated to improving and maintaining pedestrian infrastructure (e.g. sidewalks, crosswalks, etc) in the city. The Road Department is only concerned only on road- paving. Bhaktapur Municipality has regular monitoring on haphazard parking, vendors encroachment, but has no defined law on jaywalking. There is difficulty in implementation due to the lack of public awareness.

Currently, the Bhaktapur Durbar Square is declared as World Heritage Site and a vehicle free zone for more than 20 years. The Municipality is planning to extend the same initiative to make the whole core area of Bhaktapur as vehicle free zone from 2050 A. D. onwards.

The main barriers in improving the pedestrian facilities include

- Lack of awareness
- Non-stringent implementation of rules especially for family related relationship and people with high economic status and;
- Restricting entry of private vehicles in the city core.

### Local Development Office – Bhaktapur

About 60-70 percent is the total pedestrian trip mode share in the city. However, Bhaktapur itself is small so we do not have more areas to construct wide side walking paths. We have to work on the old maps for the design of roads, which were made during 2008 B.S.

### Bhaktapur Municipality Police Station

By the year 2066/67 B.S; there were 224 injuries in road accidents. Out of that 50 were pedestrians.

By the year 2066/67 B.S; total fatalities in road accidents=159. Out of that 17 were pedestrian deaths.

By the year 2065/66 B.S; total injuries were 131 in road accidents. Out of that 80 were pedestrians.

By the year 2065/66 B.S; total fatalities were 127 in road accidents. Out of that 14 were pedestrians.



## **X. Walkability: A Governance Challenge**

### **A. Increasing number of vehicles in Kathmandu Valley**

The number of cars in Kathmandu Valley has increased tenfold over the last 15 years, largely because banks have had few other viable investment opportunities amid deteriorating security conditions and only 126km of new roads have been constructed. According to the Department of Transport Management, there are 444,700 registered vehicles in Bagmati zone, most in the Kathmandu Valley.

However, registrations have increased significantly as motorcycle dealers have been offering attractive promotional schemes. Increased disposable income, easy transportation and craze for motorcycles among the young generation are also some of the reasons behind the increased number of bikes hitting the roads.

Along with registrations, revenue collection has also increased significantly. The Bagmati Zone Transport Office took in Rs. 147 million as revenue from two-wheelers during the last fiscal year. This year, revenue has already surpassed Rs. 701 million in the first 10 months.

In response to the disinclination among banks to provide financing for motorcycles and growing unsold stock, two-wheeler dealers have been launching various promotional schemes that provide attractive gifts and sure-shot cash prizes.

### **B. Government Transitions**

A full year has passed since a 2009 report of a committee led by former Kathmandu Mayor Keshav Sthapit recommended to the government a possible solution to the problem created by street vendors. However, with the change in the government after the report was submitted, no initiative has been taken to implement the report.

The report gave recommendations to the government to allocate separate places for street vendors, make provision to allocate some rooms in super markets and shopping centers for street vendors having less capital and practice mobile shopping. It has also advised the government to take action against vendors who encroach upon the footpath.

Managing the footpath and evicting street vendors in Kathmandu has always been a tough job for the municipal police and the report could be an appropriate tool when it comes to solving the problem. Due to government transitions, the initiative to manage vendor encroachment remains delayed and the situation is getting worse by the day.

### **C. Road Maintenance**

Roads in Kathmandu Valley are indeed in a sorry state. Most of the roads are ridged and drivers are at risk. Driving on these roads makes drivers apprehensive that they might hit people or damage their engine. Consequently, their vehicle consumes more fuel and takes more time to reach one's destination. About 70 per cent of the country's vehicles ply on the Valley's roads.

There are three kinds of road maintenance - routine (all the year), recurrent (2-3 year/cycle) and periodic (5-7 year/cycle) and repairing standard involves at least 40 mm layering. However, repair work has not met these standards. The Kathmandu Valley Division of Roads need about Rs 490 million annually to maintain the Valley's roads, but the government allocates only Rs 140 million. Due to machinery problems and the heavy pressure of vehicles during the day, their manpower has to work at night, and this has caused road deformities.

A total of Rs 2 billion was allocated to the Ministry of Physical Planning and Works for road maintenance in the current fiscal year. The Ministry has asked for Rs 6 billion from the National Planning Commission for 9,000 km of road repairs across the country in the next fiscal year.

Due to the low quality of road repairs, at least one-fourth of all roads deteriorate every year due to the lack of maintenance.

#### ***D. Traffic Management***

The importance of safety on the roads is a serious concern since it involves loss of precious lives due to road accidents. Though various factors are responsible for the sharp escalation in the number of road accidents, it is the police that bear the brunt of public criticism.

Traffic enforcement measures must be duly matched by town and country planning and traffic engineering measures to ensure a smooth and orderly movement on the roads. Facilities for parking, a cycle track, median islands along with good pavement and appropriate road lighting will facilitate free and rapid flow of traffic. There should be coordination between the enforcement authorities and town planners. Transport authorities must ensure a stringent driving test before issuing driving licenses. Traffic safety awareness needs to be inculcated in the community, particularly in the minds of school children. As part of the awareness campaign on road safety, a 'road safety week' has to be observed every year to give more emphasis to road safety by undertaking numerous activities vigorously.

The use of technology is the key and will act as a force multiplier in all future traffic management strategies. The police needs a command and control centre which includes a computer-assisted call centre with an inbuilt databank of telephone numbers and addresses, voice dispatching mobile units and GIS data integration. This would help the police in quickly responding to an emergency situation, rapidly dispatch vehicles to the required location and automate call taking and dispatching.

The use of modern techniques and state of the art technology could empower the road users with traffic information for their convenience and safety through various delivery channels before and during travel. The police needs to equip itself with a comprehensive traffic system that includes tools of collecting, processing and transferring traffic information to road users by means of electric bulletin boards, news transmitters and SMS.

The current system of traffic enforcement is manual, and offences are written down on preprinted forms. The violators are punished randomly. In the absence of any central database, tracking habitual offenders becomes extremely difficult, resulting in poor deterrence.

To improve traffic enforcement, upgrading the police with various automated features is the need of the hour. The police needs to acquire a system which captures real time data and transmits them to the central database.

Police vehicles need to be equipped with the GSM/GPS system for easy tracking and efficient use of vehicles. Traffic signals should be synchronized for a smooth flow and decongestion at intersections.

Traffic planners also have to put in place a system that is capable of properly coordinating the process of registering a parking space and also do online monitoring of it. Even on the outskirts of the city, dynamic displays should guide the driver to parking spaces. All information should be monitored online in the management/control centre, which relieves the driver of the chore of finding a parking space.

### ***E. Lack of coordination among regulating agencies***

The Asian Development Bank's Sustainable Urban Transport Project aims to assist the government in defining a sustainable urban transport vision to be progressively implemented over the years to come. It focuses on the dramatic increase in private vehicles in the capital.

The construction of flyovers and wider roads alone cannot improve the traffic situation as the number of private vehicles increase at the same rate. Improving the existing road network and encouraging proper use of roads is a sustainable and doable solution. The acquisition of land to widen roads is too expensive so the initial solution is to include various measures to reduce the volume of traffic and to improve the quality of public transportation.

The government could raise annual and import taxes on vehicles, and pull unviable vehicles off the road, in order to cut the growth in private vehicles. However, although what is necessary is clear, implementation will be difficult because of a lack of coordination among traffic monitoring and regulating agencies.

Under the Local Self Governance Act 1999, local bodies planned and implemented policies independently, according to the needs of their localities. The costs of this arrangement are rapidly climbing as traffic gets worse.

The responsibilities are split up among various groups that don't communicate adequately with one another: the Department of Roads repairs city roads, the Department of Transport Management registers and regulates vehicles, the Traffic Police supervise and enforce traffic regulations, the Ministry of Environment monitors air quality and the Department of Urban Development and Building Construction is responsible for strategic roads and city planning while municipalities construct local roads and parking spaces.

Naturally, it will be difficult to coordinate with departments that are under different ministries. The Traffic Police fall under the home ministry. An example of the problems this interconnectedness gives rise to: while it is necessary to revise traffic acts and regulations in order to increase penalties for traffic offenders, this is impossible unless roads are widened first, which the Traffic Police don't have the power to do.

## **XI. Best Practices in Kathmandu Valley**

### ***A. Kathmandu's Sustainable Urban Transport Management Project***

The Kathmandu's Sustainable Urban Transport (KSUT) Management Project of the Asian Development Bank (ADB) was launched August this year to manage the city's haphazard traffic by the end of 2014. The project aims to improve the operation of public transportation, implement traffic management plan for central areas of the Valley, introduce pedestrian areas in the old towns of Kathmandu with links to transport facility and improve the city's air quality by promoting electric vehicles.

ADB has assured a financial support amounting to US\$ 22 million in grant and loan for the project that will be funneled to the Department of Roads under the Ministry of Physical Planning and Works (MoPPW), Transport Management Department under the Ministry of Labour and Transport Management, Traffic Police under the Ministry of Home Affairs and Kathmandu Metropolitan City under the Ministry of Local Development. The six-month study conducted by the ADB technical team was recently completed which also contains the Walkability Survey Report from the Clean Air Initiatives for Asian Cities.

The KSUT management project includes developing parking stations at the southern part of Tundhikhel, premises of Social Welfare Council, Lainchaur, banks of the Bishnumati river and major city centres. The parking lots on the streets and in areas including Durbar Marg, Bhotahity, Sundhara and New Road will be removed. The project plans to reopen the Bhadrakali-Maitighar road crossing the Army Headquarters which was closed about a decade ago during the Maoist insurgency due to security reasons.

The ADB will provide full support to develop intersections at Teku, Sorhakhutte, Paropakar, Dallu and Bishnumati corridor junctions. The Bishnumati Link Roads will be extended from Teku to Balkhu along the Bishnumati River and to Kupondole along the Bagmati River. ADB will also support 33 per cent of the expenses for development of pedestrian zones on the city roads and streets. This project has also planned to promote electrical vehicles and traffic light system, and purchase equipment for checking vehicle emission. ADB has also agreed to support the survey and design for Old Bus Park Redevelopment Project wherein adoption of public-private-partnership modality is intended for the development of this bus park.

The KMC declared Hanumandhoka Durbar Square as a vehicle-restricted zone about two months ago and plans to extend to Thamel. The streets will be stone paved and solar panel technology will be adopted to electrify temples, courtyards, public places and roads for the conservation of heritage sites and promotion of tourism and business in the area.

### ***B. Construction of overhead bridges for pedestrians***

Kathmandu Metropolitan City (KMC) and Innovative Concept Pvt. Ltd. signed a 27-point agreement on constructing four overhead bridges over the next couple of years in order to ease pedestrian's burden in crossing unsafe roads. An added number of such passages are expected

to reduce traffic accidents in the most populous city in the country. New constructions will take place at Naya Baneshwor, Koteshwor, Gongabu and Machha Pokhari. Innovative Concept has the reputation of constructing two such bridges in Kathmandu and maintaining six others constructed by the KMC for commercial purposes.

The completion of works depends on how early the KMC will provide land for the purpose but for Innovative Concept's part, they are dedicated to completing the task in two years. According to the latest agreement, KMC will provide land in the four places while Innovative will invest in the construction. In addition, Innovative will pay Rs. 2.2 million per year to the metropolitan body. It is manifold the amount the contractor used to pay on yearly basis -- Rs. 120,000. The contractor will earn by renting spaces created on the bridge for commercial purposes for 18 years.

Innovative will construct the bridges along with toilets and regulate hoarding boards, according to the criteria set by the civil body. In case the contractor wishes to break the deal, it has to do so three months in advance while the KMC is required to pay compensation to Innovative if it scraps the deal.

## **XII. Future Directions**

Walking is a critical component of the transport system, and that improved walkability and increased walking can provide significant benefits to society. This increases accessibility and community livability, provides consumer and public cost savings, improves public health and supports strategic economic development, land use and equity objectives.

As a way forward, we want to disseminate the results of the walkability survey in Bhaktapur City through a local consultation and discussion with all relevant stakeholders to come up with an improved planning guideline and investment in pedestrian infrastructures. This can help change planning priorities that would justify devoting more government funding to walking facilities and programs, shifting road space from traffic and parking lanes to sidewalks and paths, policies to create more walkable land use patterns, and greater efforts to manage motor vehicle traffic to improve walking safety and comfort.

Through strategic awareness raising campaign, CEN and CANN aims to strengthen people's understanding of pedestrian safety education and proper motorist behavior with the help from the Municipality, the traffic police and local development office.

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**Annexes: Sample Field Survey Form**

**WALKABILITY IN ASIAN CITIES**

**FIELD SURVEY**

City:  Survey Area Name

Direction (L/R)  Area Type  Peak Hour Yes  No

Survey Team Names

Surveyed Road Stretch	1	2	3	4	5	6	7	8	9	10
1. Walking Path Modal Conflict	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Availability Of Walking Paths (with Maintenance and Cleanliness)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Availability Of Crossings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Grade Crossing Safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Motorist Behavior	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Amenities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Disability Infrastructure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Obstructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Security from Crime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Pedestrian count	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Length of surveyed stretch (Km)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**General Description of Area**

**Rough Sketch**

## Sample Pedestrian Survey Form

### WALKABILITY IN ASIAN CITIES PEDESTRIAN PREFERENCE SURVEY



#### Instructions

Please be courteous and explain the reason for this survey before asking the questions. This survey is a project of the Clean Air Initiative for Asian Cities (CAI-Asia Center) and the Asian Development Bank and is being conducted in many Asian cities in order to determine the problems faced by pedestrians, to know the pedestrians' preferences and their requirements. Please ensure that all the questions are answered.

#### 1. Travel Behavior

How much time they spend in each mode, how much is the average travel time in one direction for a major trip say to office or school? Analysis of this would help in understanding the trip preference. It is also important to understand if they are captive or choice riders and for this reason we need to ask for availability of vehicle ownership.

Mode of transportation commonly **used per day** and average travel time spent on each mode (please tick) – **estimates for one way can be considered**

Mode	<=15 min	15-30 min	30-60 min	60-90 min	> 90 min
Walk					
Cycle					
Bus/Mini Bus					
Micro Van					
Three wheeler (Tempo) 1. Gas 2. Electric					
Private Car					
Commercial Taxi					
Motorcycle					

--	--	--	--	--

Average Travel Time (**one Way**) from residence to main destination (please tick)

<=15 min	15-30 min	30-60 min	60-90 min	> 90 min

Average Travel Distance (**one Way**) from residence to main destination (please tick)

<=3 km	3-6 Km	6-9 km	9-15 km	> 15 km

What type of vehicle(s) does your family own? (please tick)

Bicycle	Car	Motorcycle	No Vehicle	Others (Pls. Specify)

Enumerator -



**2. Pedestrian Preference**

*Pedestrian preference survey is mainly to understand pedestrian needs and desire. It is also intended to understand their concerns on air pollution and other issues such as subways and skywalks. Also we need to determine if they would migrate to other modes if improvements are not made*

How do you rate the Pedestrian facilities in the city? ( 1= Worst, 2= bad, 3 = Ok, 4= good, 5= Best)

--

If given an opportunity what improvement you would like to have in pedestrian facilities (rank the top five options )

	Top 5 Priority ( 1 is top most and 5 lowest)
Easy access for people with special abilities	
Improved street lighting	
Wider, Level and clean sidewalks/ footpaths	
Reduced and slow traffic on road	
Remove obstacles/parking from footpath	
More crossing points	
Improved infrastructures (waiting sheds, paved roads, greenery)	
No/other remark	

If you have to cross the road what do you prefer?  
(please tick)

Ground Crossing (at-grade)	
Skywalks (overhead crossings)	
Subways (underground)	

How far are you willing to walk to access crossings, skywalks/subways  
(please tick)

<50m	50-100 m	100-200 m	200-300m	> 300m

When do you think are you most exposed to air pollution?

Walking	Bicycle	Bus/Microvans	Tempo	Car/Taxi	Motorcycle	Waiting for bus

Do you plan to shift from walking to other mode in future if no improvement is done? If so which mode?  
(please tick)

Walking	Cycle	Bus/Microvans	Tempo	Car/Taxi	Motorcycle

Enumerator -

--	--	--	--	--	--

**3. Socio-Economic Profile**(please tick)

Male	Female

Sex

Age



0-15 Years	15-30 Years	30-50 Years	>50 Years

Occupation

Household Income

<=5000	5000-10000	10000-15000	15000-25000	>25000

**Score Sheets: Field Walkability Data in Bhaktapur - Residential**

WALKABILITY IN ASIAN CITIES													
FIELD SURVEY													
											 		
<b>City:</b>	Bhaktapur		<b>Survey Area Name:</b>	Tekhacho-Bansagopal and Ramghat-pottery square Byasi-durbar square and Golmadhi-Tibukchhen Bholachhen-Mahalaxmi temple-Sukuldhoka and Kamalvinayak-Navadurga temple-Taulact								<b>Road Stretch</b>	
												1 to 4 5 to 8 9 to 12	
<b>Direction (L/R):</b>			<b>Area Type:</b>	Residential									
			<b>Peak Hour:</b>										
<b>Surveyed Road Stretch</b>													
<b>Road Stretch</b>	1	2	3	4	5	6	7	8	9	10	11	12	
1. Walking Path Modal Conflict	2	2	4	4	3	3	4	4	4	4	4	4	
2. Availability Of Walking Paths	3	3	3	3	3	3	4	4	4	4	4	4	
3. Availability Of Crossings	*	*	*	*	5	5	5	5	4	4	4	4	
4. Grade Crossing Safety	2	2	2	2	4	4	4	4	4	4	4	4	
5. Motorist Behavior	2	2	2	2	2	2	4	4	4	4	4	4	
6. Amenities	3	3	3	3	3	3	5	5	3	3	4	4	
7. Disability Infrastructure	1	1	1	1	1	1	5	5	1	1	4	4	
8. Obstructions	2	2	2	2	3	3	5	5	4	4	4	4	
9. Security from Crime	2	2	2	2	4	4	5	5	4	4	4	4	
<b>10. Pedestrian count</b>	150	120	180	300	20	120	90	210	75	210	75	150	<b>1700</b>
11. Length of Surveyed Stretch (km)	0.34	0.34	0.39	0.39	0.78	0.78	0.68	0.68	0.93	0.93	0.51	0.51	
	1	2	3	4	5	6	7	8	9	10	11	12	Subtotal
	1020	816	2808	4680	468	2808	2448	5712	2790	7812	1530	3060	299.6
	1530	1224	2106	3510	468	2808	2448	5712	2790	7812	1530	3060	291.65
	0	0	0	0	780	4680	3060	7140	2790	7812	1530	3060	277.1
	1020	816	1404	2340	624	3744	2448	5712	2790	7812	1530	3060	275.5
	1020	816	1404	2340	312	1872	2448	5712	2790	7812	1530	3060	259.3
	1530	1224	2106	3510	468	2808	3060	7140	2093	5859	1530	3060	286.5625
	510	408	702	1170	156	936	3060	7140	698	1953	1530	3060	177.6875
	1020	816	1404	2340	468	2808	3060	7140	2790	7812	1530	3060	285.4
	1020	816	1404	2340	624	3744	3060	7140	2790	7812	1530	3060	294.5
<b>Field Walkability Index Score</b>													<b>269.92</b>
<b>Residential Area Pedestrian Count</b>													
	<b>Road</b>	<b>Time Start</b>	<b>Time Finish</b>	<b>Pedestrian</b>									
	1	4:02	4:05	150									
	2	4:07	4:11	120									
	3	4:12	4:15	180									
	4	4:16	4:20	300									
	5	4:21	4:25	20									
	6	4:26	4:30	120									
	7	4:31	4:35	90									
	8	4:36	4:40	210									
	9	4:41	4:45	75									
	10	4:46	4:50	210									
	11	4:51	4:54	75									

**Score Sheets: Field Walkability Data in Bhaktapur - Educational**

WALKABILITY IN ASIAN CITIES																						
FIELD SURVEY																						
City:	Bhaktapur	Survey Area Name:	Byasi-Mahakali pith-Changunarayan bus stop Suryavinayak area(Outskirt area of Bhaktapur) Jagati and bhelekhel Educational area																		Road Stretch	1 to 6 7 to 14 15 to 21
Direction (L/R):		Area Type:	Educational Area																			
Peak Hour:																						
Survey Team Names:																						
Surveyed Road Stretch																						
Road Stretch	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1. Walking Path Modal Conflict	3	3	3	2	3	2	2	2	4	4	1	2	2	2	4	4	3	4	4	3	5	
2. Availability Of Walking Paths	1	1	2	3	1	1	1	1	3	3	2	3	1	2	1	2	2	2	1	1	2	
3. Availability Of Crossings	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
4. Grade Crossing Safety	4	4	3	3	4	4	2	2	4	4	4	4	2	2	4	4	4	4	4	4	4	
5. Motorist Behavior	3	3	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
6. Amenities	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7. Disability Infrastructure	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8. Obstructions	2	1	2	2	2	2	1	1	2	2	2	2	2	2	4	4	1	3	1	1	1	
9. Security from Crime	4	4	4	4	4	4	2	2	4	4	2	2	4	4	4	4	4	4	4	4	4	
<b>10. Pedestrian count</b>	240	225	195	105	855	75	330	195	150	105	240	135	150	240	55	270	870	225	225	120	120	<b>5125</b>
11. Length of Surveyed Stretch (km)	1.43	1.43	1.43	1.43	1.43	1.43	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Subtotal
	10296	9653	8366	3003	36680	2145	7920	4680	7200	5040	2880	3240	3600	5760	1980	10044	24273	8370	8370	3240	5580	820.56
	3432	3218	5577	4505	12227	1072.5	3960	2340	5400	3780	5760	4860	1800	5760	495	5022	16182	4185	2093	1080	2232	452.28
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	13728	12870	8366	4505	48906	4290	7920	4680	7200	5040	11520	6480	3600	5760	1980	10044	32364	8370	8370	4320	4464	1022.7
	10296	9653	5577	3003	36680	3217.5	11880	7020	5400	3780	8640	4860	5400	8640	1485	7533	24273	6278	6278	3240	3348	840.38
	3432	3218	2789	1502	12227	1072.5	3960	2340	1800	1260	2880	1620	1800	2880	495	2511	8091	2093	2093	1080	1116	286.94
	3432	3218	2789	1502	12227	1072.5	3960	2340	1800	1260	2880	1620	1800	2880	495	2511	8091	2093	2093	1080	1116	286.94
	6864	3218	5577	3003	24453	2145	3960	2340	3600	2520	5760	3240	3600	5760	1980	10044	8091	6278	2093	1080	1116	508.19
	13728	12870	11154	6006	48906	4290	7920	4680	7200	5040	5760	3240	7200	11520	1980	10044	32364	8370	8370	4320	4464	1044.9
<b>Field Walkability Index Score</b>																						<b>584.77</b>
	Educational Area																					
	Stretch N	Time Start	Time Finish	Pedestrian																		
	1	4:00	4:05	240																		
	2	4:07	4:11	225																		
	3	4:12	4:15	195																		
	4	4:16	4:21	105																		
	5	4:21	4:26	855																		
	6	4:26	4:30	75																		
	7	4:31	4:35	330																		
	8	4:36	4:10	195																		
	9	4:41	4:45	150																		
	10	4:46	4:51	105																		
	11	4:51	4:54	240																		
	12	4:55	5:00	135																		
	13	5:01	5:04	150																		
	14	5:07	5:09	240																		
	15	5:13	5:15	55																		
	16	5:17	5:20	270																		
	17	5:23	5:27	870																		
	18	5:28	5:31	225																		
	19	5:32	5:35	225																		
	20	5:36	5:37	120																		
	21	5:38	5:40	120																		



**Score Sheets: Field Walkability Data in Bhaktapur – Public Transport Terminal**

WALKABILITY IN ASIAN CITIES																							
FIELD SURVEY																							
City:	Bhaktapur	Survey Area Name:	Siddhapokhari-Nepal electricity office-Byasi Changunarayan bus stop-Kamalvinayak Kamalvinayak- Chyamasingh- Jagati											Road Stretch 1 to 8 9 to 16 17 to 23									
Direction (L/R):		Area Type:	Bus Terminals																				
Survey Team Names:		Peak Hour:																					
Surveyed Road Stretch	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Walking Path Modal Conflict	2	2	3	3	2	2	2	4	2	2	2	2	1	1	3	3	4	4	3	2	2	2	2
2. Availability Of Walking Paths	2	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	3	3	3	2	2	2	2
3. Availability Of Crossings	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4. Grade Crossing Safety	2	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	1	1	2	2	
5. Motorist Behavior	2	2	3	3	3	3	2	3	3	3	2	2	2	2	3	3	1	1	2	3	3	3	
6. Amenities	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7. Disability Infrastructure	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8. Obstructions	2	2	2	2	3	2	2	4	2	2	2	1	2	2	2	2	3	3	1	2	3	3	
9. Security from Crime	2	2	3	3	2	2	3	3	3	2	2	2	2	2	3	3	2	2	2	2	2	2	
<b>10. Pedestrian count</b>	60	240	60	120	60	120	75	120	180	135	105	75	150	90	225	90	180	120	150	120	180	225	150
<b>11. Length of Surveyed Stretch (km)</b>	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.6	0.6	0.6	0.6	0.6	0.6	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	2412	9648	3618	7236	2412	4824	3015	9648	4320	3240	2520	1800	1800	1080	8100	3240	4320	2880	2700	1440	2160	2700	1800
	2412	9648	2412	4824	2412	4824	3015	9648	4320	3240	2520	1800	3600	2160	5400	2160	3240	2160	2700	1440	2160	2700	1800
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2412	9648	2412	4824	2412	4824	3015	9648	4320	3240	2520	1800	3600	2160	5400	2160	2160	1440	900	720	2160	2700	1800
	2412	9648	3618	7236	3618	7236	3015	7236	6480	4860	2520	1800	3600	2160	8100	3240	1080	720	1800	2160	3240	4050	2700
	1206	4824	1206	2412	1206	2412	1508	4824	2160	1620	1260	900	1800	1080	2700	1080	1080	720	900	720	1080	1350	900
	1206	4824	1206	2412	1206	2412	1508	2412	2160	1620	1260	900	1800	1080	2700	1080	1080	720	900	720	1080	1350	900
	2412	9648	2412	4824	3618	4824	3015	9648	4320	3240	2520	900	3600	2160	5400	2160	3240	2160	900	1440	3240	4050	2700
	2412	9648	3618	7236	2412	4824	3015	7236	6480	4860	2520	1800	3600	2160	8100	3240	2160	1440	1800	1440	2160	2700	1800
<b>Field Walkability Index Score</b>																							<b>280.62</b>

Bus Terminals			
Road	Time		Pedestrian Count
	Start	Finish	
1	4:00	4:06	60
2	4:07	4:11	240
3	4:12	4:16	60
4	4:16	4:21	120
5	4:21	4:26	60
6	4:26	4:30	120
7	4:31	4:36	75
8	4:36	4:41	120
9	4:41	4:45	180
10	4:46	4:52	135
11	4:52	4:54	105
12	4:55	5:00	75
13	5:01	5:05	150
14	5:06	5:09	90
15	5:13	5:15	225
16	5:17	5:20	90
17	5:23	5:28	180
18	5:28	5:31	120
19	5:32	5:36	150
20	5:36	5:37	120
21	5:38	5:42	180
22	5:43	5:46	225
23	5:48	5:53	150

### Score Sheets: Field Walkability Data in Bhaktapur – Commercial

WALKABILITY IN ASIAN CITIES													
<b>FIELD SURVEY</b>													
 													
City:	Bhaktapur	Survey Area Name:	Na (Guhye Pokhari) - Durbar Square Entrance Gate										Road Stretch
			New mini buspark-Bansagopal-Nasamana										1 to 4
			Taumadi square - Golmadhi										5 to 8
			Golmadhi-Dattatraya temple-Chyamasingh										9 to 10
			Commercial Area										11 to 12
Direction (L/R):		Area Type:											
		Peak Hour:											
Survey Team Names:													
Surveyed Road Stretch													
<b>Road Stretch</b>	1	2	3	4	5	6	7	8	9	10	11	12	
1. Walking Path Modal Conflict	4	4	4	4	4	4	2	2	4	4	2	2	
2. Availability Of Walking Paths	2	2	3	3	2	2	2	2	4	4	1	1	
3. Availability Of Crossings	*	*	*	*	*	*	*	*	*	*	*	*	
4. Grade Crossing Safety	2	2	4	4	2	2	2	2	2	2	2	2	
5. Motorist Behavior	2	2	3	3	2	2	2	2	2	2	2	2	
6. Amenities	2	2	1	1	1	1	1	1	1	1	1	1	
7. Disability Infrastructure	1	1	1	1	1	1	1	1	1	1	1	1	
8. Obstructions	3	3	3	3	2	2	2	2	2	2	2	2	
9. Security from Crime	2	2	2	2	2	2	2	2	2	2	2	2	
<b>10. Pedestrian count</b>	105	147	90	210	119	119	300	375	150	120	161	133	<b>1896</b>
11. Length of Surveyed Stretch (km)	0.41	0.41	0.41	0.41	0.28	0.28	0.22	0.22	0.4	0.4	0.35	0.35	
	1	2	3	4	5	6	7	8	9	10	11	12	Subtotal
	1722	2411	1476	3444	1333	1333	1320	1650	2400	1920	1127	931	175.55
	861	1205	1107	2583	666	666	1320	1650	2400	1920	564	465.5	128.40
	0	0	0	0	0	0	0	0	0	0	0	0	0.00
	861	1205	1476	3444	666	666	1320	1650	1200	960	1127	931	129.23
	861	1205	1107	2583	666	666	1320	1650	1200	960	1127	931	118.98
	861	1205	369	861	333	333	660	825	600	480	564	465.5	62.97
	431	603	369	861	333	333	660	825	600	480	564	465.5	54.36
	1292	1808	1107	2583	666	666	1320	1650	1200	960	1127	931	127.59
	861	1205	738	1722	666	666	1320	1650	1200	960	1127	931	108.73
<b>Field Walkability Index Score</b>													<b>101</b>
Commercial Area													
	Road	Time		Pedestrian									
		Start	Finish										
	1	4:00	4:06	105									
	2	4:07	4:11	147									
	3	4:12	4:16	90									
	4	4:16	4:21	210									
	5	4:21	4:26	119									
	6	4:26	4:31	119									
	7	4:31	4:35	300									
	8	4:36	4:40	375									
	9	4:41	4:45	150									
	10	4:46	4:51	120									
	11	4:51	4:54	161									
	12	4:55	5:02	133									

Field Walkability Index	
Residential	270
Educational	585
Public Transport Terminal	281
Commercial Center	101
<b>Average of the Four Areas</b>	<b>309</b>

Length of Surveyed Roads	Kilometers
Residential	3.63
Educational	3.56
Public Transport Terminal	3.81
Commercial	1.66
<b>Total Length</b>	<b>12.66</b>

## Photographs



Sidewalks that are partially blocked by light posts, furniture refuse and bricks are common sight across the stretch of Changu Narayan bus stop to Nagarkot bus stop. Bhaktapur is known to produce a number of bricks from several brick kilns operating within the city.







A number of road shoulders in Bhaktapur especially outside the city core remain unpaved producing re-suspended dust. This also forces pedestrians to use the main roads creating conflict with the vehicles.





In this photo, Bhaktapur's paved side streets in the public transport areas are narrow with less than 1 meter width. Pedestrians are in constant battle with vehicles while walking to their destinations.



Some areas display uncollected garbage that blocks walking paths.



Vendors' encroachment of the sidewalk paths is a problem being faced by pedestrians. The Municipality admitted having difficulty in implementing laws against vendor encroachment due to lack of manpower.



Road maintenance is a challenge for pedestrians using these paths everyday due to inconsistent level of roads.



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