

Moving Dangerously, Moving Pleasurably: Improving Walkability in Dhaka



Using a *BRT Walkability Strategy* to Make
Dhaka's Transportation Infrastructure
Pedestrian-Friendly
Summary Report

Table of Contents

OVERVIEW	1
1 THE IMPORTANCE OF A WALKABILITY STRATEGY	3
2 THE CURRENT TRANSPORT SITUATION IN DHAKA	4
3 IMPROVING WALKABILITY IN DHAKA	9
4 PROPOSED PILOT PROJECTS	12
5 CONCLUSIONS	20
REFERENCES	21

List of Tables

Table 1: BRT Walkability Strategy recommendations and responsibilities	10
Table 2: Proposed breakdown of street space, Shahajalal Avenue	14
Table 3: Overview of issues addressed, research findings, and recommendations.....	17

List of Graphs, Figures, and Maps

Figure 1: In Dhaka, pedestrians must compete with cars for mobility space	1
Figure 2: Walkable communities are livable communities.....	2
Figure 3: Shared road space makes a community more walkable, cleaner, and healthier	3
Figure 4: Most trips in the DMA are by foot	4
Figure 5: Overview map of study area	4
Figure 6: Focus group, Uttara	5
Figure 7: Map: Footpath Availability	5
Figure 8: Poor quality footpath, Mirpur	6
Figure 9: Dirty, obstructed footpath.....	6
Figure 10: Unsafe roadway in Dhaka.....	7
Figure 11: Recommended improvements, perception survey	7
Figure 12: Footpath with non-curvilinear curb cut	7
Figure 13: Vendors providing "eyes on the street", Gazipur.....	8
Figure 14: Dangerous crossing in Dhaka	9
Figure 15: Mixed land uses increase pedestrian opportunities	9
Figure 16: Map: Shahajalal Avenue, pilot site	12
Figure 17: Before pictures of Shahajalal Avenue	13
Figure 18: Map: Travel infrastructure, Shahajalal Avenue	14
Figure 19: Before-after artistic renderings of Gazipur pilot design.....	15

Acknowledgements

Many people and organizations have contributed to the design and completion of this study in various ways. Of those in Bangladesh, we would particularly like to express our special thanks to political and civic leaders in and residents of Tongi Pourashava and Gazipur Pourashava, to experts and project staff in the Dhaka City Corporation, the Local Government Engineering Department, the Transport Coordination Board, and the Roads and Highways Department, to professors and students at BUET and Jagannath University, to World Bank specialists, and to staff at WBB Trust. Of those outside Bangladesh, we would like to acknowledge the special support from and contributions by specialists at the Asian Development Bank, the Advanced Logistics Group, Gehl Architects, and the HealthBridge Foundation of Canada.

The project team was comprised of the following people:

Team Leader: Debra Efroymson (Regional Director, HealthBridge)

Technical Advisers: Saifuddin Ahmed (Executive Director, WBB Trust) and Kristie Daniel (Program Manager, Livable Cities, HealthBridge)

Research Team: From WBB Trust: Syed Mahbulul Alam (Director, Programming and Planning), Gaous Pearee Mukti (Director, Administration), Aminul Islam (Project Coordinator), Maruf Hossain Rahman (National Advocacy Officer), Najnin Kabir (Senior Project Officer), Ziaur Rahman (Project Officer); from HealthBridge and McGill University: Brendan Azim Rahman (Intern and student)

Field Researchers: From Urban and Regional Planning, BUET: Md. Abu Hanif, Md. Rifat Hossain, Neaz Rassel Shaikh, Arnab Thakur Roni, Syed Rezwanul Islam; Fuad Hasan Ovi, Md. Jashim Uddin; from the Department of Architecture, BUET: Azher-ul-Islam, Nazmul Ahmed, Muhammad Abu Zobayer; from the Department of Architecture, UAP: Md. Sakib Hossain; and from the Civil Engineering Department, UAP: Ashiq Mahmud.

Data Entry: Shamsia Akther Jenny, Sharmin Akther Rini

Design Team: Brendan Azim Rahman, Prodip Biswas Md. Robiul Islam, Sagor Das

Report Editing, Layout, and Formatting: Lori Jones, Director (Special Projects), HealthBridge

List of Acronyms

ADB:	Asian Development Bank	DUTP:	Dhaka Urban Transport Plan
BR:	Bangladesh Railways	LGED:	Local Government Engineering Division
BRT:	Bus Rapid Transit	LGRD:	Ministry of Local Government and Rural Development
BRTA:	Bangladesh Road Transport Authority	NGO:	Non-governmental Organization
BRTC:	Bangladesh Road Transport Corporation	NMT:	Non-motorized Transport
BUET:	Bangladesh University of Engineering and Technology	RAJUK:	Capital Development Authority
DAP:	Detailed Area Plan	RHD:	Roads and Highways Department
DCC:	Dhaka City Corporation	STP:	Strategic Transport Plan
DITS:	Dhaka Integrated Transport Study	UAP:	University of Asia Pacific
DMA:	Dhaka Metropolitan Authority	WASA:	Dhaka Water Supply and Sewerage Authority
DMDP:	Dhaka Metropolitan Development Plan	WBB:	Work for a Better Bangladesh Trust
DMP:	Dhaka Metropolitan Police		
DTCB:	Dhaka Transport Coordination Board		

Overview

To improve the growing traffic problems in Dhaka, the Asian Development Bank (ADB) is currently supporting the development of a Bus Rapid Transit (BRT) corridor that will run between the airport and Gazipur. It is anticipated that the BRT will carry up to 100,000 passengers daily along the 20-kilometre corridor. However, since a large proportion of trips in Dhaka are currently made by foot, the needs of pedestrians must be addressed if the BRT is to create a positive and efficient public transit experience. Walking is, in fact, a basic form of mobility in Dhaka and is an important component of almost every journey taken. When the BRT is fully operational, passengers will need to walk to and from the stations safely and comfortably.

To ensure that the BRT corridor not only improves traffic problems in Dhaka but also addresses the needs of pedestrians, this report presents a **BRT Walkability Strategy** which provides policy and infrastructure recommendations aimed at creating an environment in which walking is appealing, safe, and convenient. The BRT Walkability Strategy can be used as a model for other neighbourhoods in Dhaka, as well as for other cities throughout Bangladesh, to assist decision-makers as they strive to create safer and more convenient pedestrian-friendly transportation options.

The BRT Walkability Strategy builds on the results of primary and desk-top research, as well as extensive discussions with both policy-makers and citizens. An observation and perception study was designed to generate a clearer picture of the actual and perceived problems faced by pedestrians in Dhaka and to identify and document the specific challenges that they confront. In May and June 2011, direct personal observations of pedestrian environments were conducted in Uttara, Gazipur, and Tongi – areas located directly along the proposed BRT Line. Observations were also made in Mirpur and Old Dhaka, as these areas would be served by a proposed World Bank-funded BRT line which will ultimately be connected to the airport/Gazipur corridor. A total of 1,055 road segments were observed and photographed. The study revealed that footpaths were often non-existent or in very poor condition, while crossing streets is both difficult and dangerous.



Figure 1: In Dhaka, pedestrians must compete with cars for mobility space

The observational study was complemented by a perception study of a random sample of 1,850 people and two focus group discussions. The perception survey was conducted among residents of and visitors to various locations in Uttara, Tongi, Gazipur, Mirpur, and Old Dhaka who were asked about how they felt about current street and walking conditions. In addition to complementing the observations made by the research team, these interviews were important to gauge people's *perception* of their walking experiences. The focus groups, held with mothers of school aged-children and female garment workers, explored some of the perceived problems in more depth, particularly related to safety when walking. The surveys and the

discussions highlighted that walking in Dhaka is often neither safe nor convenient. A corresponding survey of 64 hawkers focused on identifying facilities and supports which could improve the pedestrian environment; it also highlighted the mostly unrecognized contribution that hawkers make to Dhaka's economic vitality and safety.

An analysis of transport policy documents was also carried out. The purpose of this review was to identify sections in the existing plans that addressed pedestrians, to determine who is responsible

for which aspects of the pedestrian environment, to flag potential institutional and coordination barriers to pedestrian safety, and to acknowledge key stakeholders who must be involved in improving the pedestrian environment. Further information was collected during a series of workshops and information sessions held with local-policy makers and stakeholders. While thirteen agencies within five Ministries have responsibilities which impact on the pedestrian environment in Dhaka, no single body exists to look after the situation of pedestrians. There is also little coordination between those responsible for urban planning and those responsible for transport planning. Although many existing policy documents make reference to the importance of pedestrians, few have put suggestions into action. The situation is serious: by 2008-09, pedestrians accounted for 86% of road fatalities.

Many policy-related recommendations emerged from the research, including the need to create a Non-Motorized Transportation Cell (NMT Cell), evaluate pedestrian impacts of road projects, train staff on pedestrian issues, build and maintain footpaths, create safe, at-grade pedestrian crossings, establish parking controls and charges, develop a maintenance schedule for footpaths, develop a Hawker support and management policy, develop a Pedestrian Charter of Rights, and organize driver education campaigns.

The BRT Walkability Strategy reflects the results of the research and provides plans for possible pilot projects in Uttara and Gazipur which could illustrate the types of improvements that could realistically be made in Dhaka. These pilot projects address two road segments that connect to the BRT and redesign them to be supportive of all mobility modes to create a safe, clean, and comfortable pedestrian experience. The Strategy also highlights broad policies and actions, based on existing best-practices, which need to be taken to create more pedestrian-friendly cities generally.

An improved environment for pedestrians would also result in improved traffic flow and would help create a more congenial living environment. Current challenges to the creation of a pedestrian-friendly environment include a weak policy framework, an unsupportive infrastructure, and a transportation environment that is more focused on cars than on people. There is, however, tremendous opportunity for Dhaka's residents to demand improved pedestrian conditions and for the city's decision-makers to show real leadership and make investments in pedestrian-friendly environments. This leadership is already being shown in some areas, as evidenced by the support given to the proposed pilot projects.

Pedestrians are of vital importance to a city and yet face many obstacles to their safe, easy and convenient movement. Those problems cannot be adequately addressed without first giving pedestrians priority within urban and transport planning. The BRT Walkability Strategy provides the framework within which a pedestrian-friendly city that values walking can be created.



Figure 2: Walkable communities are livable communities

This report is a summary of the original report. For more information, please contact the ADB (jshah@adb.org), WBB (info@wbbtrust.org) or HealthBridge (debra@healthbridge.ca).

1 The Importance of a Walkability Strategy

The BRT Walkability Strategy envisions a city with a culture of walking. It envisions a city in which streets, parks, public spaces, and neighbourhoods are accessible, secure, vibrant, and enjoyable so that people choose to walk more often. Walking does not harm the physical environment, it is free, it requires little infrastructure, it can save time, and it requires no fuel. **But what makes a Walkability Strategy necessary?**

As Dhaka's commercial streets depend on high levels of foot traffic, designing communities that facilitate walking will benefit local businesses. In addition, creating a walkable community along the BRT corridor will contribute to the success of public transit, as most transit trips begin and end with walking. Finally, supporting and building pedestrian-friendly environments will encourage people to choose walking as a regular mode of travel, creating lively streets and making the city more livable. In other words, **walkable communities are livable communities.**



Figure 3: Shared road space makes a community more walkable, cleaner, and healthier

The transportation sector creates environmental problems when it prioritises moving private automobiles rather than people. Space allocated to moving and parking cars and motorbikes means less space for housing, parks, schools, and playgrounds. Negative environmental impacts can be lessened by reducing vehicle kilometres travelled, encouraging active transportation, building communities that reduce the distances people must travel. Walking and cycling do not emit air pollutants, require significantly less space, and generate little if any noise. **Walking and cycling are environmentally-friendly modes of transport.**

Low physical activity levels contribute to obesity, heart disease, diabetes, and other chronic health problems. One of the easiest ways to be active is through purposive physical activity: trips made on foot could reduce the risk of diseases and their high social and economic costs. However, walking safely requires a safe walking space. In Bangladesh, pedestrians are the main victims of road accidents. In 2006, the Bangladesh Health and Injury Survey estimated there were approximately 13,200 reported road traffic deaths in the country and 403,000 injuries; 54% of the dead were pedestrians.¹ In Dhaka, the proportion of road deaths that are pedestrians is even higher, at 86%. Almost half of pedestrian-related accidents occur while people are waiting for a bus or walking along the roadway. A walkable community is more than a place where people walk; it is an environment in which people walk often, securely, and conveniently. **Walkable communities are therefore safer and healthier communities.**

Transport and urban planning in Dhaka and surrounding areas is the responsibility of many separate departments, agencies, and international organizations whose work is not coordinated. No single body exists to oversee pedestrian issues. By engaging all of these organizations, the **BRT Walkability Strategy could encourage and facilitate coordination.**

¹ World Health Organization, *Global Status Report on Road Safety: Time for Action*. Geneva: World Health Organization, 2009, p. 9. <http://www.un.org/ar/roadsafety/pdf/roadsafetyreport.pdf>

2 The Current Transport Situation in Dhaka

2.1 Walking in Dhaka

The vast majority of trips in Dhaka are done by foot, rickshaw, or public bus. Within the Dhaka City Corporation (DCC) area, 38.7% of primary trips are made by rickshaw, 28.5% by public bus, and 19% by foot. In the greater Dhaka Metropolitan Area (DMA) excluding the DCC itself, walking is the main form of transport, accounting for 37.2% of trips, followed by rickshaws (28.5%) and public bus (24.4%). In both areas, the percentage of trips taken by private car is very low: 5.2% in DCC and 3.8% in DMA.²

These numbers are not currently reflected in Dhaka's transportation planning and budget allocation. This study's research results highlight the importance of considering the most common forms of transport when determining how to allocate funds and what infrastructure should be prioritized.

To gain a better understanding of the problems faced by pedestrians in Dhaka and to identify and document the specific challenges that they confront on a regular basis, we conducted a multi-pronged observation and perception study using a variety of methods.



Figure 4: Most trips in the DMA are by foot

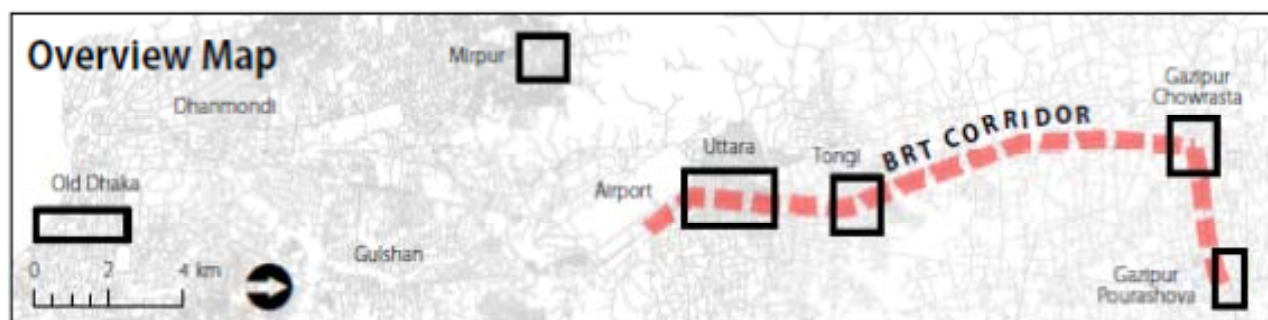


Figure 5: Overview map of study area

Using an observation analysis tool developed specifically for this study, the project team analysed 1,055 road segments (the section of road between two intersections) in Uttara, Tongi, Gazipur, Mirpur, and Old Dhaka. A team of twelve urban planning students completed one Observation Survey Form per segment after walking each segment several times. Still photography was also taken to document what the students had observed.

These personal observations were supplemented by perception intercept surveys conducted with a random sample of 1,850 residents of and visitors to the same five study areas; these perception surveys collected information about how people in the street felt about the street conditions which they experienced every day.

² Data taken from Dhaka Transport Coordination Board (DTCB), Ministry of Communications (MOC), Government of the People's Republic of Bangladesh, Preparatory Survey Report on Dhaka Urban Transport Network Development Study (DHUTS) in Bangladesh Final Report (Appendix Volume). JICA, March 2010.

For a more in-depth understanding of the issues, the research team hosted two focus groups discussions (FGDs), one with mothers of school-aged children and one with female garment factory workers. The project team also conducted a series of surveys with hawkers to identify ways to improve the pedestrian environment. The following categories were then used to analyse the research results:



Figure 6: Focus group, Uttara

- Land use diversity
- Footpath availability and quality
- Safety
- Facilities for the disabled & pedestrian amenities
- Community life (including hawkers)

2.1.1 Land Use Diversity

Three-quarters of the observed roads had either a low- or medium-volume of motorized traffic, which was reflective of the fact that eighty-four percent of the analysed segments were completely or primarily single use – mostly residences. Almost no segments contained parks or playgrounds. This lack of mixed-use was identified as a problem by some perception survey respondents. Thirty-eight percent said that a desired destination was “too far” to reach by foot conveniently or safely.

2.1.2 Footpath Availability

A major factor in pedestrian deaths is the lack of good quality footpaths, as people are forced to walk on the road. A previous DevCon (2009) report notes that there are only about 400 kilometres of footpaths within the DCC area, compared to a road network of 1,293 km. Ideally, footpaths should exist on both sides of a street; this suggests that Dhaka should have almost 2,600 km of footpaths. However, only 37% of observed roads had footpaths on both sides, and almost half had none at all.



Figure 7: Map: Footpath Availability

2.1.3 Footpath Quality

Most of the observed footpaths were constructed of dirt and sand, materials which are inappropriate in a city setting as they become virtually unusable during wet weather. Almost three-quarters of the footpaths constructed of better materials were still of poor quality and likely to cause pedestrian injury. Only 18% of the observed footpaths were given a “good rating.”

Surveyed pedestrians complained that the absence or poor quality of footpaths meant that they could not walk to their desired destinations. During focus groups, 62% of garment factory workers and mothers indicated that they would like to see wider, more level footpaths. The garment workers mentioned the often-muddy pathways as a particular hardship when walking.

The literature review suggested that even when footpaths are available, they are commonly obstructed, thereby reducing their usefulness (DevCon 2009). Consequently, pedestrians are often forced to walk in the street instead of on the footpaths, even in areas where footpaths are provided. This was corroborated by the observation study, which found that only 15% of all footpaths were free of obstructions. In 65% of the observed segments, the observer had to leave the footpath at least once because of obstructions.



Figure 8: Poor quality footpath, Mirpur



Figure 9: Dirty, obstructed footpath

Car exits/entries cut into footpaths are also a significant problem, affecting more than half of all observed footpaths. The Capital Development Authority (RAJUK) by-laws allow this type of design to accommodate vehicles. In addition, cars/motorbikes were observed parking on 39% of the footpaths. Thus, even where space is designed for pedestrians, it is being used for cars.

A common concern expressed in much of the literature is that vendors and shop-keepers block footpaths. The observation results did not support this claim. Instead, we observed that although goods from shops do block almost half of footpaths, vendors are much less of a problem, with only 22% of segments blocked by them. Meanwhile, vendors and shop-keepers can play the very important role of providing “eyes on the street”. A final significant obstruction on many footpaths is construction rubbish; 40% of all footpath segments observed were almost completely covered by construction rubbish, rendering them unwalkable.

2.1.4 Safety

Research conducted by Hoque et al. in 2008 found that the most dangerous places for pedestrians were on roads and at the sides of roads – precisely where pedestrians are often forced to walk due to absence, obstruction, or poor quality of footpaths. The most dangerous activities were crossing the road (46%) and walking along the road edge (35%). Only 3% of fatalities occurred at designated pedestrian crossings, suggesting that when pedestrian crossings – such as zebra crossings and signalized pedestrian crossings – exist, they provide significant protection for the pedestrian. Among perception survey respondents, 48% said that they feared crossing the street.

Despite the high level of pedestrian injuries and deaths, there were almost no crossing aids seen in the observed segments; in only 1% of the observed roads did cars yield to pedestrians. During focus

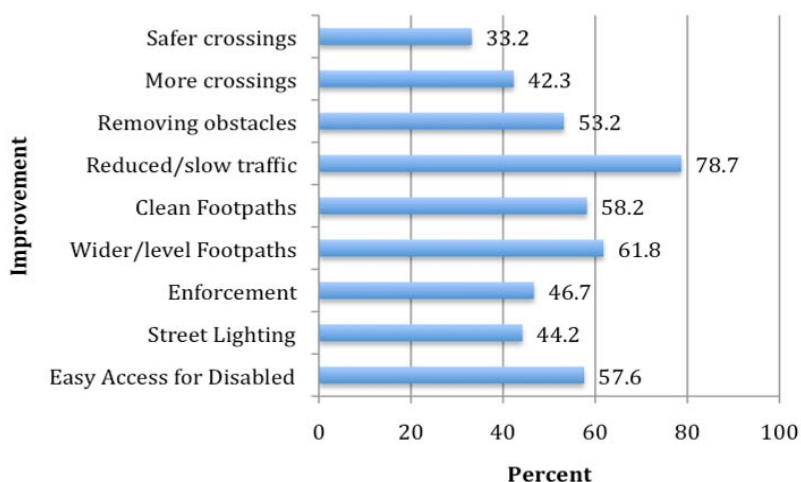
group discussions, it became clear that most people were unaware of the types of pedestrian crossing aids available. Although some participants felt that the foot over-bridges increased safety, women and the elderly in particular identified them as being a serious obstacle to their movement by foot, particularly when they are unwell or tired, when they are wearing saris, when they have children with them, and/or when they are carrying bags or boxes.

Observers noted aggressive drivers who were speeding or not giving pedestrians the right of way on 51% of the roads. Fifty-eight percent of participants indicated that cars or motorbikes caused them fear at least once a week, while 73% feared fast-moving buses. Very few roads had traffic calming or controlling measures. Reducing and slowing traffic was the number one priority of those surveyed. Poor quality, unusable footpaths increased the danger from vehicles. While vehicles parked on the road may provide a safe buffer between pedestrians and moving traffic, only 4% of the observed roads had legal, on-street parking. In most cases, vehicles were illegally parked. The most commonly suggested improvements involved reducing traffic speed, making footpaths and road crossings safer, and increasing/improving street lighting.



Figure 10: Unsafe roadway in Dhaka

Figure 11: Recommended improvements, perception survey



2.1.5 Facilities for the Disabled and Pedestrian Amenities



Figure 12: Footpath with non-curb cut

Virtually all of the roads observed during the study were inhospitable for people with disabilities. Few had curvilinear or curb cuts or were usable for a person in a wheelchair. Fifty-eight percent of the perception survey respondents desired better facilities for those living with disabilities.

At the same time, very few amenities (such as seating, trash cans, and public toilets) existed for pedestrians.

The most common service amenity was the presence of vendors, observed in only 20% of the

segments. Trees are also a very important pedestrian amenity as they provide shade and can provide a physical separation between pedestrians and traffic. Only 9% of streets surveyed had many trees/dense tree cover, while 62% of streets had few or no trees.

2.1.6 Community Life (Including Hawkers)

Pedestrian-friendly environments encourage more people to walk as a regular mode of travel, creating social, lively streets while reducing traffic congestion. Many pedestrians were observed in most segments, where people stopped to talk to or to greet one another. However, in only 9% of segments were children observed playing in the streets. No parks or playgrounds mean that the streets provide children with their only opportunity for outdoor play.



Figure 13: Vendors providing "eyes on the street", Gazipur

Given that 90% of people indicated that they felt safer with other people on the street, it is important to maintain a hawkers presence. While both mothers and garment factory workers felt that hawkers blocking the footpath were a problem, women also identified the key benefits of having vendors on footpaths: they act as “eyes on the street”, making women feel safe. Their presence not only increased the convenience of buying goods, which in turn reduced women’s travel time and distance; hawkers also contribute significantly to the local economy. An economic

analysis of hawkers showed that, on average, hawkers earned on average 250 taka per day (7,500 per month) after expenses; in contrast, many security guards earn just 3,000 to 3,500 taka per month. Almost all of the perception survey respondents said that they would like to see some type of hawkers management system implemented. For example, hawkers could be recruited to maintain cleanliness along their segment of the footpath.

2.2 Policy Context

Several studies have examined the issues faced by Dhaka’s pedestrians and have made suggestions to mitigate these challenges. These issues and potential solutions, however, have yet to be addressed to any great extent in Dhaka’s official transport plans and policies. A review of various transport and urban plans³ made it clear that while policy makers acknowledge that more than 70% of the daily trips taken in Dhaka include walking and that current pedestrian conditions are very poor, virtually all funding is allocated to moving motorized vehicles. Little attention is given in the plans to pedestrians or pedestrian issues. For instance, of 40 working papers listed in the 1994 Dhaka Integrated Transport Study, none specifically addresses pedestrians. The policy documents typically treat walking as transport for the poor. While some reports recognize the need for a pedestrian-first policy and include suggestions for policies to prioritize pedestrians over motorized vehicles, to provide street-level crossings, and to slow vehicular traffic, the focus remains on moving automobile traffic. Unfortunately, when pedestrian issues are addressed, it is typically not based on research but rather on perceptions of the pedestrian environment. For example, despite the fact that they actually represent a barrier to convenient pedestrian movement, the main pedestrian infrastructure recommended and planned is foot over-bridges and underpasses. Significant work needs to be done to embed pedestrian-supportive initiatives into the legal and policy frameworks.

³ Such as the Dhaka Metropolitan Development Plan, Dhaka Integrated Transport Study, Dhaka Urban Transport Plan, Strategic Transport Plan, Detailed Area Plan, and the Clean Air and Sustainable Environment Project.

3 Improving Walkability in Dhaka

Improving the environment for pedestrians would, in addition to being a precondition for making the BRT feasible, generate a broader positive change. It would help people to reach their destinations safely, affordably, and conveniently. It would also improve traffic flow and create a more congenial community. As such, improving the pedestrian environment would be one of the most popular measures that a politician could take. The many challenges to be addressed are accompanied by exciting opportunities.

Current challenges to the creation of a pedestrian-friendly environment include a weak policy framework, an unsupportive infrastructure, and a transportation environment more focused on cars than on people. However, there is significant reason to be hopeful given high modal share by walking; 88% of respondents indicated that they would be walking for at least part of their trip.



Figure 14: Dangerous crossing in Dhaka

Given that most people currently walk, there is a tremendous opportunity for the city's decision-makers to show real leadership and make investments in pedestrian-friendly environments. This would mitigate some of the serious problems that occur in cities that focus almost exclusively on the private motorized vehicle, such as congestion, pollution, and poor health.

Meetings with more than 150 policymakers and other stakeholders suggest that decision-makers are prepared to show leadership to improve pedestrian conditions. Stakeholders spoke of the need to improving conditions for walking, both for health and for convenient, relatively rapid transport. Support was garnered to move forward with planning two pilot sites to demonstrate possible pedestrian improvements. Stakeholders agreed that the pilot sites should be designed based on the problems identified through surveys and interviews rather than through pre-existing assumptions about the situation.



Figure 15: Mixed land uses increase pedestrian opportunities

Several actions are recommended as part of the **BRT Walkability Strategy**. No single measure will be sufficient to improve the condition of pedestrians in Dhaka to the point where walking can become a popular mode of transport that reduces road congestion and ensures the successful operation of mass transit. Given the wide range of issues that must be addressed, a broad and integrated approach is needed. Furthermore, given

the limited scope of this study, it will be necessary to conduct further research, including on the feasibility of the recommended options, before moving forward.

Table 1: BRT Walkability Strategy recommendations and responsibilities

Recommended Action	Government Level and Agency Responsible	Comments/Recommendations
Create a Non-Motorized Transportation Cell (NMT Cell)	DMA - LRGD	This cell should be responsible for overseeing implementation of the BRT Walkability Strategy, and should work with all staff involved in transportation and urban planning to improve the pedestrian realm. The cell would be a resource for all issues related to non-motorized travel.
Develop methods to evaluate pedestrian impacts	DMA – NMT Cell	Develop and implement tools and methods for evaluating the potential impacts of any road construction project on pedestrians.
Develop staff training programs	DMA - NMT Cell	Train all staff involved in transportation and urban planning on innovative practices for non-motorized travel, including walking.
Develop a Transportation Equity Analysis	DMA - NMT Cell	Ensure an equitable distribution of transport funds, noting that almost every trip involves walking but very few trips involve automobiles. Tools should be developed to help city staff equitably review and revise transportation budgets.
Develop fiscal policies related to road pricing, vehicle taxes, etc.	National - Ministry of Finance	Utilizing international experience, develop a series of fiscal policies to reduce incentives for owning and driving a private car; this could include congestion charges, vehicle registration taxes, higher vehicle import taxes (but lower taxes on bicycles), sales taxes, and/or annual vehicle registration fees.
Develop land Use policies – no parking on ground floor	DMA - RAJUK	Reverse the requirement that all new buildings provide car parking, thus freeing up valuable urban space for retail and housing.
Develop policy prohibiting construction rubbish	City - City Corporations	Develop policies to make car exit/entry cuts and construction waste disposal on footpaths illegal, with violators subject to fines and other punishments.
Ensure playgrounds in all new development	DMA - RAJUK	Enforce a policy requiring playgrounds in all new developments. Where no playgrounds or community parks exist, local streets should be converted to family-friendly areas to reduce traffic and improve liveability.
Build footpaths on all roads with high and medium volume of motorized traffic	City - City Corporations/ Pourashava	Ensure well-built and properly maintained footpaths on both sides of all roads with high and medium motorized traffic volumes. Priority should be given to roads with no existing footpaths and a high volume of pedestrians.
Build safe pedestrian crossings	City - City Corporations/ Pourashava	Ensure safe at-grade pedestrian crossings along all roads with high and medium motorized traffic volumes. At-grade crossings improve traffic flow by rationalizing crossings and traffic. FOBs are not practical or safe.
Upgrade dirt and sand footpaths	City - City Corporations/ Pourashava	Upgrade all footpaths made of dirt or sand to concrete. Give priority to roads with high volumes of pedestrian traffic.

Recommended Action	Government Level and Agency Responsible	Comments/Recommendations
Develop a Family-friendly streets project	City - DTCB	Designate low-volume roads with high pedestrian traffic and no footpaths as “family-friendly” roads. This would limit or prohibit vehicular traffic at certain times of day and allow people to play in the streets (given lack of other play/recreational areas in most neighbourhoods).
Establish Parking controls (space and fines)	City - City Corporations/ Pourashava	Develop policies to regulate and enforce car parking in designated spaces. Issue fines to anyone parked in a designated pedestrian or hawker space.
Parking charges	City - City Corporations/ Pourashava	Introduce parking charges on streets that do not currently have them. Increase the cost of parking. Base fees on the amount of space use and time taken: in areas of higher demand higher charges or smaller units of time are reasonable.
Develop a maintenance schedule for footpaths	City - City Corporations/ Pourashava	Give local City Corporations clearly stated responsibility for building and maintaining footpaths. Develop a footpath maintenance program, including regular monitoring and adequate funding.
Develop a street furniture program	City - City Corporations/ Pourashava	Involve the private sector in footpath maintenance and street furniture provision. The private sector could provide street furniture in return for advertising space. If considered, the city should develop a set of clear street furniture design guidelines to which the private sector must adhere to ensure an attractive public realm.
Develop a Hawker support and management policy	National - Ministry of Labour and Employment	Research and develop a hawker policy to properly support and manage hawkers and other street vendors; this would allow them to do business and increase safety and attractiveness for pedestrians without impeding their movement.
Organize Car-free Days	City - NGO	Organize car-free days to celebrate walking. Such days are celebrated internationally, reduce pollution, and are popular. Organize large public events to inform and educate the public about the importance of pedestrian safety.
Organize a driver education campaign; other programs	National - BRTA	Implement driver awareness campaigns. Train drivers about the importance of respecting pedestrians and allowing them to cross streets safely. Designate low-speed zones and/or pedestrian-only zones.
Develop a Pedestrian Charter of Rights	DMA - LGRD	Adopt a Pedestrian Charter of Rights. Use it as the basis of pedestrian-first policies and/or laws. It would serve as a reminder to decision-makers that walking must be valued as the most sustainable of all forms of travel, with enormous social, environmental, and economic benefits. Explore opportunities to develop specific laws to implement the Pedestrian Charter, including the specific recommendations made in this report.

4 Proposed Pilot Projects

The study results and the institutional analysis clearly demonstrate that significant practical and policy improvements must be made to Dhaka's pedestrian environment if people are to be moved safely. The project team designed two pilot projects, one in Uttara and one in Gazipur, to illustrate such improvements. The pilot designs were developed following a detailed analysis of the research results, extensive discussions with a variety of stakeholders, and numerous planning sessions. Although the pilots address design changes along two specific roadways, they are sufficiently generic as to be applicable more broadly throughout the entire Dhaka Metropolitan Area.

4.1 Uttara Pilot Project

Uttara is located immediately north of Dhaka's international airport. It is the southernmost area through which the BRT Corridor will pass and will provide a connection to the World Bank's proposed BRT Corridor. As the first section that will be built, Uttara provides an important test case for addressing key issues that affect pedestrian accessibility. It hosts several garment factories, whose workers generally walk to their place of employment. Although these workers are considered to be the urban poor, Uttara itself is not a low-income neighbourhood. As such, it is not uncommon for residents to own and use cars for personal transport. Uttara's mix of local residential and industrial areas and the potential for car-pedestrian conflict made it an ideal pilot site.

In terms of walkability, Shahajalal Avenue currently **is unsafe, inconvenient, uncomfortable, and unattractive**. Figure 12 presents Shahajalal Avenue, which was selected as the specific pilot site because it feeds directly into a proposed BRT station and also hosts a large, multi-storey garment factory. Little hard infrastructure currently exists on the street, which is not uniform in width along its length. Figure 13 provides a series of “before” shots of the pilot area.

Figure 16: Map: Shahajalal Avenue, pilot site

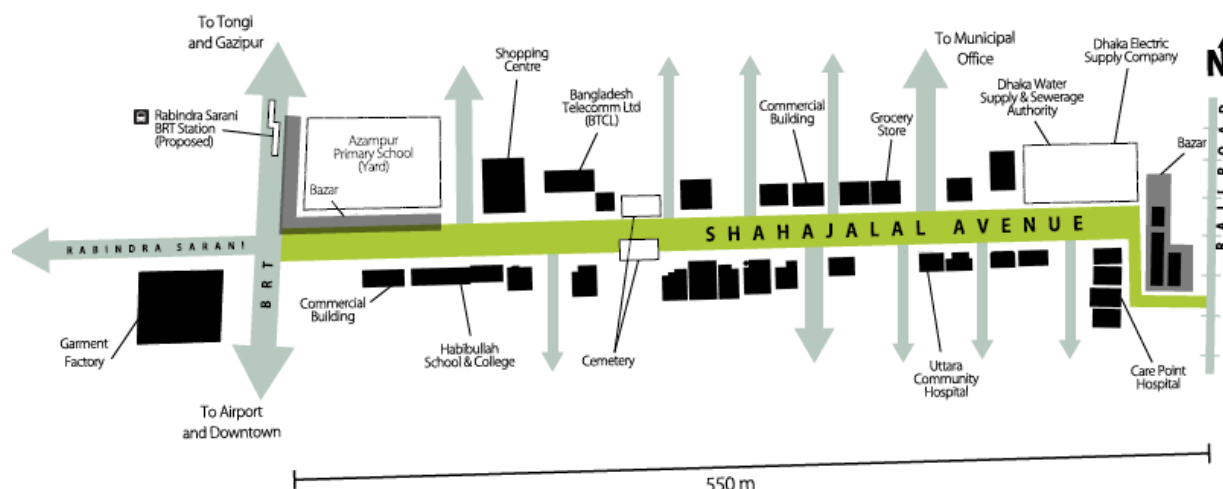


Figure 17: Before pictures of Shahjalal Avenue



The goal of the proposed pilot project is thus to **improve walkability and safety**, and **ensure pedestrians have the right of way**. Emphasis was placed on pedestrian mobility for the poor and vulnerable, as well as transit users' access and egress. The following recommendations are made to improve the walking situation along Shahjalal Avenue:

- ✳ **To accommodate pedestrians**, ensure an unobstructed footpath width of three metres.
- ✳ **To reduce conflicts between pedestrians and vehicles**, use bicycle lanes as buffers, extend sidewalk widths at intersections, and raise well-used intersections to the level of footpaths.
- ✳ **To eliminate mobility barriers for pedestrians with physical disabilities**, construct level footpaths, ensure crosswalks are raised (or, where this is impractical, cut curbs at intersections with wheelchair-friendly slopes (1:12 rise-run ratio)), and retrofit existing car entry/exit cuts to accommodate wheelchairs.
- ✳ **To increase shade cover and protection from precipitation**, plant trees (preferably fruit-bearing, broad leaf varieties) at six-metre intervals along footpaths' outside edge and between

vendors at the bazaar near the BRT corridor, plant banyan trees at gathering places, and erect planted trellis shades above bicycle parking and rickshaw stands.

- ☀ **To reduce the incidence of storm water flooding**, construct a permeable buffer between the bicycle lane and the parking lane, using permeable pavers where possible.
- ☀ **To reduce the incidence of public urination and defecation**, provide serviced public toilets with male and female stalls at the two bazaars (at the eastern and western edges of Shahajalal Avenue) and allocate space for rickshaw stands near the facilities.
- ☀ **To legally accommodate street vendors**, designate an additional 1-metre footpath width at the edge of non-retail buildings where they can work.
- ☀ **To maintain an orderly flow of two-way vehicular traffic**, designate two 3.2-metre lanes for single-lane traffic in both directions and provide limited pay parking spaces in designated areas.
- ☀ **To encourage non-transport pedestrian activities**, place street furniture along the footpath, where space permits. Also place bollards to block car traffic and to provide leaning surfaces.
- ☀ **To ensure visibility for pedestrians at night**, use existing utility poles to mount or string low-lying LED bulbs at ten-metre intervals.
- ☀ **To reduce the incidence of public littering**, place concrete waste bins at regular intervals and ensure that they are emptied regularly.

Figure 14 shows an artist's rendition of the proposed redesign of Shahajalal Avenue. A detailed legend follows in Table 1.

Figure 18: Map: Travel infrastructure, Shahajalal Avenue

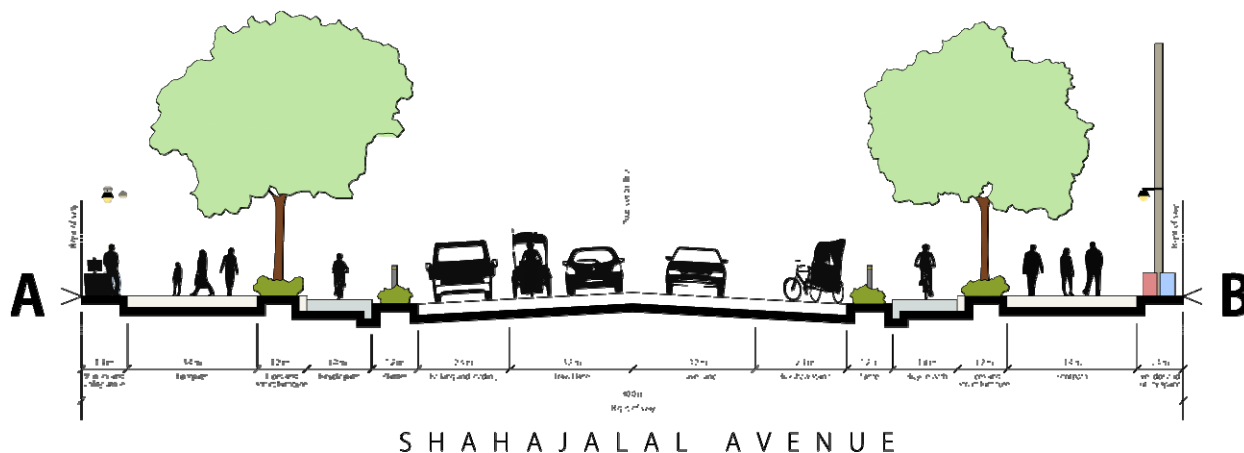


Table 2: Proposed breakdown of street space, Shahajalal Avenue

Description	Description
☀ Two 3.2m car and rickshaw travel lanes	☀ Two 1.2m planted buffers (between parking & bike path)
☀ Two 2.4m parking and loading lanes (or rickshaw stand where designated)	☀ Every 1.2m, trees and street furniture (between foot & bike paths)
☀ Two 1.8m bicycle lanes	☀ Every 1.4m, vendor and utilities space
☀ Two 3.4m unobstructed footpaths	☀ 30m total pedestrian right-of-way

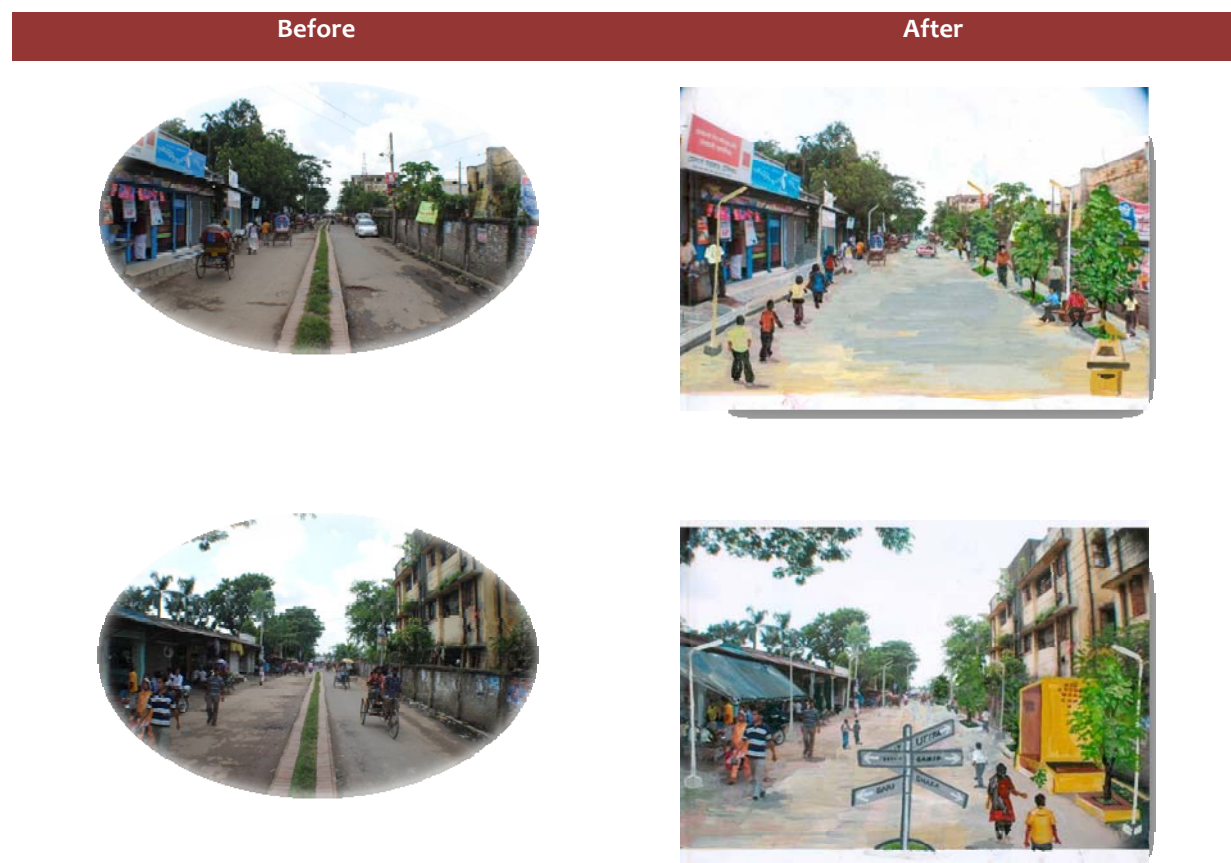
4.2 Gazipur Pilot Project

The road segment selected for the second pilot site is called “Hospital Road” and connects the Gazipur pourashava (local government office) with the Joydebpur Railway station and the last BRT station. This site was chosen because it is visited frequently by a variety of officials, decision-makers, and local residents. This area also sees heavy foot traffic by garment factory workers and other low-income people. The current Gazipur mayor also showed great enthusiasm to improve the pedestrian environment in this area.

Despite the area’s low level of motorized traffic and high pedestrian volume, there are few amenities to facilitate walking and the roads are unsafe and unattractive. The street is too narrow to accommodate both footpaths and vehicles. Although space is available for other amenities, there are no trees, public toilets, street lights, seating arrangements, or trash cans. Significant space is also occupied in a haphazard fashion for parking by human haulers and rickshaw drivers. These factors affect those who walk, as well as those whose transit access and egress involves walking.

The recommendations made for this pilot site are very similar to those noted above for the Uttara pilot project, and are not repeated here. However, the following preliminary ‘before-after’ artistic renderings are meant to illustrate the possible changes which would follow the implementation of the pilot project. Before implementation, the viewpoints of local residents will need to be solicited to improve the likelihood of project success.

Figure 19: Before-after artistic renderings of Gazipur pilot design





4.3 Recommendations

Based on the pilot project objectives, the following action items are recommended.

Table 3: Overview of issues addressed, research findings, and recommendations

Issue	Observation study	Perception survey /FGD	Recommendation
Road construction	6.5% of roads were under construction	n/a	<ul style="list-style-type: none"> • Provide walkways or signs during maintenance/construction periods. • Improvements to the pedestrian environment should be included in all road construction projects.
Motorized traffic volume	<ul style="list-style-type: none"> • Low: 54% • High: 15% • No road present: 9% 	n/a	Prioritize improvements to footpath availability on all high and medium motorized traffic volume roads. Make streets with little motorized traffic either free of motorized vehicles or pedestrian priority streets.
Land use mix	Most segments had little (48%) or no (36%) land use mix	n/a	Land use mix should be increased to make walking more viable.
Land use specifics – type of land use	<ul style="list-style-type: none"> • Residences: 85% • Shops: 58% • Offices: 24% • Schools: 17% • Parks/playgrounds: 2% • Entertainment: 1% 	<ul style="list-style-type: none"> • Desired destination too far to walk: 38% • Want to walk to entertainment or to park: 37% 	Increased neighbourhood diversity, especially neglected aspects like parks/playgrounds, should be prioritized.
Footpath availability	<ul style="list-style-type: none"> • Both sides of street: 37% • One side of street: 19% • No footpath: 44% 	39% of respondents could not walk where they wanted to because there was no footpath	<ul style="list-style-type: none"> • High volume roads should have footpaths on both sides of the road. • Medium volume traffic roads should have a footpath on at least one side of the road.
Footpath composition and quality	<ul style="list-style-type: none"> • Dirt & sand: 55% • Smooth: 18% • Broken/uneven: 82% 	<ul style="list-style-type: none"> • Very bad: 79% • OK: 17% • Good: 4% 	<ul style="list-style-type: none"> • Dirt or sand footpaths should be upgraded to brick or concrete. • Footpaths should be made smoother and more level.
Footpath obstructions	<ul style="list-style-type: none"> • Free of obstruction: 15% • Many obstructions: 16% • Had to leave footpath due to obstruction: 65% of segments 	31% of those surveyed had recently been injured while walking.	Footpaths must be kept free of obstruction.
Footpath obstructions, type	<ul style="list-style-type: none"> • Car exit/entry cuts: 52% • Shop goods: 42% 	53% of respondents said that it is a priority to remove obstructions	<ul style="list-style-type: none"> • Policies to prevent obstructions on footpaths should be established and enforced, with fines for violators.

Issue	Observation study	Perception survey /FGD	Recommendation
	<ul style="list-style-type: none"> • Cars/motorbike: 39% • Rubbish: 39% • Pillars/cables: 25% • Vendors: 22% • Trash cans: 16% • Trees: 14% • Trucks: 8% 	from footpaths.	<ul style="list-style-type: none"> • Vendors should not be targeted for removal; they are a minor source of obstruction and make a positive contribution to the pedestrian environment.
Footpath disorder, quantity	<ul style="list-style-type: none"> • Much disorder: 34% • Little disorder: 15% 	58% of respondents mentioned cleaner footpaths as a priority concern	Regular cleaning of footpaths is needed.
Footpath disorder, types	<ul style="list-style-type: none"> • Cigarette/bidi butts: 92% • Cans/bottles: 58% • Garbage: 58% • Graffiti: 28% • Urine smell: 16% • Broken glass: 16% 		
Street crossing barriers	<ul style="list-style-type: none"> • Mixed traffic: 46% • High median: 7% • More than 2 lanes: 4% • Barbed wire: 3% • Trees/plantings: 3% 	<ul style="list-style-type: none"> • More and safer crossings were a high priority for 75% of respondents. • 48% feared crossing the road 	Foot-over bridges (FOBs) should not be used as a solution; they are a serious obstacle to pedestrian movement and are unlikely to improve traffic flow. Instead, the number of zebra crossings should be increased, with attention to enforcement.
Street crossing facilities	<ul style="list-style-type: none"> • Special lights: 16% • Wheelchair accessible: 4% • Curb cuts: 3% • Cars obey the laws or yield to pedestrians: 1.3% • Police enforcement: 1% • Signs: 0.6% • FOB or underpass: 0.2% • Zebra crossing: 0.1% • No crossing safety: 97% 	<u>Desires of perception survey respondents</u> <ul style="list-style-type: none"> • Better police enforcement: 30% • FOBs: 28% • Zebra crossings: 26% • FOBs as a serious obstacle for women and the elderly 	

Issue	Observation study	Perception survey /FGD	Recommendation
Aggressive drivers	Aggressive drivers speeding or not giving pedestrians the right of way: 51% of roads	Motorized vehicles a major source of fear for pedestrians: more than 75%.	<ul style="list-style-type: none"> Buses should run in dedicated lanes only. City should establish and enforce speed limits of 30 km/hour.
Traffic calming	<ul style="list-style-type: none"> No traffic calming: 93% Lane width restriction: 16% Speed humps: 5.5% Signs: 1% Traffic signals: 0.4% Roundabout: 0.2% 	Top priority of surveyed pedestrians is reducing and slowing traffic: 79%	Measures to reduce speed should be implemented. This is one of the most powerful instruments to reduce road trauma. Investments made to calm traffic are considered highly cost effective and would prove very popular.
Service amenities	<ul style="list-style-type: none"> Tree shade: 38% Vendors: 20% Seating: 1.4% Trash bins: 0.9% Toilet: 0.1% None: 79% 	n/a	Service amenities are lacking and should be increased.
Lighting	<ul style="list-style-type: none"> Lighting from surrounding buildings: 73% Road-oriented: 67% Pedestrian-oriented: 3% None: 8% 	<ul style="list-style-type: none"> Lack of adequate lighting causes pedestrians to be afraid of being robbed: 50% Sexual harassment was identified as a serious issue by FGD participants. 	Pedestrian-oriented lighting should be increased, as it prevents both crime and injury.
Vehicle parking	<ul style="list-style-type: none"> Cars and motorbikes illegally parked: 45% of roads Trucks illegally parked: 11% Legal, on-street parking for cars/motorbikes: 4% 	n/a	<ul style="list-style-type: none"> Illegal parking should be monitored and fines enforced Limited legal paid on-road parking should be permitted to provide a buffer between pedestrians and moving traffic.

5 Conclusions

Until pedestrians are treated as valuable and a significant part of traffic, measures to improve their conditions will not prove successful.

To ensure that ADB's Bus Rapid Transit (BRT) corridor would not only improve the growing traffic problems in Dhaka but also address the needs of pedestrians, this report presents a **BRT Walkability Strategy** which provides policy and infrastructure recommendations aimed at creating an environment in which walking is an appealing, safe, and convenient experience for people along the BRT corridor. The Strategy can be used as a model for other neighbourhoods in Dhaka, as well as for other cities throughout Bangladesh, to assist decision-makers as they strive to create safer and more convenient pedestrian-friendly transportation options.

The recommendations included in the Strategy are based on the results of primary and desk-top research, as well as extensive discussions with both policy-makers and citizens. By 2008-09, pedestrians accounted for 86% of road fatalities. The observational study of Dhaka's walking environment revealed that almost half of the observed streets had no footpaths and, where there were footpaths, less than one-fifth were of sufficiently good quality to be safely useable. Pedestrians also face significant challenges in crossing streets and virtually all of the roads observed during the study were inhospitable for people living with disabilities. Pedestrian surveys and focus group discussions corroborated the findings of the observational study, highlighting that in spite of the desire or need to walk from one destination to another, few people in Dhaka are able to do so safely or conveniently.

An improved environment for pedestrians would, in addition to being a precondition for making the BRT feasible, generate a broader positive change – not only terms in enabling people to reach their destinations safely, affordably and conveniently, but also by improving traffic flow and creating a more congenial living environment. Current challenges to the creation of a pedestrian-friendly environment include a weak policy framework, an unsupportive infrastructure, and a transportation environment that is more focused on cars than on people. There is, however, tremendous opportunity for Dhaka's residents to demand improved pedestrian conditions and for the city's decision-makers to show real leadership and make investments in pedestrian-friendly environments. This leadership is already being shown in some areas, as evidenced by the support given to the proposed pilot projects.

The report provides a series of action-based recommendations related to policy, law, government structures, infrastructure, maintenance, and implementation. No single measure will be sufficient to improve the condition of pedestrians in Dhaka to the point where walking can become a popular mode of transport. Given the wide range of issues that must be addressed, a broad and integrated approach is needed. These recommendations have thus been integrated into two proposed pilot projects which, if implemented, will showcase the design upgrades that can be made in Dhaka to improve the pedestrian-environment while still supporting other modes of transport.

Pedestrians are of vital importance to a city and yet face many obstacles to their safe, easy and convenient movement. Those problems cannot be adequately addressed without first giving pedestrians priority within urban and transport planning. Until this happens, their situation will not improve. The BRT Walkability Strategy provides the framework within which a pedestrian-friendly city that values walking can be created. The strategy includes drafting, passing, and implementing a pedestrian-first policy that recognizes the importance of walking to the city, to health, to economics, and to the environment.

References

- Ahmad, SA et al., *Assessment of Impact of Air Pollution Among School Children in Selected Schools of Dhaka City, Bangladesh*. Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effect for South Asia, August 2008.
- Ahmed, I, “Urban Transport and Institutional Issues in the Developing Cities” in Alam 2008.
- Alam, JB, “Concerns, Challenges and Options for Sustainable Transport in Developing Countries” in Alam 2008.
- Alam, Md. Jobair Bin, ed., *Sustainable Transport for Developing Countries: Concerns, Issues and Options*. BUET, British Council, Loughborough University and Hiroshima University, 2008.
- American Public Health Association, *The Hidden Health Costs of Transportation*. February 2010.
- Anjuman, T, S Hasanat-E-Rabbi and CKA Siddiqui, “Necessity of Providing NMT Facilities: Towards Accident Free Sustainable Transport in Metropolitan Dhaka” in Alam 2008.
- Bari, M and D Efroymson, *Detailed Area Plan (DAP) for Dhaka Metropolitan Development Plan (DMDP), A critical review*. WBB Trust, Dhaka, March 2009.
- Bari, M and D Efroymson, *Efficient Use of Road Space and Maximisation of Door-to-Door Mobility: Suggestions for Improvements in Dhaka*. WBB Trust, Dhaka: June 2005.
- Bari, M and D Efroymson, *Rickshaw Bans in Dhaka City: An Overview of the Arguments For and Against*. Roads for People, Dhaka: August 2005.
- Bari, M and D Efroymson, *Vehicle Mix and Road Space in Dhaka: The Current Situation and Future Scenarios*. WBB Trust, Dhaka: December 2005.
- City of Copenhagen, “A Metropolis for People: Visions and Goals for Urban Life in Copenhagen 2015.”
- Centre for Urban Studies (CUS) and The World Bank, “Technical, Environmental and Social Survey of Proposed FOBs and Sidewalks in Dhaka city, FINAL REPORT.” March 2008.
- Daniel, K and D Efroymson, *Urban Planning for Livable Cities: Density, Diversity and Design*. HealthBridge 2010.
- Dhaka Metropolitan Development Plan (1995-2015), Volume I and II.
- Dhaka Transport Coordination Board (DTCB), Ministry of Communications (MOC), Government of the People’s Republic of Bangladesh, *Preparatory Survey Report on Dhaka Urban Transport Network Development Study (DHUTS) in Bangladesh Final Report (Appendix Volume)*. JICA, March 2010.
- DSM Consultants, *Impact Assessment of DUTP “After Project”*, February 2006.
- Efroymson, D and K Munna. *Addressing Climate Change: Can we reduce carbon emissions while increasing quality of life?* WBB Trust, January 2011.
- Efroymson, D and M Bari, *Dhaka Strategic Transport Plan (STP), A Critical Review*. WBB Trust, Dhaka: May 2007.
- Efroymson, D, Hafiz, RH, and Jones, L, ed. *Ecocity Planning: Images and Ideas*. WBB Trust, Bangladesh University of Engineering and Technology, and Health Bridge 2008.
- Efroymson, D and M Bari, *Improving Dhaka’s Traffic Situation, Lessons from Mirpur Road*. WBB Trust, Dhaka: February 2005.
- Efroymson, D, M Rahman and R Shama. *Making Cities More Livable*. HealthBridge and WBB Trust 2009.
- Efroymson, D, TTKT Ha and PT Ha, *Public Spaces: How They Humanize Cities*. HealthBridge 2009.
- Efroymson, D and M Rahman, *Transportation Policy for Poverty Reduction and Social Equity*. WBB Trust, Dhaka: May 2005.

- Efroymson, D. *Using Media and Research for Advocacy: Low Cost Ways to Increase Success*. HealthBridge, June 2006.
- Fabian, H, S Gota, A Mejia, and J Leather. *Walkability and Pedestrian Facilities in Asian Cities: State and Issues*. Draft Report, ADB Sustainable Development Working Paper Series. Asian Development Bank, 2010.
- Federal Highway Administration (2010). *Safety Benefits of Walkways, Sidewalks, and Paved Shoulders*. Accessed on July 27th, 2011 from http://safety.fhwa.dot.gov/ped_bike/tools_solve/walkways_brochure/
- Gallagher, R, *The Rickshaws of Bangladesh*. Dhaka: The University Press Limited, 1992.
- Gehl, J, LJ Kaefer and S Reigstad, “Close Encounters with Buildings”. Centre for Public Space Research/Realdania Research, Institute for Planning, School of Architecture, The Royal Danish Academy of Fine Arts, 2004.
- Gehl, J and Gemzøe, L, *Public Spaces - Public Life, Copenhagen*. The Danish Architectural Press & The Royal Danish Academy of Fine Arts School of Architecture Publishers, Copenhagen, 2004.
- Government of Bangladesh Planning Commission, UNDP and Department of Development Support and Management Services, *Greater Dhaka Metropolitan Area Integrated Transport Study Final Report Volume 1, Database and Immediate Actions*, November 1994.
- Government of Bangladesh Planning Commission, UNDP and Department of Development Support and Management Services, *Greater Dhaka Metropolitan Area Integrated Transport Study Working Paper Volume VI Special Studies*, January, 1994.
- Government of Bangladesh Planning Commission, UNDP and Department of Development Support and Management Services, *Greater Dhaka Metropolitan Area Integrated Transport Study Final Report: Volume 2, Strategic Directions*, November 1994.
- Government of People’s Republic of Bangladesh, Department of Environment (DOE), *Clean Air and Sustainable Environment (CASE) Preparation Project Final Report*. DevCon, June 2009.
- Government of the People’s Republic of Bangladesh, Bangladesh Road Transport Authority, *Dhaka Urban Transport Project Phase I Working Paper on Bus Transport and Affordability*, December 1996.
- Government of the People’s Republic of Bangladesh, Ministry of Communication Bangladesh Road Transport Authority, Road Safety Cell, *National Road Traffic Accident Report 2004*.
- Government of People’s Republic of Bangladesh, Ministry of Communications, Dhaka Transport Co-ordination Board, *Strategic Transport Plan for Dhaka*.
- Government of People’s Republic of Bangladesh, Ministry of Communications, Dhaka Transport Co-ordination Board, *Strategic Transport Plan for Dhaka Urban Transport Policy Final Report*, September 2005.
- Government of People’s Republic of Bangladesh, Ministry of Communications, Dhaka Transport Co-ordination Board, *Strategic Transport Plan for Dhaka Final Report*, December 2005.
- Guitink, P, S Holste, and J Lebo, “Non-Motorized Transport: Confronting Poverty through Affordable Mobility”. World Bank discussion paper, April 1994.
- Hoque, MM and SMS Mahmud, “Road Accidents Involving Children in Bangladesh” in Alam 2008.
- Hoque, MM, S Anowar and MA Raihan, “Towards Sustainable Road Safety in Bangladesh” in Alam 2008.
- Human Development Research Centre (HDRC), *After Study on the Impact of Mirpur Demonstration Corridor Project (Gabtoli-Russel Square)*. Prepared for Dhaka Transport Coordination Board (DTCB), August 2004.
- Jacobson, J and A Forsyth, “Seven American TODs: Good practices for urban design in Transit-Oriented Development Projects.” *Journal of Transport and Land Use* 1:2 (Fall 2008), pp. 51-88.

Khan, RR, N Ohmori and N Ohmori, "Evaluation of the Roadside Walkway Environment of Dhaka City." *Proceedings of the Eastern Asia Society for Transportation Studies*, Vol. 5, pp. 1751 - 1766, 2005.

New York City Department of Transportation, "Green Light for Midtown Evaluation Report," January 2010.

New York City Department of Transportation, *World Class Streets: Remaking New York City's Public Realm*.

Shoup, D, *The High Cost of Free Parking*. Chicago: American Planning Association, 2005.

World Health Organization, *Global Status Report on Road Safety: Time for Action*. Geneva: World Health Organization, 2009, p. 9. <http://www.un.org/ar/roadsafety/pdf/roadsafetyreport.pdf>

Zohir, SC, P Paul-Majumder, K Alam and WH Shah, "Gender Analysis for Improving Mobility in Dhaka City." Report prepared for the Dhaka World Bank Office, Bangladesh Institute of Development Studies, September 2008.