Improving Sustainable Pedestrian Facilities in Congested Urban Areas Adapting Breeam Assessment: A Case of Dhaka, Bangladesh

Shayeeka Binte Alam[1*], Shamma Tasneem[2]

[1]Student of M.Arch Environmental Design, Department of Architecture and Built Environment, University of Nottingham, **UK**
[2]Designer and Design Co-ordinator, Code Surfer, **BANGLADESH**

Corresponding Email: laxsa26@nottingham.ac.uk

ABSTRACT

The persistence of the paper is to learning the role of walkable roads in sustainable development of Dhaka City. Accordingly, a documented investigation through effective sources has been employed to demonstrate this study. The outcomes prove that walking can lead to sustainable urban growth from various aspects. Also, Pedestrian Facilities –which are the focal background of walking- act as focal arguments of growth in Dhaka city and have a great influence on adjusting and motivating of their breeam assessment. Today due to the land kerb, lots of thick urban areas are facing pressures and difficulties, such as traffic jamming and lack of public open space. This study emphases on finding means to condense pedestrian delay. This work presents a real scenario for sustainable pedestrian facilities through breeam assessment and offer comfort ability in Urban Areas.

Key Words: Pedestrian, BREEAM, Sustainable, Dhaka, Accessibility

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INTRODUCTION

Dhaka is the capital city of Bangladesh with inhabitants of almost 17 million (Bangladesh Bureau of Statistics, 2011). Growing at astonishing levels since the independence in 1971, Dhaka is often described as the toughest city in the world and consistently being ranked as the least unlivable city according to the global livability report (The Economist Intelligence Unit, 2017), Dhaka demands new architectural and urban imagination to escape from those tags.

Regrettably, once the city with rich traditions, Dhaka, cannot be stated as a pedestrian-friendly capital city anymore. Maximum infrastructural facilities are not suitable for public use. The government is giving priority to pedestrian improvement as well, as it is the international norm, to develop the current traffic condition. Many research works are

happening to assess the pedestrian services in the developed nations, but it is not remarkable for the transport planners in developing countries like Bangladesh.

Currently, the traffic situation in Dhaka city has deteriorated at an alarming level, due to deficiency of proper pedestrian network throughout the city. The age-old unplanned infrastructure is causing the heterogeneous mixing of a vehicle within the same road with no access control. With this background of Dhaka, the nominalization of this essay is to analyze BREEAM's standards and assessment methods which can assist to provide solutions to solve the current traffic problems faced in Dhaka, achieving high-quality sustainability in pedestrian network.

LITERATURE REVIEW

Dhaka is the central place of political decision, employment, businesses and educational activities of Bangladesh. People from other urban and rural in Bangladesh have been migrating to Dhaka in search of better livelihood. Being the hub of political, commercial and cultural activities of Bangladesh and the nation's gateway, Dhaka is now declared as 26th Mega City and 10th most congested city of the world (Habib et al., 2005).

The population density of Dhaka city is over 10,000 per square kilometre. Despite being the capital, Dhaka is considered as one of the least motorized cities within the world. Almost 60% of the trips are on foot while almost half of the remaining trips are on non-motorized vehicles (Shafiqul and Masud, 2001).

Pedestrians constitute the largest single road user group in Bangladesh. From Microcomputer Accident Analysis Package (MAAP) Data Base, it is observed that highest frequency of pedestrian casualties in Dhaka occurs at road side and footpath which is 48% of the total (ARI, 2012).

Accident Research Institute (ARI), BUET (2012) has analysed over fifteen years (1998 to 2012) of accidents occurred in Dhaka. The pedestrian casualties numbered 27228 making it the second largest, 34% of the total 81464 casualties. Evidently, that pedestrian accident occurring in road side location is the greatest problem of all.

The government has given "priority to pedestrians" in the National Integrated Multimodal Transport Policy of 2013. The policy has directed that clearing of footpaths; construction of wide pedestrian and pedestrian-friendly roads; ensuring maintenance and cleaning; slopes on sideways for the people with special needs; protection for pedestrians to safely cross the streets; and, giving priority to pedestrians in the traffic signal light changes (Hossain, 2014).

According to a 2011 study by Work for Better Bangladesh, 44% of Dhaka's roads don't even have footpaths, and 82% of the existing pedestrians are in a deplorable state. A total of 31% of the pedestrians using these footpaths say they get hurt while walking (Hossain, 2014).

IMPORTANCE OF PEDESTRIAN FACILITY DEVELOPMENT

Walking is the most rudimentary mode which is part of nearly every trip we make. To plan for pedestrians, including people who travel with the aid of wheelchairs or other mobility devices, is designing for everyone. In addition to increasing mobility options, walking and bicycling generate a range of health, safety, economic development, and environmental benefits (Roughton et al., 2012).

Some of the advantages of walking and bicycling impacts directly to the individuals who choose to walk or bike. Some of the impacts of walking or bicycling for transportation and recreation are:

- Develops personal health.
- Accelerates mobility and access, particularly for youth, older adults and the financially constrained.
- Saves money on transportation.
- Elevates opportunities for social interactions while providing enjoyment.
- Improves the neighbouring environment.

Pedestrian Characteristics

The impact of the pedestrian network upon street and highway operations is always of elevated priority. The high way designer needs to have an appreciation of some general characteristics of the pedestrian such as body area, walking rates, and capacities for pedestrian-related facilities. Besides knowing about average pedestrians, the designer also needs to know about pedestrians with physical, visual or mental disabilities (Traffic Engineering Council Committee, 1998).

STUDY AREA

Dhaka is experiencing a rise of scattered development without appropriate monitoring within a glimpse of last few decades resulting in urban transport system difficulties. Weak transportation system has noticeably affected the physical form and functional performance of the city. Only 9% of roadways and 6% of pavement area are available, in which 62 km functional primary, 108 km secondary and 221 km connector road serve the city road network (Mahmud et al., 2008). Five different pedestrians have been selected to get different information and Level-of-Services on the walkways.

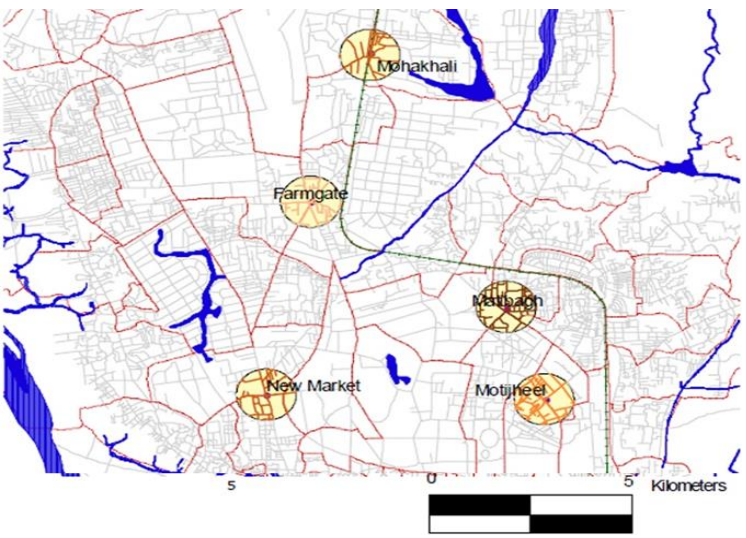

Figure 1: Study areas on Dhaka map (Source: Rahaman, 2006.)

- Farmgate: one of the prime junctures of Dhaka City which is known as a major commercial and transit area in this study.
- New Market: one of the famous shopping and business areas.
- Motijheel: the CBD or the central business district.
- Malibagh: the residential and shopping mix.
- Mohakhali: the major transit area (Figure 1) (Rahaman, 2006).

PEDESTRIAN'S PURPOSE OF WALKING IN DHAKA

In Dhaka City, pedestrians walk for different purposes. Going to the workplace is the key reason among them. Generally, people prefer to walk for shopping. Most importantly, people are also walking for saving time and money due to heavy congestion in the central part of the city (Figure 2) (Rahaman, 2006).

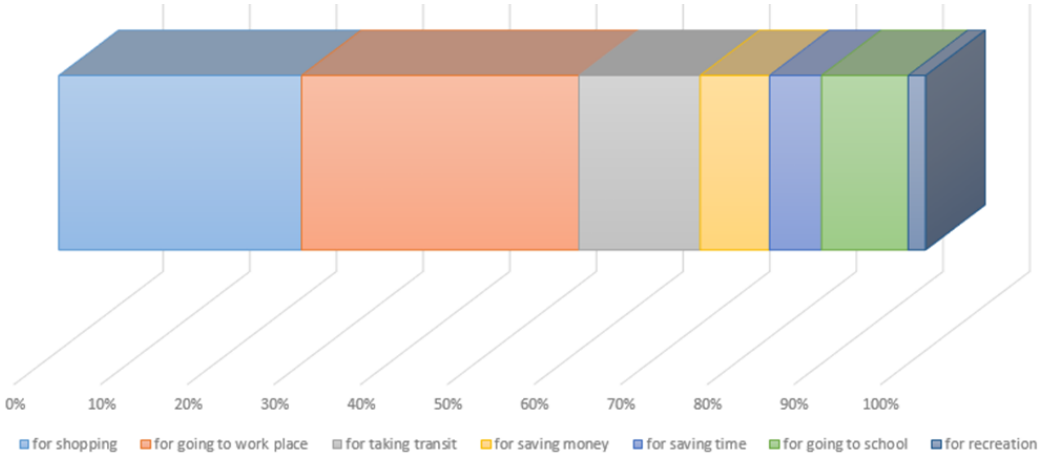

Figure 2: Pedestrian's purpose of walking in Dhaka (Source: Rahaman, 2006)

- Pedestrian flow in the study area: There is always a rush of working class people in the area. Especially the flow of pedestrian is intense in the morning and evening.
- Pavement Facilities in the study area: The pavements are clean enough in the morning. Every morning a cleaning worker cleans the walkways, but as the day passes, the pavements become dirty.
- Pedestrian crossing facilities: There is a scarcity of signage for pedestrian crossing.

EXISTING PROBLEMS

The poor condition of pavement: Broken pavement was found in some spot near Dainik Banglar Mor. The state of the pavement near Gulistan circle is vulnerable (Barua et al., 2007) (Figure 3).

Figure 3: Poor condition of pavement (source: Barua et al., 2007)

The electric wire on pavement: electric wires can be seen to be hanging on the pavement. Eventually, pedestrians face dangerous accident and this creates inconvenience while walking (Figure 4).


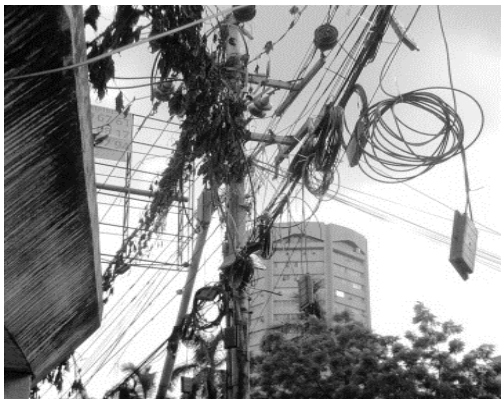

Figure 4: Electric wire on the pavement (source: Barua et al., 2007)

Obstacles for pedestrian's movement: Some bricks and stones on the pavements often disturb the pedestrian while walking. Besides some large baskets kept in front of the underpass hinders pedestrian movement.

Security problem of pedestrians: Pedestrians often face some unpleasant incidents like pick-pocketing, hijacking, eve-teasing, etc. especially in the night.

Lack of signage and symbol: There is only five signage From Dainik Banglar Mor to DIT pavement; three indicate no parking and one non-motorized vehicle prohibition and one pavement crossing. But near Gulistan, there is no sign and symbol in the study area which creates an obstacle for the pedestrians and the vehicle user (Barua et al., 2007).

Improper Drainage System: Improper and poorly placed drainage line creates a lot of issues. Besides, the existing drainage line was not cleaned up properly and regularly. So, in the rainy season, it caused water logging, especially near Underpass area (Figure 5).

Figure 5: Improper Drainage System (source: Barua et al., 2007)

Illegal vehicle parking: Illegal vehicle parking over footpath creates a lot of problems for the pedestrians. It also reduced the area and width of the footpath which is an unexpected effect creating difficulty for the pedestrians.

Lack of Trees: Trees were rarely found on pavement. Some large shady trees from the adjacent buildings and Gulistan Park shade the pavement (Barua et al., 2007).

Inadequate garbage management: The garbage management system of the pavement is substandard. There is hardly any dustbin or litter bin on the pavement.

No Facility for disable/differently abled people: For the elderly persons, the broken and discontinued walkways are always troublesome. It hinders their ability to move freely on the roads.

Pavement blocked by Shopkeepers and hawkers: Pavements are often blocked by the shopkeepers and hawkers (Figure 6).

Figure 6: Pavement blocked by Shopkeepers and hawkers (source: Barua et al., 2007)

Figure 7: pedestrian of Dhaka city (source: author)

CASE STUDY

To eliminate the existing complications of the pedestrian streets of Dhaka city, we need new sustainable approaches; we need to find solutions from around the world. The case studies presented afterward give an idea of some of the innovative approaches that local authorities and politicians have taken in other cities to tackle the growing problem of motorized traffic. The case study of Cambridge was chosen to understand the strategies undertaken by the authority to create space for sustainable transport. On the other hand, NW Bicester Masterplan is a community targeting a healthy and sustainable future integrating green infrastructures.

Creating Space for Sustainable Transport: Case Study of Cambridge, England

Cambridge, the university city with a historic center characterized by a medieval street pattern, having college buildings with high architectural value, and beautiful bridges over the River Cam.

The European instruction value for nitrogen dioxide was overreached in the year 1999, at 24 of the 27 monitoring sites in Cambridge. It was anticipated that 18% traffic level would increase by the year 2016 if no further action was implemented. However, with the new scheme, a 27–48 % increase in traffic was projected, a situation which was considered unsustainable (Lawson and Smith, 2013).

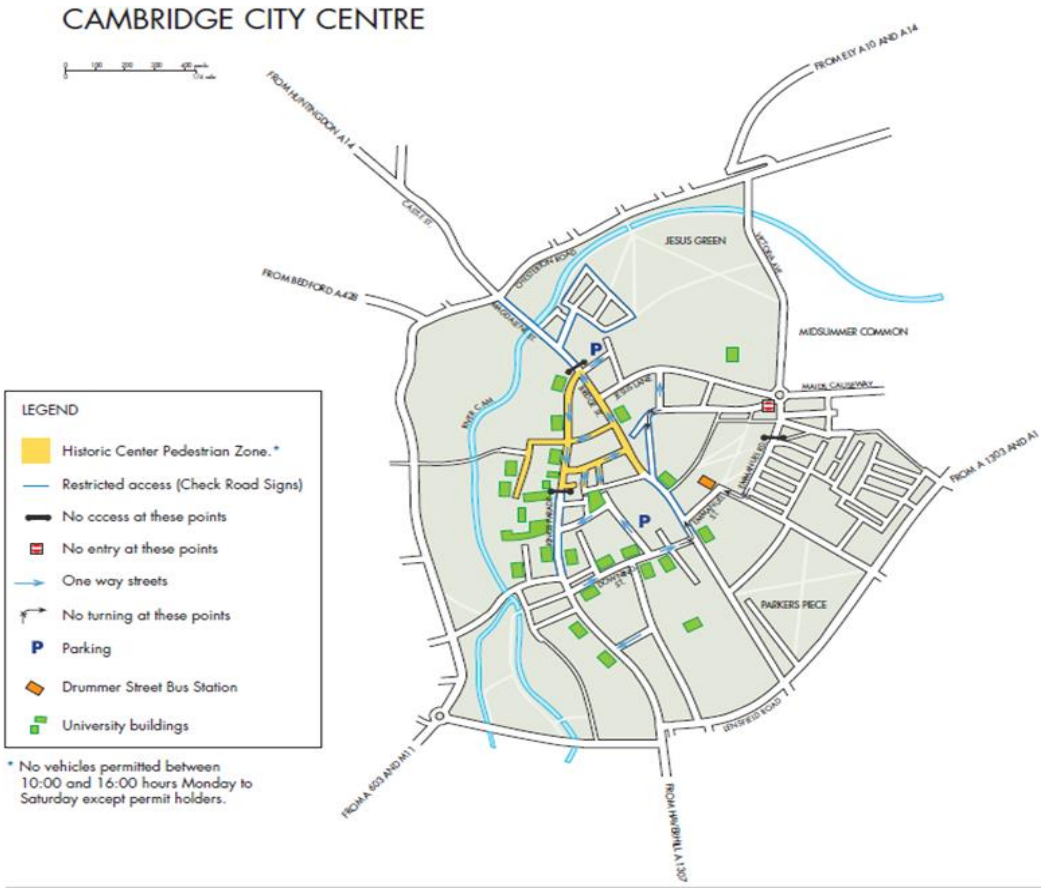

Figure 8: Cambridge city center (source: DGE, 2004)

THE STRATEGY— CAMBRIDGE CORE TRAFFIC SCHEME

The reduction of the impact of traffic by inspiring more use of public transport, walking and cycling; was the intention of the Cambridge core traffic scheme. It did not want to ban cars, on the contrary, they wanted to make their use less attractive.

The experimental Bridge Street road closure, implemented in January 1997, was the first step in restricting private car access. Computer modeling of traffic flows predicted significant increases in traffic in some neighboring streets, and traffic light settings were altered given the new traffic patterns predicted (DGE, 2004).

Result of Cambridge Core Traffic Scheme

Traffic on Emmanuel Road was decreased by about 9 000 vehicles (78 %), and 5000 (57 %) on the adjacent Parkside as expected with the closure of the route to through-traffic. However, only 2,000 extra vehicles were recorded on the main adjacent routes (East Road and Maids Causeway) (Lawson and Smith, 2013) (Figure 8).

Figure 9: Before and after situation of Cambridge (source: DGE, 2004)

Figure 10: streets of Cambridge (source: author)

Air quality improvement: Air quality measurements before and during the experiment suggest that between 1997 and 1999 the situation was either improved or stayed constant at 16 of 18 monitoring sites. Levels of PM10s (particulate matter) have fallen by about 5 % as a result of the change in traffic levels and composition in Magdalene Street, an extension of Bridge Street (DGE, 2004).

Quality of life developed: While Pedestrians and cyclists can enjoy a cleaner, quieter, safer city center environment with the removal of through car traffic, at the same time public transport users were benefitted from time savings due to congestion reduction. (DGE, 2004).

NORTH WEST BICESTER MASTER PLAN: THINKING ABOUT TOMORROW

Appearing from 2011, NW Bicester masterplan, located around 70 miles south of Birmingham, is aiming for a sustainable eco-town. The project is currently undergoing construction, yet already, have all received BREEAM excellence rating.

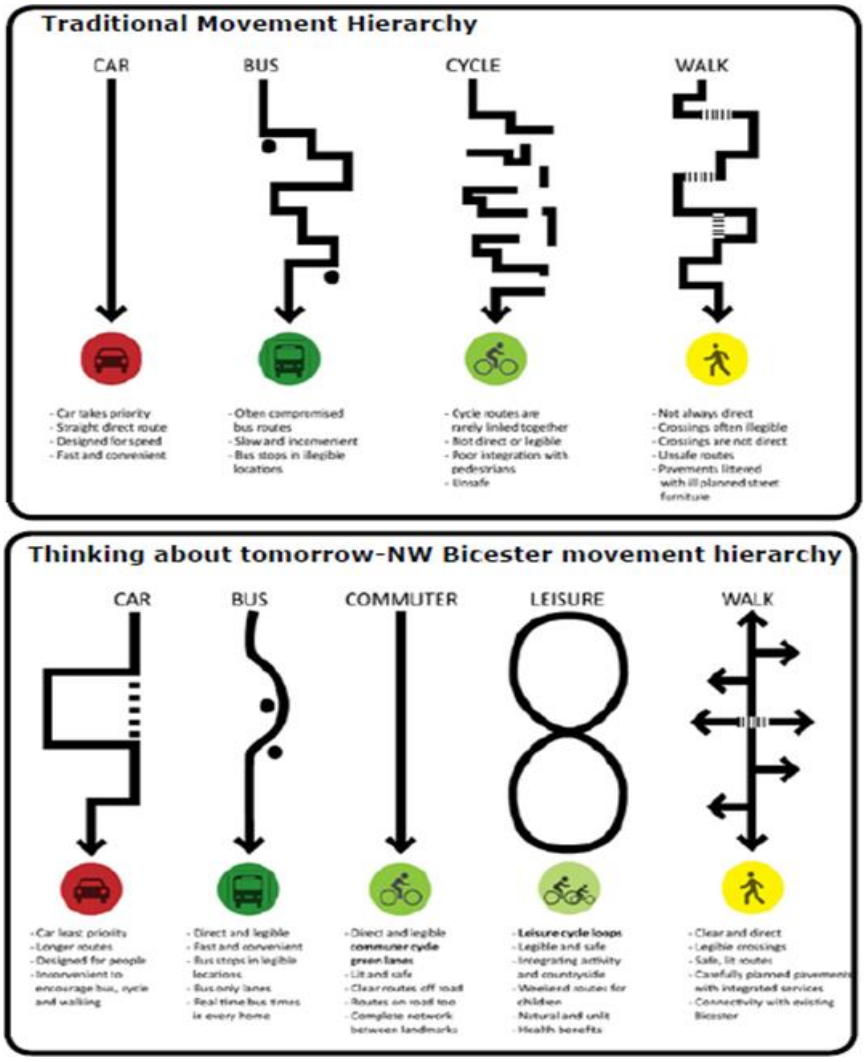

Figure 11: NW Bicester's movement hierarchy (source: North West Bicester, 2014)

The vision of the NW Bicester Masterplan is to inspire non-car use with alternative means of sustainable transport, ensuring the highways and access arrangements, which are suitable to allow connectivity to existing routes.

The green travel policy will develop on the existing infrastructure of Bicester focusing on its public transport, cycle route network, walkways and pavements. This would give priority to alternatives such as walking, cycling, public transport and other sustainable options, as a result decreasing people's dependency on personal cars (North West Bicester, 2014) (figure 11).

Promoting Walking and Cycling

Walking and cycling routes must be of high quality maintaining all-weather surfacing, well-lit and easily supported. Pedestrians and cyclists will be segregated to minimize potential conflicts, securing separated walking and cycling routes from vehicular path. Safety of pedestrians and cyclists must be protected by providing routes of adequate widths (North West Bicester, 2014). The walking and cycling routes should be separated into two distinct categories. 'Direct routes' will act as commuting routes to allow direct and fast access to key local employment areas, schools, local centers and hubs.

On the other hand, a network of 'leisure routes' will be introduced, which allow more weekend routes, longer meandering paths, these will tend to be more rural and will take in the arable farmland, the bure stream and the hedgerows. To achieve the number of trips by walking and cycling, the masterplan offers a high level of accessibility within the site on foot and cycle. A Walking and cycling strategy has been generated about local and national policy (N*orth West Bicester, 2014)* (Figure 12).

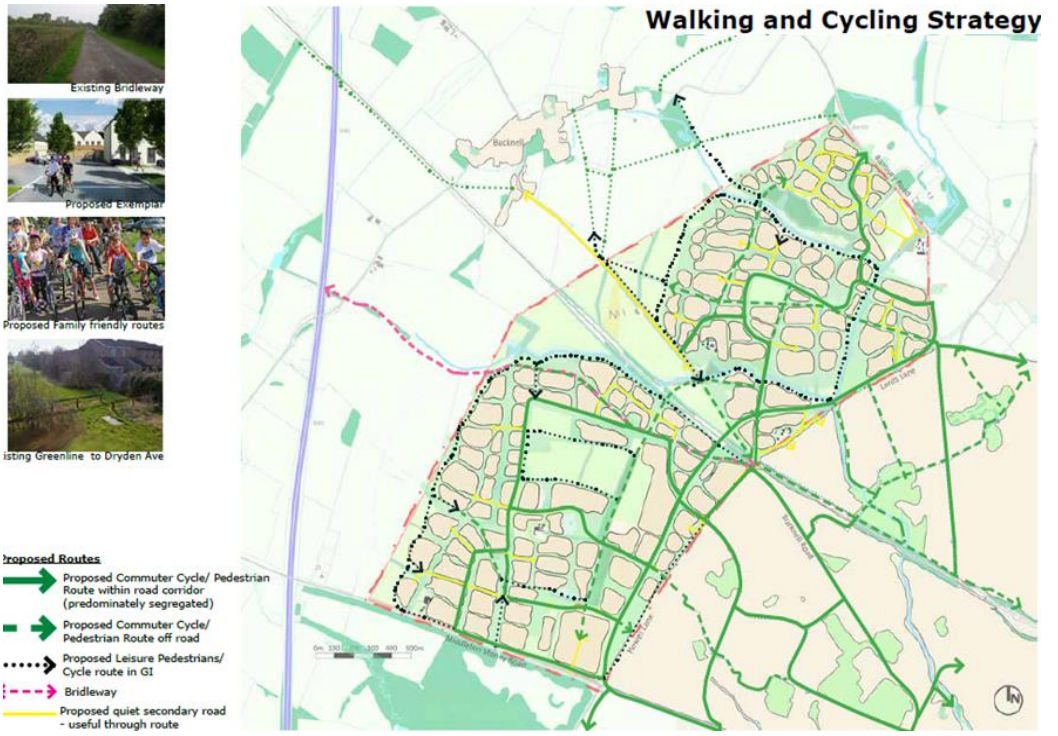

Figure 12: walking and cycling strategy of Bicester Masterplan (Source: *North West Bicester, 2014)*

BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

Launched in 1990, by the Building Research Establishment (BRE), BREEAM is a sustainability assessment method that is used to assess masterplan projects, infrastructure and buildings. From setting standards for the environmental performance of buildings through the design, BREEAM can specify construction and operation phases also, which is applicable to new developments or refurbishment schemes. BREEAM rating is based on weight score of credits points. The Higher credit can be earned, the better sustainable a system is.

Following is an analysis of BREEAM's Transportation assessments which can be beneficent for developing cities like Dhaka to achieve transportation systems focusing on pedestrians with high sustainability.

Accessibility Index (AI)

AI is a measure of the ease of access, type and frequency of the public transport system at a point of interest (building or node). AI is building type dependent and factors in the proximity of public transport and frequency of service at a node (BREEAM International New Construction, 2013) (Table 1).

The measurement of the ease of access, type and frequency of the public transport system at a point of interest, especially building or node is known as AI. It depends on the building type and factors in the proximity of public transport and frequency of services at a node (BREEAM International New Construction, 2013) (Table 1).

ACCESSIBILITY INDEX	≥0.5	≥1	≥2	≥4	≥8	≥10	≥12	≥18
BUILDING TYPE	BREEAM CREDITS AVAILABLE							
Type 1&2 (Offices and Industries)	-	-	1	2	3	-	-	-
Type 3 (Retail)	-	-	1	2	3	3	4	5
Type 4 & 5 (Rural location)	-	-	1	2	-	-	-	-
Type 6 (Residential)	1	2	3	4	-	-	-	-
Type 7 (Transport hubs)	-	-		2	3	3	3	4

Table 1: Accessibility Index and BREEAM credits available (source: BREEAM International New Construction, 2013)

Proximity to Amenities

BREEAM rewards buildings which are located close to local amenities so that it can reduce extended travels and multiple trips. This assessment is dependent on building types and can earn up to two credits (Table 2).

Safe and Appealing Streets

Four credits can be achieved by creating safe and appealing spaces, which encourage human interaction and a positive sense of place.

Cycling Networks and Facilities

BREEAM provides one credit, underlines certain guidelines to promote cycling as an alternative to vehicle use. These strategies are useful for designing safe and efficient cycle network.

CRITERIA	BUILDING TYPES					
	Type 1, 2, 3, 7 (Offices, Industries, Retail, Transport hub)		Type 4, 5 (Rural Location)	Type 6 (Residential Buildings)		
No. of credits	1	1	1	1	1	2
No. of applicable amenities	All	5 (food outlet compulsory)	All	2	5 (food outlet compulsory)	5 (food outlet compulsory)
Proximity of amenities (metres)	≤500	≤1000	≤500	≤500	≤1000	≤500
APPLICABLE AMENITIES						
Food shop/outlet	✓	✓	✓	✓	✓	✓
Post box	✓	✓	✓	✓	✓	✓
Cash machine/Bank	✓	✓	✓	✓	✓	✓
Pharmacy		✓		✓	✓	✓
Creche/School		✓		✓	✓	✓
Medical Centre		✓		✓	✓	✓
Leisure/Sports Centre		✓		✓	✓	✓
Outdoor open public access area		✓		✓	✓	✓
Community centre		✓		✓	✓	✓
Place of worship		✓		✓	✓	✓

Table 2: Building types against available credits (source: BREEAM International New Construction, 2013)

The cycles routes should be direct and safe, while being segregated from vehicles and pedestrians with adequate signage and route information for cyclist to navigate conveniently. Cycle lanes should be ≥1.25m and ≥2.25m width for one way and two way respectively (BREEAM Communities, 2012).

Access to Public Transport

BREEAM also provides four credits for the availability of frequent and convenient public transport which is linked to fixed public transport and local centers. The distance from each building entrance to compliant transport node must be via safe and convenient pedestrian route (BREEAM Communities, 2012) (Table 3).

Credits	Distances (urban)	Distances (rural)
1	≤650m	≤1300m
2	≤550m	≤1100m
3	≤450m	≤900m
4	≤350m	≤700m

Table 3: distance for public transport (source: BREEAM Communities, 2012)

CONCLUSION

To achieve a sustainable environment, authorities from all over the world are emphasizing pedestrian development, abandoning motorized vehicles. The developing countries like Bangladesh are getting over saturated with the demand for public transport, which is having a brutal impact on the environment. Being in the necessity of safe and appealing pedestrian network to secure a sustainable future, we must opt for holistic approaches as BREEAM proposes.

In Dhaka, various steps have been taken to improve the transport system by government and related organizations. In the Dhaka Structure Plan 2015-2035 (DSP 2016-2035), RAJUK has proposed several plans to encourage the development of sidewalks and bicycle routes for both mobility and recreation purpose, which are quite similar to what BREEAM recommends.

It is essential to remember that "all problems of the advanced capitalist's world pale into insignificance compared to the extraordinary dilemmas of developing countries" (Harvey,1996), but certainly, embracing an independent, reasonable and holistic scheme as BREEAM, to achieve high quality sustainable transport system with a captivating pedestrian network, would be beneficial for the cities of developing countries.

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