



RESEARCH ARTICLE

INCORPORATING MOBILITY HANDICAPPED PEOPLE IN MASS TRANSPORTATION
SYSTEM OF BANGLADESH

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ABSTRACT

Accessible transport means to make transport services easier for all groups of people. Removing features that create barriers for a particular group of people is the precondition of ensuring accessible transportation system. Mobility handicapped people constitute about 12% of the total population in Bangladesh. Problems with transport are the major reasons why they cannot access education, healthcare and employment opportunities. This inability leads them and their families to poverty. Incorporating these people in mass transportation system is a prime requisite to ensure an independent and poverty free life for them. This research work focuses on explaining the access difficulties faced by mobility-disabled people. It summarizes some instances of good access practice followed throughout the world for improving accessibility of disabled people. Considering costs & all other constraints, some recommendations are given here for improving access in Bangladesh.

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INTRODUCTION

Disability can be defined from different perspectives. The definitions based on social perspective are more acceptable at present. Disability results from the interaction between persons with impairments, conditions or illnesses and the environmental and attitudinal barriers they face. Such impairments, conditions or illnesses may be permanent, temporary, intermittent or imputed, and include those that are physical, sensory, psychosocial, neurological, medical or intellectual (UN, 2004). For ensuring equal rights and opportunities in the disabled community, improving accessibility is a must. A disabled person becomes a social outcast only due to absence of accessible transportation system. Accessible transportation plays key role in ensuring employment, health care, education, housing and a better community life for disabled people. The need for costly institutional care will be reduced by improving accessibility which will ensure employment and eventually an independent life for disabled people. Improving accessibility of mobility handicapped people will also result in infrastructures that are easier for everybody to use.

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Although Persons with Disabilities Rights and Protection Act of 2013 puts emphasis on the rights to use accessible transportation, disabled people in Bangladesh still lack viable transportation options. An important reason behind the ineffectiveness of the policies regarding better accessibility is the lack of adequate resources for implementation. As the government stays busy meeting other priorities, it is difficult to allocate funding for improving accessibility. The private sector also does not have enough involvement in improving accessibility. In many cases, international best practices are applied to provide access solutions and ensure universal access which are not affordable or realistic for a low-income country like Bangladesh. For this reason, a comprehensive research is necessary to be conducted for finding out effective solutions of accessibility problems for mobility handicapped people of Bangladesh considering costs and all other constraints. An integrated system is a prerequisite for improving accessibility of mobility handicapped people. To ensure an accessible environment for disabled people the uniformity and continuity is necessary. Accessible aiding features should be installed at every location visited by disabled people in order to ensure better accessibility for them. Improvement of education and awareness created by society play important role for ensuring effectiveness of these improvements. The objectives of this research work are as follows.

- To identify access difficulties faced by mobility handicapped people.
- To provide some guidelines on good access practice.
- To suggest some low cost features which can be easily implemented for improving mobility of disabled people in Bangladesh based on lessons learned from global practice.

Access Difficulties Faced by Mobility Handicapped People

Some of the common access difficulties faced by mobility-disabled people in our country are as follows.

- Absence of footpaths or encroachments along the road network makes it unsuitable for walking. Most often no protective covering is provided over potholes during digging up of roadways.
- As orthopedically impaired people cannot walk for a long period of time, they find it difficult to move when the road surface is bad and uneven with steep gradients.
- Disabled people face difficulties to board or alight from buses when rickshaws and other vehicles accumulate near bus stands.
- Bus stops do not have provision for displaying route information for mobility handicapped people.
- Most often, public transport staffs do not show an attitude of cooperation with mobility handicapped people.
- Disabled people face difficulties while boarding or alighting comfortably from buses as buses stop for an insufficient amount of time.
- As footpaths do not have ramps, wheelchair equipped persons face difficulties while moving on footpaths.
- Vehicles are not designed considering the accessibility of mobility-disabled people. There is absence of priority seating facilities for mobility handicapped people.
- There is lack of adequate security at railway compartments especially for mobility-disabled women.
- Hearing impaired people finds it difficult to choose which bus is the right one to board to reach their respective destination.

Guidelines on Good Access Practice (DFID/TRL, 2004)

This section describes some important guidelines for improving accessibility of mobility handicapped people.

Personal Mobility

- A minimum clear width of 900 mm is required for movement of a handicapped person using stick or crutches or a wheelchair user.
- To turn corners or to turn around, a maneuvering space of 1500 mm diameter is needed for a wheelchair equipped person.

Table 1. Recommended walking distance limits for disabled pedestrians (Oxley, 2012)

Group	Maximum walking distance without rest
Vision impaired people	150m
Wheelchair users	150m
Mobility disabled people without walking aid	100m
Mobility handicapped people with walking aid	50m

- Recommended walking distance limits for disabled pedestrians are provided in the following table
- It is difficult for disabled people to use steps more than 200 mm high.
- The color should contrast with its surroundings.
- Mobility aids such as wheelchair, trolley, crutches, walking stick, guide cane, walking frame etc should be available.

Pedestrian Footways

- Pedestrian facilities should be paved with asphalt or concrete because even and smooth surfaces are important for people using walking aids or wheelchair equipped persons.
- A minimum width of 2000 mm is recommended for footways and paths having moderate to high pedestrian traffic.
- To prevent collision of visually impaired people with signs or overhanging branches a clearance of at least 2100 mm must be provided.
- The design of footways should be as simple and straight as possible. This will help vision impaired people.
- A continuous tactile guide way having a texture dissimilar to the rest of the footway will guide people in case of approaching any obstacle or the edge of the footway.
- The absolute maximum gradient that can be used in pedestrian areas is 8% (1 meter rise to every 12 meter horizontal distance).
- Parked cars, dirt or other obstacles should not be on the walkway in any case.
- Seating arrangements at regular intervals should be provided along highly used pedestrian ways.
- Guardrails must be provided when there is a considerable difference of elevation at the edge of a footway.

Street Crossings

- A minimum width of 1200 mm is recommended for street crossings.
- When footways cross roads, pavements or other raised surfaces kerb ramps must be used. A minimum width of 1200 mm is recommended for ramps.
- For allowing disabled pedestrians to complete their crossing, the red phase of traffic signal must keep vehicles stopped for about 12 seconds for a 7.5 metre crossing.
- In low income countries traffic calming measures like road humps can be very effective.

Bus Stops

- Bus stops should be provided at every 400 m intervals so that people do not have to walk a large distance.
- For safe boarding and exiting from vehicles a paved and level surface should be present around the bus stop.
- Adequate space should be provided in bus stops so that passengers can enter, wait and board easily.
- Bus transport can be made comfortable if shelters and benches are provided at bus stops.

- Poles painted with colored bands should represent the required position for the entrance of an arriving bus. This will help visually impaired people.
- Wheelchair access with mechanical lifts or raised boarding structures should be provided

Design and operation of buses

- The following table summarizes both the ideal and the transitional specifications for vehicles not designed with a low floor.

Table 2. Specifications for entrances in bus (no wheelchair access)

Item	Ideal Specification/Transitional Specification	
First step height (maximum)	250mm	325mm
Height for subsequent steps (maximum)	200mm	225mm
Item	Ideal Specification/Transitional Specification	
No. of steps (maximum)	3	3
Ground to floor height (maximum)	650mm	775mm
Depth of steps (minimum)	300mm (280mm on vehicles less than 2.5 wide).	
Step risers	Vertical, smooth, flat, colour contrast on nose.	
Ceiling height at door (Minimum)	1.8m above first step.	
Entrance width between handrails	700 mm-850 mm (single stream) 530 mm-850 mm (for wider doorways with central handrail).	

- Handrails should be provided to reduce the fear of falling which is prevalent among elderly and mobility handicapped people.
- From the entrance to at least middle portion of the bus, the bus floor should remain flat, smooth and level.
- One feature of universal design is to use bus wayside platforms for high floor buses and wheelchair ramps for low floor buses. This feature should be adopted for easy accessibility of wheelchair equipped people.
- Bell pushes will help mobility handicapped people to stop buses that stop on request only.
- For people with sight impairments easily visible journey information displayed on the outside of the bus to identify the correct bus they need to board will be necessary.
- Bus travel can be subsidized by governments for mobility handicapped people by either charging them no fare or a reduced fare.

Design and operation of trains

- Keeping the train floor and the platform on the same level is the best practice for easy accessibility of mobility handicapped people.
- A minimum width of 800 mm should be kept unobstructed to allow easy accessibility of wheelchair equipped persons.
- Train-mounted lifts or ramps having a maximum gradient of 8% can be used to provide easy access for wheelchair users
- Space fixed for wheelchair users, priority seating arrangements, color contrasted step edges and handrails should be provided inside trains for mobility disabled people (UNDP, 2010).

- The name of the destination should be written clearly in front of trains in case a station serves more than one railway line (UNDP, 2010).
- Visually impaired people will get benefitted by audible information announcing the name of next station before the train arrives at that station.
- Rail travel should be subsidized by the government for mobility handicapped people by making provisions of reduced fare or no fare at all.

Bus and Train Stations

- Step-free access should be provided between street level and doorway.
- For easy accessibility of mobility handicapped people a simple layout of bus and train stations is desirable.
- The most appropriate approach to facilitate wheelchair access between different floor levels is to use ramps with a maximum gradient of 8%.

Signage and travel information

- The most appropriate font to use for signage and travel information is sans serif (such as Helvetica or Standard), having a width to height ratio of between 3:5 to 1:1. UPPERCASE letters are harder to read than lowercase letters.
- A height of 1300 mm to 1600 mm is recommended for wall mounted signs so that they can be viewed easily.
- It is important to note that letters and symbols must contrast with the background of the sign. Otherwise visually impaired people will face difficulties.
- Numbers indicating route or information showing direction to bus bays, railway platforms or ticket counters can be provided with the help of tactile signage.
- People with visual disability must be able to read printed materials containing journey information or information regarding timetables and fares.
- For people with visual disabilities, there should be provisions for audible announcements.

Specialized Transport Services

Transport services that have been introduced specifically for the needs of mobility handicapped people are termed as specialized transport services. These services enhance accessibility of mobility disabled people.

Training

Training should include the followings:

- Driver Training- Training on safe driving
- Staff Training: Training on handling of wheelchairs, walkers etc)
- Disability awareness training: Training on information on all disabilities, barriers faced by disabled people etc
- Training of users: Travel Training

Global Practice

Some noteworthy instances of good access practice worldwide for mobility handicapped people are as follows. Barrier free entry has been ensured at all "A" and "B" category stations of India by standard ramps. These stations also have separate

parking lots for disabled people, non slippery walkway, wheelchairs, signals and “May I help you booth”. In the long term, Railways will provide facilities of inter-platform transfer and engraving on edges of platforms in the near future. For easy accessibility of handicapped people in airports, lift facility and barrier free movement have been ensured. All of these facilities are provided not only during arrival and departure but also on board. All domestic airports of India have aisle wheelchairs. Ambulift to assist mobility handicapped people are available in some airports of India (Ratna, Udit, 1999). Door-to-door service is provided by a volunteer group in Tokyo for mobility handicapped people in Japan. A group of volunteers assist disabled people on their way to hospital. After the medical test is over, the volunteers help mobility disabled people to reach their respective destination (Akiyama and Mihoshi, 1994). The bus services of Singapore have different features such as wheelchair ramps for handicapped people, special areas with padded backrest, horizontal handrail, vertical stanchion pole and a bell-push button for signaling the intention to alight.

Lifts are fitted in some pedestrian overpasses in Singapore which greatly helps wheelchair equipped persons and persons with visual disability in their movement (Accessibility, <http://www.smrt.com.sg/Journey-with-Us/Travel-Information/Accessibility>). All licensed London taxis are wheelchair accessible (Department for Transport and the Regions, 2005). These taxis have features like wheelchair ramps, high visibility seat panels, large colored grab handles, swivel seats, low level floor lighting, intercom, hearing aid induction loop and ability to carry assistance dogs at no extra charge. Ramps are available for easy accessibility of wheelchair equipped persons. The wheelchair can be moved easily to a securing position with seatbelt restraints due the presence of spacious interior (DPTAC, 1996). Swivel seats help mobility disabled people by extending to the exterior of the vehicle in order to allow seamless movement into the vehicle. Disabled people can use the high visibility grab handles to enter the vehicle with the help of intermediate step.

individuals who cannot use public transportation due to any form of impairment. These services can be compared to the fixed bus system of the city regarding routes and availability (Access Board, 2006). Disability awareness training and driver instruction programs are carried out by the Federal District of Mexico City.

On the basis of this training license is issued to 180,000 drivers. Instructions are given to the mobility handicapped people by the government social service agency in such training (ECMT, 1999). Mobility disabled people get highly benefitted from such training. Lift equipped vans are in operation for mobility handicapped people in Brazil. These vans help disabled people to lead an independent life by arranging trips to rehabilitation centers, educational institutions and hospitals. For ensuring efficiency of the service, it has been kept limited within nine large cities which divides the country (DPTAC, 2003). For easy access to buses, wayside platforms are used in Pretoria by means of which mobility handicapped people can easily access high floor buses. Trainings are given to drivers through different demonstration projects so that they position the buses correctly for easy access of mobility disabled people (DPTAC, 2003).

Enhancing accessibility in Bangladesh

As an initial step towards improving accessibility of mobility handicapped people in Bangladesh, some low to moderate cost and easily implementable features are shown here in the form of a table. We can initiate our mission towards improving accessibility following these easily implementable features in our country. The recommended features can be applied to other low income countries as well for improving accessibility of mobility handicapped people.

Table 3. Likely costs and benefits of some easily implementable features

Feature	Cost	Likely Benefits
Pre Journey Information Printed information	Low	Helps mobility handicapped people to plan a journey easily
Information at stops Pre-recorded audible information	Low	Helps disabled people to easily locate transport services and facilities
Tactile Information	Low	Significant benefit to travelers with serious visual impairments.
Railway Stationsn Folding or fixed seats	Low	Gives disabled people comfort while waiting for a bus
Bus Priority Seating	Low	Enables disabled people to access a bus easily and make their journey comfortable
Hand rails and Stanchions	Low	Benefits those who find steps difficult and helps to board/ alight with greater ease
Feature	Cost	Likely Benefits
Color Contrasted Step Nose	Low	Removes difficulties in distinguishing the edge of each step
Rickshaw Seat Belts for rickshaw	Low	Provides additional safety to physically disabled people
Lowering the floor	Low	For easy access on rickshaw
Train Hand Rails on stair	Low	Benefits those who find steps difficult
Wheelchair Ramps	Low	Enables wheelchair users to board easily
Portable manual train lift	Low (as only one is required per station)	Enables wheelchair users to board easily
Footways and Sidewalks Tactile Paving	Medium	Facilitates safe movement of visually impaired people
Signage and way-finding	Low	Tactile signage benefits visually impaired people and audible way-finding helps hearing impaired people

Passengers with hearing impairments get the necessary information with the help of hearing aid induction loops in taxis (Maunder *et al.*, 2004). For the convenience of mobility handicapped people paratransit services are available in most of the US cities. Paratransit services pick up and drops off

Conclusion

This paper provides an international overview of some key technical issues on accessible public transportation for mobility handicapped people. It starts with a short description

of the accessibility problems faced by mobility handicapped people. It then provides a description of design requirements for ensuring accessible transportation system. This report also provides an overview of good access practices followed globally throughout the world for disabled people. A number of low-cost and easily implementable access aiding features for mobility handicapped people in Bangladesh have also been provided in this report. In order to improve accessibility of mobility-disabled people in Bangladesh, five elements will be helpful and important. These elements include advocacy by people with disabilities, formulation of policy and legislative frameworks, collaboration between authorities and mobility handicapped people, source of funding and planning and implementation of access strategies. It is high time disabled people should come forward in increasing awareness of their necessities in society.

REFERENCES

- Access Board, 2006. Americans with Disabilities Act Standards for Transportation Facilities. US Architectural and Transportation Barriers Compliance Board (US Access Board), Washington DC. (www.access-board.gov/ada-aba/ada-standards-dot.cfm)
- Accessibility, <http://www.smrt.com.sg/Journey-with-Us/Travel-Information/Accessibility>
- Akiyama, T. and Mihoshi, A. 1994. Shogaisha/koreisha ni hairyoshita doro no genjyo to kadai (Current situation and challenges of roadways for elderly and disabled people), pp. 1-11, Journals of the Japan Society of Civil Engineers, Vol. 25, No. 502.
- Department for Transport and the Regions, 2005. Guidance on the use of tactile paving surfaces. Mobility and Inclusion Unit, Department for Transport, London.
- DFID/TRL, 2004. Enhancing the mobility of disabled people: Guidelines for practitioners. Overseas Road Note 21, Department for International Development and TRL Limited, Crowthome, Berkshire.
- DPTAC, 1996. Legibility of bus timetable books and leaflets - code of best practice. Disabled Persons Transport Advisory Committee, London.
- DPTAC, 2003. Making private hire services more accessible to disabled people: A good practice guide for private hire vehicle operators and drivers. Disabled Persons Transport Advisory Committee, London.
- ECMT, 1999. 'Improving Transport for People with Mobility Handicaps: A Guide to Good Practice', European Conference of Ministers of Transport, Paris.
- Maunder, D.A.C., Venter, C.J., Rickert, T. and J. Sentinella, 2004. 'Improving transport access and mobility for people with disabilities', London, United Kingdom: Department for International Development (DFID).
- Oxley P R. 2002. Inclusive Mobility: A Guide to Best Practice. Mobility and Inclusion Unit, Department for Transport, London.
- Ratna, Udit, 1999. Delhi MRTS: A Sustainable Transport Development in the Next Millennium, Civil Engineering and Construction Review, Vol. 12, No. 6, pp. 34-39.
- UN, 2004. 'Accessibility for the disabled: A design manual for a barrier free environment'.
- UNDP, 2010. 'A review of international good practice in accessible transport for persons with disabilities'.
