

# Walkability Assessment in Housing Schemes Using Global Walkability Index and GIS based Spatial Analysis

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**Abstract**— Walkability refers to the safety, security, and convenience of traveling by foot. It is the extent to which the built environment is friendly to the presence of people living, shopping, visiting, or spending time in an area. It can be generally defined as the measure of suitability of an area for walking. The study assesses the walkability in neighbourhood design of Garden Town and DHA-EME Housing Society using GIS Based Spatial Analysis Technique and Global Walkability Index. Furthermore, questionnaire based surveys have been conducted for exploring the users perception regarding existing condition of pedestrian facilities. The GIS Based Analysis for assessing the walkable community facilities has been made on the basis of location standards given in National Reference Manual (NRM) and Walkability Index.

According to Global Walkability Index (GWI), Garden Town is more walkable and accessible for pedestrians. An average value of 18 has been calculated for Garden Town while EME shows a value of 13.1. The average Asia Index value of 48.8 is calculated for Garden Town while DHA-EME has much higher value i.e. 61.9. The higher value of GWI in Garden Town indicates more pedestrian movement however its low Asia Index value shows that the quality of pedestrian infrastructure is not good in Garden Town in spite of more number of pedestrians in the area. In DHA-EME, the value of GWI is low but its Asia Index value is high and indicates that the good quality pedestrian facilities are available in DHA-EME but residents prefer to commute through automobile due to less number of community facilities. Based on these findings, this research project also suggests recommendations for promoting walking as a mode of transport within neighborhood design and for improvising infrastructure for pedestrian movement in order to encourage walking friendly environment, therefore, leading to sustainable communities and neighbourhoods.

**Index Terms**— Asia Index, GIS based Spatial Analysis, Global Walkability Index (GWI), National Reference Manual, Neighborhood design, Sustainability, Walkability.

## 1 INTRODUCTION

Traffic blocking is one of the major problems in most of the cities around the world, especially in developing regions.

Lots of possible alternatives have been proposed to solve the problem of traffic congestion but the most recommended is to encourage “walkability” and “pedestrianization” all over the world. Walkability refers to the safety, security, economy, and convenience of traveling by foot and is a major aspect to make neighbourhood design sustainable. It is the extent to which the built environment is pleasant to the presence of people living, shopping, visiting, enjoying or spending time in an area. A concise definition of “walkable neighbourhood” is that it is a safe, well-serviced neighbourhood, within which pedestrian has easy access to neighbourhood level activities like schools, health clinics, parks and convenience shops and is considered as an indicator of urban quality within the area.

## 2 PROBLEM STATEMENT

It has been observed that walkability within developing countries has been deteriorated over the years. Pedestrian facilities are being overlooked by the authorities. There are no appropriate policy guidelines and parameters to promote walkability throughout the country. The only guidelines in Pakistan, which give the location standards for community facilities, are provided in National Reference Manual (NRM) which was prepared in 1986. Today the design of many private and public schemes is focused on increasing saleable area without giv-

ing any consideration to placement of community facilities within a walkable reach of the target population.

## 3 JUSTIFICATION OF THE RESEARCH

Today industrialization, rural urban migration, urbanization and change in infrastructure is causing most unfavorable impacts on walkability and thus discouraging and reducing its scope. With the development of new transportation routes & infrastructure, the extent to which pedestrian infrastructure allows people to walk with ease and safety has been trim down. A research is needed to suggest ways in order to increase the opportunities for pedestrian-oriented development. The findings of this research would enable the responsible authorities to perceive and understanding the locations required for development, causes and echelons of destruction of walking routes as well as the pedestrians’ specific needs through the systematic and acceptable assessment.

## 4 RESEARCH OBJECTIVES

- To review the literature addressing importance of walkability and different policies adopted in developed and developing countries to improve the walkability in neighbourhood design
- To investigate the walkability index for the selected

- To identify the walkable areas around the basic community facilities based on the location standards given in National Reference Manual (NRM) Pakistan using the GIS spatial analysis technique of buffering
- To know the perception of the pedestrians regarding the walkability conditions and access to community facilities in the selected case study areas
- To draw conclusion and make recommendations for improving the walkability to achieve the goal of sustainable neighbourhoods.

This includes a review of different approaches and policies, adopted in developed as well as developing countries regarding improvement of walkability and pedestrian facilities and explores the effective solutions which are applied globally for easy pedestrian movement. GIS also plays an important role in assessing walkability and pedestrian facilities within towns through proximity analysis and buffering tool; therefore, the role of these technologies was explored. The current walkability situation and relevant policy guidelines in Pakistan which promote the concept of walkability were reviewed. The location guidelines for the provision of walkable community facilities given in National Reference Manual (NRM) were also studied.

Today in many developing countries including Pakistan, pedestrians are given minimum priority in terms of planning and all efforts are made to provide more space for vehicular traffic. In many cities of Pakistan, observations have been made that pedestrian facilities within the cities have always been ignored by the authorities resulting in increased traffic accidents. The Clean Air Initiative (CAI) along with the Asian Development Bank (ADB) conducted surveys on walkability and its issues in different Asian cities including the cities of Karachi & Islamabad. The results indicate that pedestrians consider improvement of accessibility for persons with special abilities to be the top priority. In Pakistan, there are no appropriate policy guidelines and parameters to promote walkability.

It was preferred to select two planned housing schemes within Lahore as case study areas in order to review their planning and design with respect to walkability. After brainstorming sessions and consultations with the supervisor, two housing schemes, a government and a private, were selected as case study areas within Lahore district namely:

- The Garden Town is comparatively old scheme and has been extensively developed since its inception resulting in increased number of community facilities as compared to those planned in

Figure 1 consists of two land use maps of Garden Town Lahore. The top map, titled "LANDUSE MAP OF GARDEN TOWN LAHORE", is a detailed plan showing various land use zones color-coded according to a legend. The bottom map, titled "LANDUSE MAP OF GARDEN TOWN IN ORIGINAL MASTER PLAN", shows a similar but less detailed plan. Both maps include a legend, a scale bar, and a north arrow. The legend lists 20 categories: Alsat Densat Alsat, Alsat Block, Abu Bar Block, Alsat Block, Arman Arman Islam, Abu Turk Block, Babar Block, Uman Block, Tipu Block, Garden Block, Tanq Block, Shensah Block, Ourgangab Block, Industry, Mosque, Hospital, Police Workshop, Research Laboratory, Schools, Cemetery, Commercial, and Canals. The scale bar for the top map ranges from 0 to 1,520 meters, and for the bottom map from 0 to 1,600 meters.

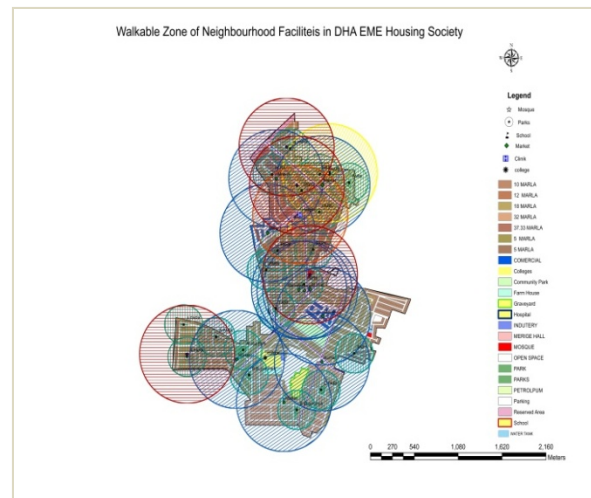
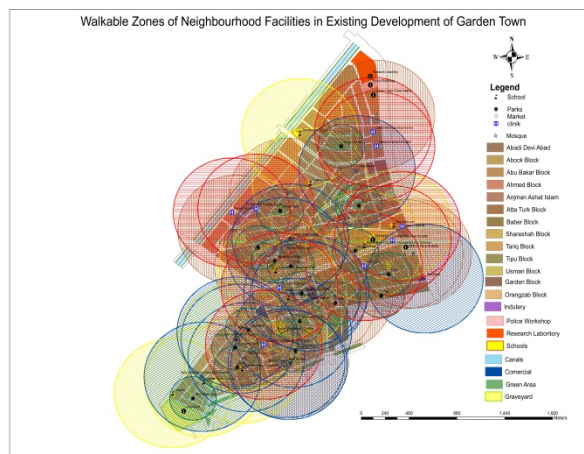
The nature of analysis adopted for the research is of following types:

1. Spatial GIS based analysis for walkability assessment
2. Calculation of Walkability Index
3. Perception of the local community regarding walkability

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## Assessment

In GIS based analysis , maps showing the walkable zones of all the neighborhood level services and facilities including schools, mohallah shops/convenience shops, playgrounds/open spaces, and mosques have been generated for both the case studies. These walkable zones have been generated with reference to the guidelines given in National Reference Manual on Planning and Infrastructure Standards (NRM). These maps have been created in order to determine and analyze the areas that are not served with neighbourhood level facilities.



## 8.3 Calculation of Global Walkability Index

For the calculation of Global Walkability Index, the pedestrian count has been done on the roads in both schemes and the length of roads surveyed has also been calculated. All the nine parameters of Global Walkability Index were calculated and analyzed in selected schemes within different land uses i.e. residential, commercial, educational and public transport terminal areas. An average walkability rating for each parameter within each land use was also calculated.

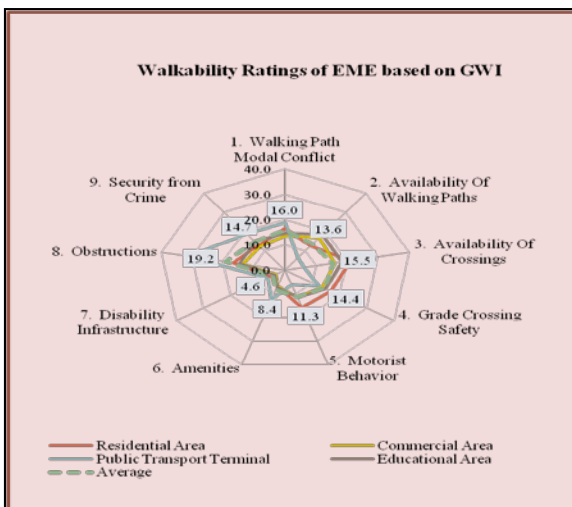
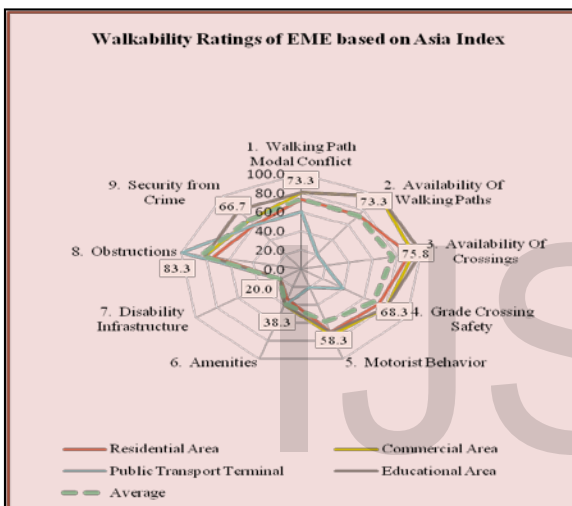
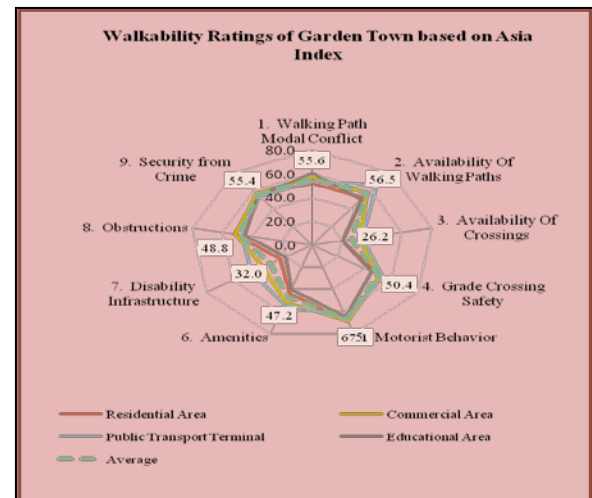
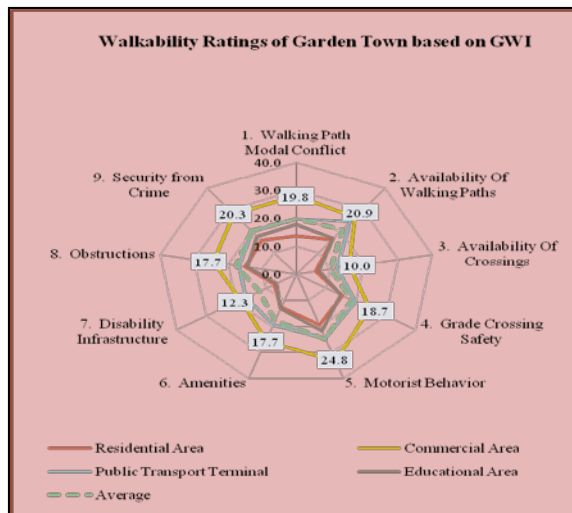
## 8.4 Calculation of Asia Index

Asia index is a modified form of Global Walkability Index. It differs from GWI as it does not document street lengths and pedestrian counts in its analysis and considers only field ratings for nine parameters of GWI in the analysis. Similarly as in case of GWI an average walkability rating for each parameter within each land use was also calculated.

## 8.5 Perception of the Local Community regarding Walkability

Perception of the local community regarding walkability conditions in the area was investigated using questionnaire based analysis. The overall findings about perception of interviewed residents regarding walkability and pedestrian facilities indicate quite high level of satisfaction, while several measures should still be taken to improve such facilities. The major issue in both towns is the non-availability of facilities for people with special abilities. The other major concerns of the respondents were the provision of street lights and wider/clear footpaths.





## 9 CONCLUSIONS

The study focused on the measurement of walkability in both case study areas in the form of two walkability indexes; Global Walkability Index and ASIA Index. According to Global Walkability Index (GWI), Garden Town is more walkable and more accessible for pedestrians. An average rating of 18 has been calculated for Garden Town while EME shows a value of 13.1. Whereas while assessing Asia Index, an average value of 48.8 is calculated for Garden Town while DHA-EME has much higher value i.e. 61.9. The higher value of GWI in Garden Town indicates more pedestrian movement however its low Asia Index value shows that the quality of pedestrian infrastructure is not good whereas DHA-EME the value of GWI is low but its Asia Index value is high and indicates that the good quality pedestrian facilities but residents prefer to commute through automobile due to less number of community facilities. Web based walkscore value for Garden Town is 76 while it is 33 for DHA-EME. Walkable areas around the basic community level facilities in both case studies were identified based on the location standards given in National Reference Manual (NRM) Pakistan using the GIS spatial analysis technique of buffering. It was clearly observed that pedestrians of Garden Town can access neighborhood level facilities more effortlessly as compared to DHA-EME. Pedestrian movement in DHA-EME housing scheme was far less as compared to Garden Town. The overall findings about perception of interviewed residents regarding walkability and pedestrian facilities also indicate quite high level of satisfaction. Based on all these findings, it can be concluded that Garden Town is more walkable in terms of provision and accessibility of community facilities. However the infrastructure provided for pedestrians is not of satisfactory quality.

## 10 RECOMMENDATIONS

- Walking should be promoted as a mode of transport within neighborhood design and major focus should be given on to improve pedestrian infrastructure.
- Public campaigns should be initiated to enhance the public awareness about right of pedestrians and im-

portance of pedestrian facilities.

- Pedestrian and bicycle facilities should meet accessibility requirements and safe, convenient, and interconnected networks for these modes should be provided.
- The pathways for pedestrians should be provided within neighborhood design and covered pathways in the schemes should be provided which not only ensure protection from traffic hazards but also give adequate consideration to harsh climate conditions.
- While initiating the process of road widening for vehicular traffic, proper plan must be prepared making sure that this enhancement is not at the cost of pedestrian facilities.
- Standards pertaining to disability infrastructure should implement throughout the country. These standards comprise of following
- Sidewalks should be 1.525m width to accommodate two wheelchairs passing opposite each other as well as allow 180-degree turn.
- Dropped curbs at intersections and crossings must be provided to ensure smooth and seamless path for the physically challenged
- All types of encroachment should be removed from the sidewalks by as removal of encroachment enhances the pedestrian movement within the areas.
- The intersection should be made pedestrian-friendly by using colored crosswalks or by providing some refuge.
- Provision of street lights within regular intervals within an area with at least distance of 100 meters along with operation and maintenance of the street lights should be ensured.
- The development of such neighbourhoods and schemes that promote pedestrian facilities should be given great importance while developing master plans of cities of Pakistan.
- In the design of schemes, it must be ensured that every resident has accessibility to basic community level facilities at walkable distance.
- The study recommends specific actions for:
- Preparation of pedestrian-focused policies and guidelines
- Development of institutions and resources clearly allocated for walking and pedestrian facilities
- Implementation of urban and transport plans and projects that integrate and link the needs of pedestrians and the quality of facilities.
- Development agencies should play dynamic roles in establishing and supporting initiatives for improving walking environments as an integral part of the planning of transport projects.

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