Protibesh © BUET
July 2008, Volume 12 Issue 2
pp. 55-67

Sustainability of Development Trends in the Urban Fringe: A Case Study on North-Eastern Dhaka City

Md. Shakil Bin Kashem
Lecturer
Department of Urban and Regional Planning
Bangladesh University of Engineering and Technology (BUET)
Dhaka-1000
E-mail: shakil_kashem@urp.buet.ac.bd

Prof. Dr. Roxana Hafiz
Department of Urban and Regional Planning
Bangladesh University of Engineering and Technology (BUET)
Dhaka-1000
E-mail: rhafiz@urp.buet.ac.bd

Abstract
Various tools and mechanisms are being developed for appraising sustainability both at the local and global levels. This study tried to formulate a mechanism to appraise sustainability using Multi-Criteria Analysis (MCA) at the local scale. It selected the north-eastern fringe area of Dhaka to appraise the sustainability of development trends there. Three main spheres of sustainable development, i.e. environmental, social and economical sustainability were taken as Primary Tier Criteria (PTC). Under these PTC 28 Secondary Tier Criteria (STC) were selected. These STC were weighted using Analytical Hierarchy Process (AHP) under their respective PTC. Two sites within the study area (one in the inner fringe and another in the outer fringe areas) were selected for determining the overall sustainability level of the area. This sustainability level was measured in the form of Generic Sustainability Level (GSL). The result showed that, the study area is in a negative state of sustainability. The main reason was pinpointed to its deteriorated environmental condition caused by the ongoing unplanned development works there. Although the study area has experienced some progresses in its social and economic sustainability spheres, its highly negative environmental sustainability situation has rendered it in a negative state of sustainability. Through analysis of the results, this study proposed some actions that can promote sustainability in the whole study area.

Key words: Sustainability, Sustainability appraisal, Urban fringe area Development.

1.Introduction

The issue of 'Sustainable Development' or 'Sustainability' has been gaining momentum for the past few decades when technological advancement and rapid population growth are exerting enormous stress on the limited natural resource base of the earth. Now question arises as to whether the Earth's resources will be able to meet the demands of a growing human population that has rising aspirations for consumption and quality of life, while maintaining the rich diversity of the natural environment or biosphere. And, in the case of city or urban development, this issue of sustainability is raising much concern as being the root cause for exploiting the natural resources as well as providing improved amenities and services. Again, sustainable development is essentially not about the environment but rather about the capacity of human society to enact permanent reform in order to safeguard the delicate balance between humans and their natural life support system (Hamm & Muttagi, 1998 p.2). For this reason, this study tried to evaluate the issue of sustainability from all of its social, economic and environmental dimensions in the case of fringe area development and suggested policy options that would be necessary to ensure sustainable urban growth.

1.1 The Concept of Sustainability

'Sustainable Development' or 'Sustainability' means that in a global context any economic or social development can make improvement without harming the environment. The concept of 'Sustainability' has developed from a global political process over the last three decades of the 20th century into one that now touches every part of the society. In 1987 the Prime Minister of Norway, Gro Harlem Brundtland, launched the book *Our Common Future* which effectively began the era of sustainability. In this report, the Commission offered one of the first definitions of sustainable development as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987 p.43).

In the decade following the publication of the Brundtland Report, over 100 alternate, more detailed definitions of sustainable development, and related term of sustainability, were proposed (Murcott 1997, Elkington 2002). This proliferation was not only a reflection of the complexity of defining sustainability for a wide variety of actors, from individuals to communities to organizations, but also signaled a mounting concern over the deteriorating health of natural and social systems and a growing recognition of the economic benefits of sustainability. Thus when the issue of sustainability is referred it will be the simple idea that means the simultaneous achievement of social, economic and environmental sustainability. This concept is explained in Figure-1.

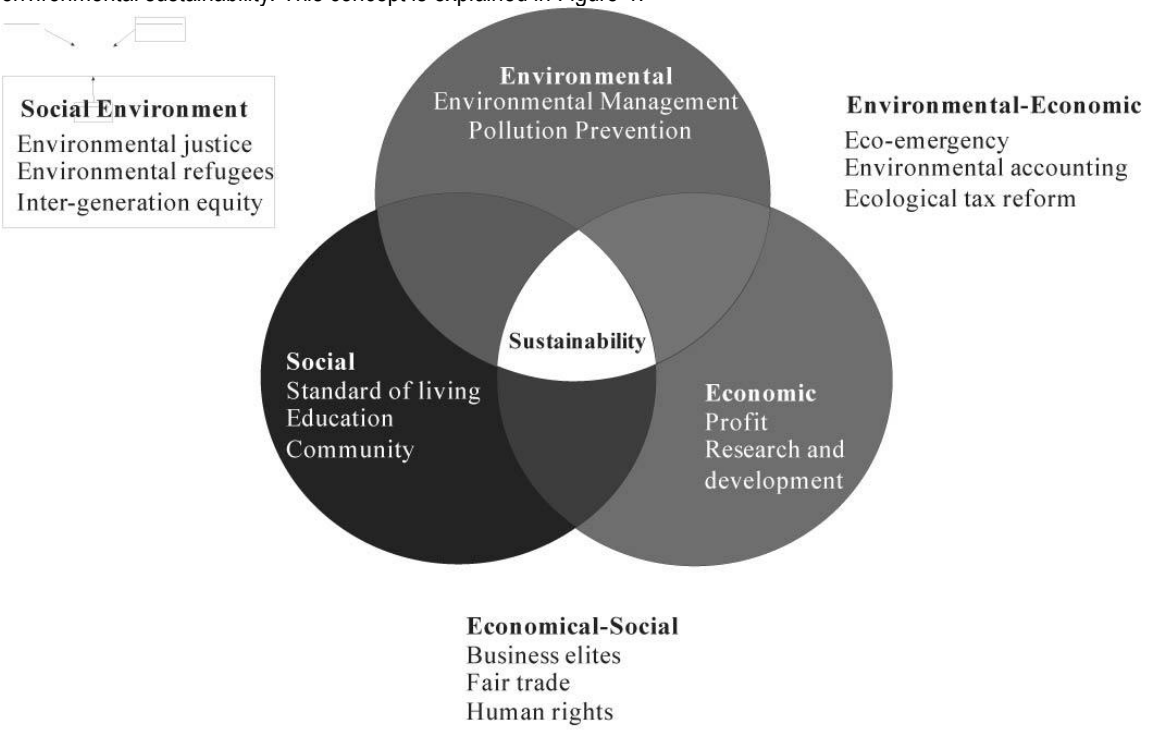


Figure 01: Issues within three spheres of Sustainability (Sustainability, 2002)

1.2 The Concept of Urban Fringe

The term fringe has been subject to a lot of discussions since the beginning of the 20th century. Many terms synonymous to fringe such as urban fringe, rural urban fringe, sub-urban areas, suburbs, urban periphery and more recently extended metropolitan regions (EMRs) have been used in planning literature. Whatever may be the designation, conceptually, fringe is related to the growth of cities that lies immediately outside the designated urbanizable limits and has strong interaction with present city and bears an urban reflection on the physical, occupational and demographic characteristics (Sinha, 1997).

Pryor (1968) distinguished 'urban fringe' from 'rural-urban fringe' by narrating 'urban fringe' as, "… that sub-zone that is in context with a contiguous to the central city. Its density of occupied dwellings is higher than the density of occupied dwellings for 'rural-urban fringe' as a whole. It has high proportion of residential, commercial, industrial and vacant land as distinct from farmland. And it has higher rates of increase in population density, of land use conversion from farm to non-farm and of commuting than does the rural-urban fringe as a whole."

Sinha (1997) classified fringe into two components- rural (outer) and urban (inner). According to his concept, the outer fringe (rural fringe) is more rural than urban areas whereas inner fringe (urban fringe) is more urban than rural and together may be called rural urban fringe. Sinha's concept can be visualized in Figure-2 below.

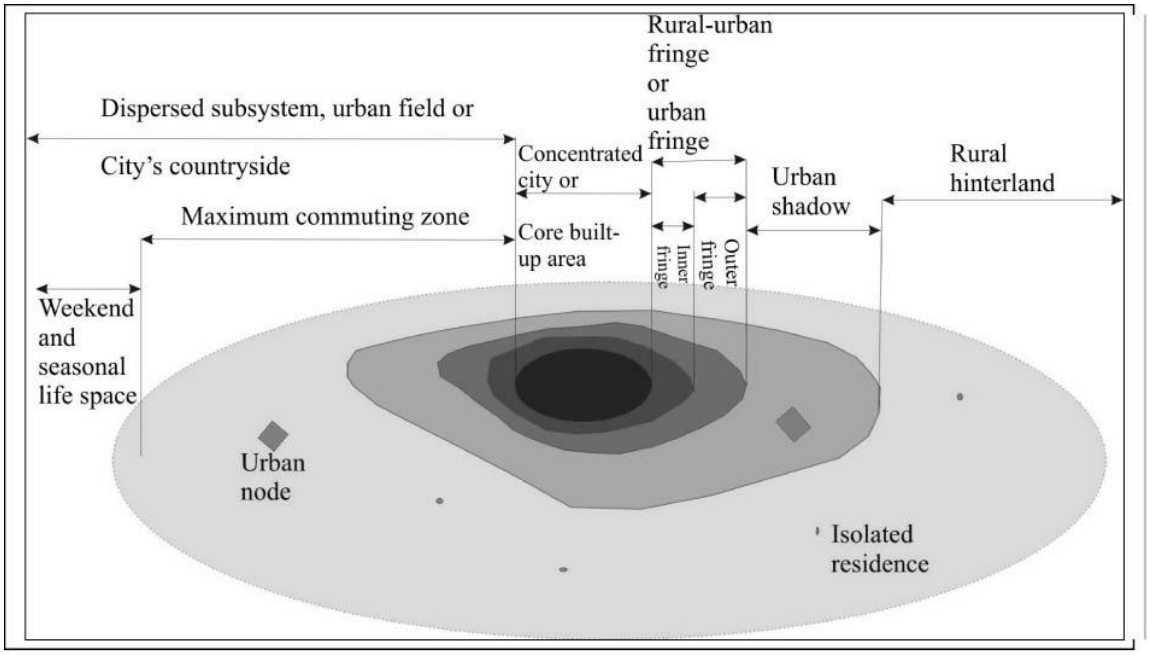


Figure02: The form of the regional city (from Bryant *et al.* 1982)

1.3 Objectives of the Study

The focus of this study circulated around determining the sustainability of present development trends in the selected fringe areas of Dhaka City, Bangladesh. Through this study it has been attempted to identify policy options that would ensure sustainable fringe area development. This study was also carried out with an objective to develop a mechanism for quick appraisal of sustainability of any development process that can assist in future development-planning activities. In the case study it applied a sustainability appraisal framework based on Multi Criteria Analysis (MCA) and evaluated its applicability in the local context of Bangladesh.

1.4 Methodology of the Study

Various methods and frameworks have been developed worldwide for appraising sustainability of any development activity. But most of these methods need extensive data on the concerned activity, which is very difficult in the context of a developing country. For this reason, after reviewing a significant number of methods and techniques, this study decided that Multi-Criteria Analysis (MCA) would be the feasible technique that can be applied for appraising sustainability at the local context of Bangladesh. MCA is a decision-making tool developed for complex multi-criteria problems that include qualitative and/or quantitative aspects of the problem in the decision-making process (Mendoza and Macoun, 1999). For the present study Linear Additive Model of MCA was applied due to its flexibility, easy interpretation capability and above all minimum data requirement.

For conducting MCA this study has identified 3 Primary Tier Criteria (PTC), namely Environmental, Social and Economical. Under these PTC, 28 Secondary Tier Criteria (STC) have been identified. The Environmental PTC contains 10 STC, the Social PTC contains 9 STC and the Economical PTC has got 9 STC. These PTC and STC are listed in Table-1. Analytical Hierarchy Process (AHP) was applied in this study for weighting the STCs. All of the PTCs were given the value of 1 which was distributed among their STCs in the form of Sustainability Weight (SW) on the basis of AHP (Table 1). AHP is a multi-attribute modeling methodology, which was first developed and applied by Saaty (1980). It is a systematic method for comparing a list of objectives or alternatives. In AHP a pair wise comparison matrix is developed among the objectives/decision criteria which are gradually normalized to get weights of each of the objective/criteria. In this study, the pair wise comparison matrixes were developed by the researchers after extensive visits to the study area. These matrixes were normalized to get Sustainability Weights (SW) of each of the criteria (Table 1). Consistency Ration (CR) of each of the matrix was also calculated to ensure that the consistencies of the pair wise comparisons are within acceptable level. An AHP module developed in Microsoft Excel spreadsheet program was used in this process.

Table 01: Primary Tier Criteria (PTC) and Secondary Tier Criteria (STC) with their Sustainability Weight (SW) generated by AHP

PTC	STC	SW
PTC 1 (Environmental Sustainability)	(STC 1-1) Air Pollution	0.077
	(STC 1-2) Loss of wetland	0.189
	(STC 1-3) Water Pollution	0.109
	(STC 1-4) Noise Pollution	0.053
	(STC 1-5) Waste Management	0.109
	(STC 1-6) Agricultural Productivity	0.116
	(STC 1-7) Fisheries Production	0.077
	(STC 1-8) Ground water extraction	0.051
	(STC 1-9) Deforestation	0.076
	(STC 1-10) Sanitation	0.143
	Total	1.000
	Consistency Ratio (CR)	0.045
PTC 2 (Social Sustainability)	(STC 2-1) Public Participation	0.147
	(STC 2-2) Housing Quality	0.074
	(STC 2-3) Education Facility	0.211
	(STC 2-4) Healthcare Facility	0.134
	(STC 2-5) Access to safe drinking water	0.113
	(STC 2-6) Recreational Facility	0.053
	(STC 2-7) Gender equity	0.149
	(STC 2-8)Public security/ crime	0.053
	(STC 2-9) Disaster Management	0.067
	Total	1.000
	Consistency Ratio (CR)	0.025
PTC 3 (Economic Sustainability)	(STC 3-1) Increase of income	0.131
	(STC 3-2) Employment opportunity	0.173
	(STC 3-3) Increase of property value	0.088
	(STC 3-4) Economic equity	0.254
	(STC 3-5) Development of Industries	0.068
	(STC 3-6) Economic return of agricultural products	0.109
	(STC 3-7) Transport Facility	0.078
	(STC 3-8) Electricity Supply	0.052
	(STC 3-9) Gas Supply	0.046
	Total	1.000
	Consistency Ratio (CR)	0.025

Two sites within the study area were selected for achieving the best result from the analysis. Between these two sites one was in the inner fringe area and the other was in the outer fringe area. Based on the selected PTC and STC a close-ended questionnaire was prepared to identify the perception of the local residents regarding the positive or negative change of these criteria within last 10-15 years in the study area. Two focal group meetings were arranged in the sites in April 2005 comprising local political leaders, representatives from different professional and social groups and peoples who are residing in the study area for more than 10 years. Equitable presence of all income groups and sexes was also ensured. In these focal group discussions the purpose of the study was duly briefed and how the

questionnaire would be filled up was elaborately shown. The meeting attendees were then asked to answer about the level of change of each criterion as shown in Figure-3. 100 questionnaires (50 from each of the focal group discussions) were collected.

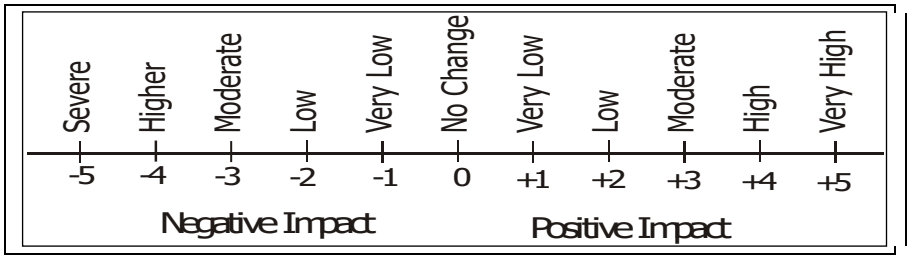


Figure 03: Sustainability Impact Level (SIL) for different STC

For calculating Sustainability Impact Value (SIV) of each of the STC from questionnaire survey, following equation was used:

$$SIV_{ji} = \frac{\sum(SIL \times X)}{\sum X} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Here,

SIV_{ji} = Sustainability Impact Value of i-th STC of j-th PTC
SIL = Sustainability Impact Level (SIL) assigned by the respondent
X = No. of respondent

After providing SW to all of the STC (by AHP), these SWs were then multiplied by SIVs of the respective STC. In this process the following equation was used to calculate Primary Sustainability Level (PSL) of each of the PTC:

$$PSL_j = \frac{\sum_{j=1,i=1}^{n}\left(SW_{ji} \times SIV_{ji}\right)}{\sum_{j=1,i=1}^{n} SW_{ji}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Here, PSL_j = Primary Sustainability Level of j-th Primary Tier Criteria (PTC)
SW_{ji} = Sustainability Weight of i-th Secondary Tier Criteria (STC) of j-th Primary Tier Criteria (PTC) (here, $SW_{j1}+SW_{j2}+SW_{j3}+\text{---------}+SW_{jn}=1$)
SIV_{ji} = Sustainability Impact Value of i-th STC of j-th PTC
(here $-5 \leq SIV_{ji} \leq +5$)

Identified PSL of the three PTC were then calculated to identify Site Sustainability Level (SSL) of each of the sites using the following equation:

$$SSL = \frac{\sum_{j=1}^{n}(PSL_j \times SSV_j)}{\sum_{j=1}^{n} SSV_j} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Here, SSL = Site Sustainability Level
PSL_j = Primary Sustainability Level of j-th PTC
SSV_j = Sustainability Significance Value of j-th PTC

Here, Sustainability Significance Value (SSV) for different PTC was applied depending on the relative importance of the PTC on the total sustainability of the area. SSV is an arbitrary value depending on its significance. For this particular study, it was assumed that all the PTCs are equally important for the overall sustainability of the fringe area and hence all the SSVs were equally valued (=1).

In this way SSL_1 and SSL_2 were calculated for site-1 (inner fringe) and Sited-2 (outer fringe) respectively. SSLs were then used to identify Generic Sustainability Level (GSL) of the study area according to following equation:

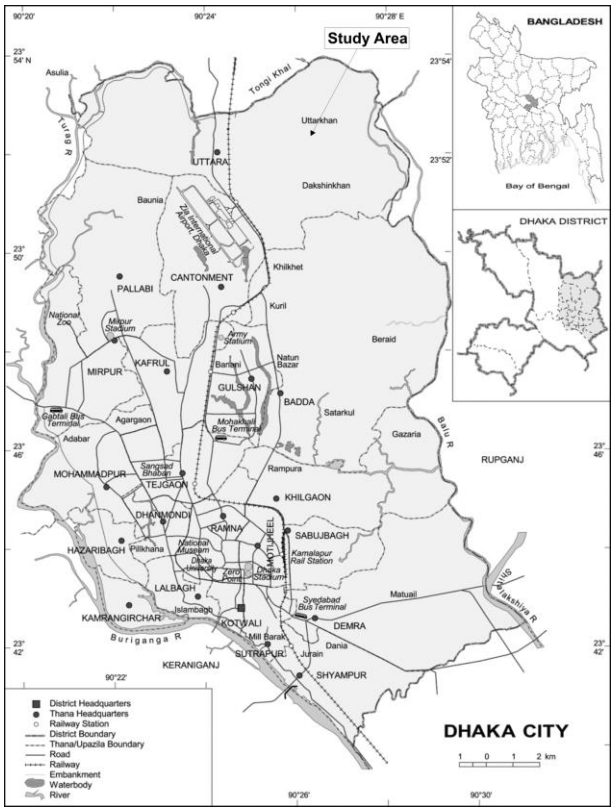
$$GSL = \frac{\sum_{k=1}^{n}(SSL_k \times SSV_k)}{\sum_{k=1}^{n} SSV_k} \quad \text{..... (4)}$$

Here, GSL = Generic Sustainability Level of the study area
SSL_k = Site Sustainability Level of k-th Site
SSV_k = Sustainability Significance Value of k-th site

In this case also, Sustainability Significance Value (SSV) was applied for the two sites based on their relative locational importance on the overall sustainability of fringe area. These SSVs are arbitrary values depending on their significance. In this case, two of the sites were in inner fringe and outer fringe and sustainability of both of these sites were assumed to be equally important for the sustainability of whole fringe area.

2. Description of the study area

The study area is in the northeastern part of Dhaka city that falls to the east of Uttara Model Town. It has an area of about 40 sq.km (Chowdhury et.al., 2001). It is bounded by the Dhaka-Tongi railway line at the west, the *Tongi Khal* at the north, the *Balu* River at the east and the eastern fringe of Dhaka at the south. Notable places in the study area are *Dakkhinkhan, Uttarkhan, Kachkura, Baparipara, Fayadabad, Chamurkhan, Dobadia, Atipara, Holan, Sonarkhola (Jamun) Borua gram (Langani Para)* etc. As an urban fringe, the study area definitely contains less density of population than that of the core part of the city. It had a population of approximately 126,000 in 1990 (Chowdhury et.al., 2001), which increased to about 233,000 in 2001 (BBS, 2001).



Map 1: Location of the study area

The study area has a dynamic pattern of land use, which is changing rapidly with the span of time. It contains not only dense urbanized sites (in its inner fringe) but also rural homesteads and agriculture lands (mostly in its outer fringe). The land use pattern in the study area have undergone extensive changes over time, in response to accelerated economic growth, population pressure and increasing competition between different types of land uses in a limited area. Particularly earth filling and residential development in the study area is occurring due to socio-economic changes, development of roads and other infrastructures by different public agencies, plan for the bypass road cum embankment and functional linkages to the main city. Chowdhury *et.al.*, 2001 classified the land use of the area into 6 major classes that are given in Table-2.

Table 02: Land use distribution of the study area in the year 2000.

Land use Category	Area in sq. Km.	Area in Percent (%)
Built-up area	14.55	35.31
Commercial	.58	1.41
Semi Urban	3.28	7.96
Rural	1.63	3.96
Agriculture	10.60	25.72
Depression	9.41	22.83
Rivers / Khal	1.16	2.81
Total Area	41.21	100

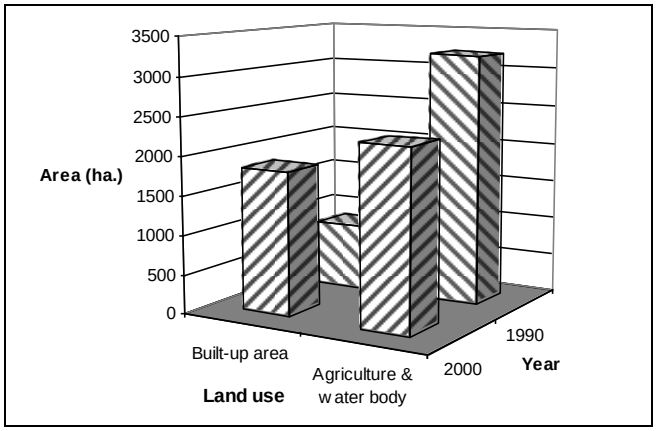
(Source: Chowdhury et.al., 2001)

2.1 Development Trends in the Study Area

This study had identified some key development trends in the study fringe area. These are briefly discussed here:

2.2 Filling of wetlands and change of land use

Presently agricultural land and depressions (i.e water bodies) dominates the land use of the study area, but urbanization is progressing very fast. And in this process of urban expansion, filling of low-lying areas is a common trend in this area. Figure-4 below shows the land use change of the area broadly in two categories – 'built-up area' and 'agriculture and water body' between the year 1990 and 2000. It shows that built-up area has increased by about 50% within this time period diminishing the total stock of agricultural land and water bodies.



(Chowdhury et.al., 2001)

Figure 04: Pattern of land use change between 1990 and 2000 in the study area

2.3 Obstruction of natural flow of water

Obstruction of natural flow of water is one of the major causes of severe floods in and around Dhaka city. Recession of water after intense rainfall now requires longer time period due to the continuous shrinkage of natural water flow

channels both in the inner city and its fringe areas. It was found that both public and private development works are causing obstruction to natural flow of water.

2.4 Real Estate Development

Due to its vicinity to the urban core of Dhaka, the study area is a lucrative choice for real estate developers. But for lack of adequate flood free lands, low lands are now being considered as potential sites for real estate development. Housing projects through earth filling of low lands is a common scenario here. Such housing developments pose threats not only to the wetlands within the study area but also to its greenery and natural serenity.

2.5 Conversion of agricultural land to other uses

In the process of urban expansion, huge tract of agricultural land within the study area are rapidly being converted to different urban land uses (mostly residential use). Field surveys revealed that the inner fringe of the study area is experiencing this conversion process more rapidly than that of the outer fringe.

2.6 Increase of land value

Land value in the study area has rapidly increased within last 10 to 15 years. Table 3 below shows the pattern of land value increase in this area as identified through field visits and personal interviews of local residents. It shows that, in the inner fringe land value has increased significantly than that of the outer fringe.

Table 03: Increasing pattern of land value in the study area

Location	Land Type	Land Value per katha (720 sq. ft.) in taka	
		1990-95	2000-05
Inner Fringe	High Land	200,000-300,000	500,000-1,200,000
	Low agricultural /wetland	50,000-150,000	300,000-450,000
Outer Fringe	High Land	70,000-150,000	300,000-600,000
	Low agricultural /wetland	15,000-40,000	50,000-150,000

Source: Field survey, 2005 and interview of local residents

2.7 Increase of transport facility

Road transport facility has significantly increased in the study area within last 10-15 years. Most parts of the inner fringe of the area have got easy access to road transport facility. Non-motorized transport (mostly rickshaw) is the main mode of the transport in this area, although it has some provision of public transport in the form of bus. People of the outer fringe area use both road way and waterway as their communication mean. During rainy season, native boats become the main mode of transport here.

2.8 Provision of utility services and community facilities

As most parts of the study area is out of the jurisdiction of Dhaka City Corporation, utility services and community facilities are not so developed here (mostly in its outer fringe area). Previously the situation was worse (as revealed through personal interview of the local residents); at present, most part of the study area is under the network of electricity and gas supply. Provision of piped water supply is available only in some parts of the inner fringe area. With improvement of road transport facility, access to education and healthcare facilities have increased.

2.9 Lack of adequate development control

Development control mechanism is very weak for the study area. Although this area is under the jurisdiction of *RAJUK* (the capital development authority of Dhaka), hardly any building owner of the area bother to obtain building permission from RAJUK. Irregular inspection by *RAJUK* officials in the study area prompts improper and hazardous building construction (i.e. construction defying zoning regulation and building code).

2.10 Analysis of the Study Result

Using the sustainability appraisal framework described earlier, the sustainability level of the study area was identified. At first the level of sustainability of both inner and outer fringe area was identified in the form of Site Sustainability Level (SSL). Analyzing the Primary Sustainability Level (PSL) of all the PTC, the mostly affected component of sustainability

was identified both in inner and outer fringe area. On the basis of the SSLs, the sustainability position of each of the sites can be identified according to Table 4. This table was also consulted to identify the position of the GSL.

Table 4: Qualitative Statement on Sustainability based on SSL and GSL

SSL/ GSL	Qualitative statement on Sustainability
–5 to –4	Severely Negative state
–4 to –3	Highly Negative State
–3 to –2	Moderately Negative State
–2 to –1	Low Negative State
–1 to 0	Very Low Negative State
0 to 1	Very Low Positive State
1 to 2	Low Positive State
2 to 3	Moderately Positive State
3 to 4	Highly Positive State
4 to 5	Very High Positive State

2.11 Sustainability Level of the Study Area

Figure 5 below shows the Sustainability Impact Value (SIV) of different Secondary Tier Criteria (STC) under the Primary Tier Criteria of Environmental Sustainability (PTC-1). It shows that only STC 1-5 (Waste Management) and STC 1-10 (Sanitation) of both inner and outer fringe are in a positive state of sustainability although with a very low value of SIV. All the other STC of this PTC are in a negatives state where STC 1-2 (Loss of Wetland) is in the worst position, which is followed by STC 1-9 (Deforestation). STC 1-3 (Water Pollution), STC 1-7 (Fisheries Production) and STC 1-8 (Ground Water extraction) are also in highly negative state as can be seen from Figure 5

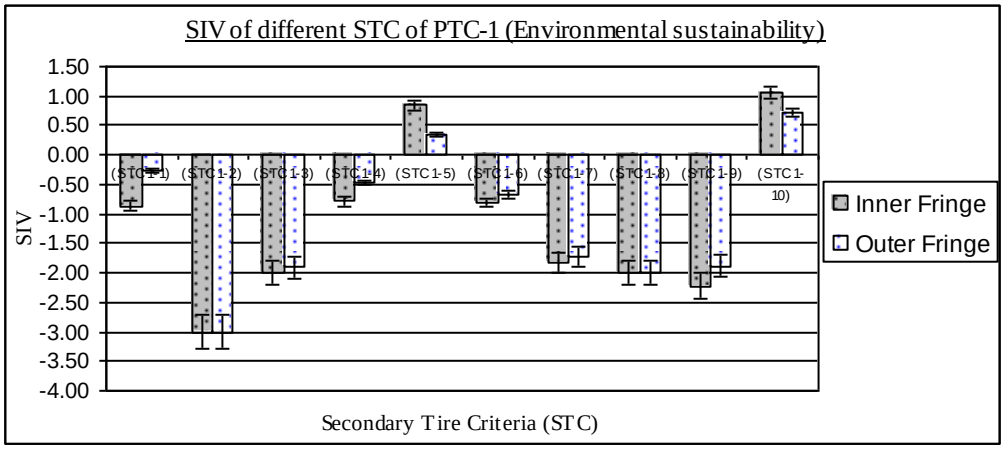


Figure05: Sustainability Impact Value (SIV) of different STC in PTC-1 (Environmental Sustainability)

Figure 6 shows the Sustainability Impact Value (SIV) of different Secondary Tier Criteria (STC) under the Primary Tier Criteria of Social Sustainability (PTC-2). It shows that both inner and outer fringe is in a positive state of sustainability in terms of Public Participation (STC 2-1), Housing Quality (STC 2-2), Education Facility (STC 2-3), Healthcare Facility (STC 2-4), Access to safe drinking water (STC 2-5) and Gender equity (STC 2-7) although all of them contains a low positive value of SIV. In terms of Recreational Facility (STC 2-6), Public security/crime (STC 2-8) and Disaster Management (STC 2-9) both of the sites are in a negative state of sustainability.

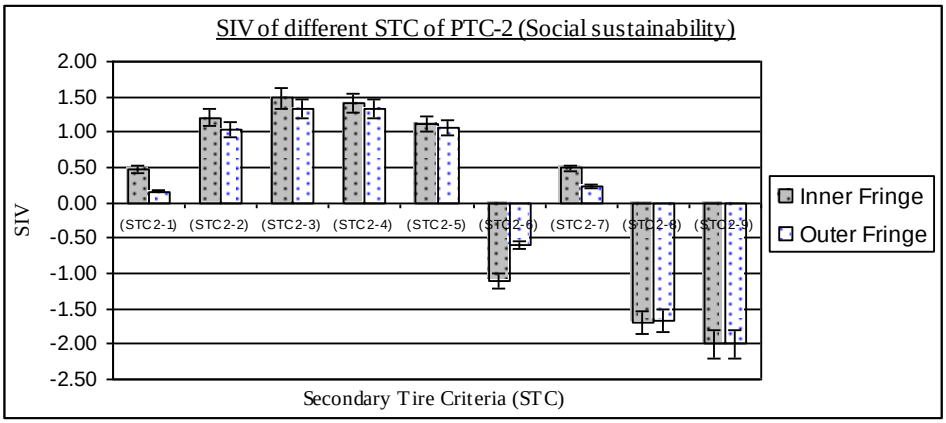


Figure06: Sustainability Impact Value (SIV) of different STC in PTC-2 (Social Sustainability)

Figure 7 shows the Sustainability Impact Value (SIV) of different Secondary Tier Criteria (STC) under the Primary Tier Criteria of Economic Sustainability (PTC-3). It shows that both inner and outer fringe is in a positive state of sustainability in terms of increase in income (STC 3-1), employment opportunity (STC 3-2), value of property (STC 3-3), development of Industries (STC 3-5), economic return of agricultural products (STC 3-6), transport facility (STC 3-7), electricity supply (STC 3-8) and gas supply (STC 3-9) although all of them contains a low positive value of SIV. But, in terms of economic equity (STC 3-4) both of the sites are in a highly negative state of sustainability.

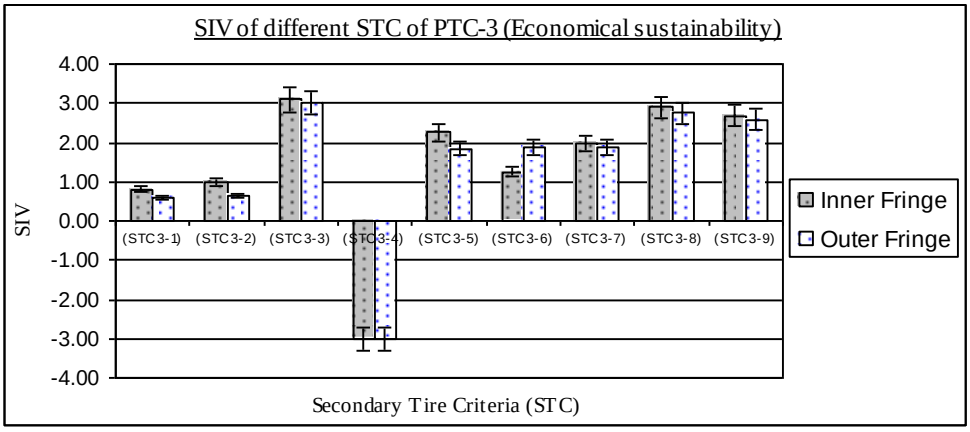


Figure07: Sustainability Impact Value (SIV) of different STC in PTC-3 (Economic Sustainability)

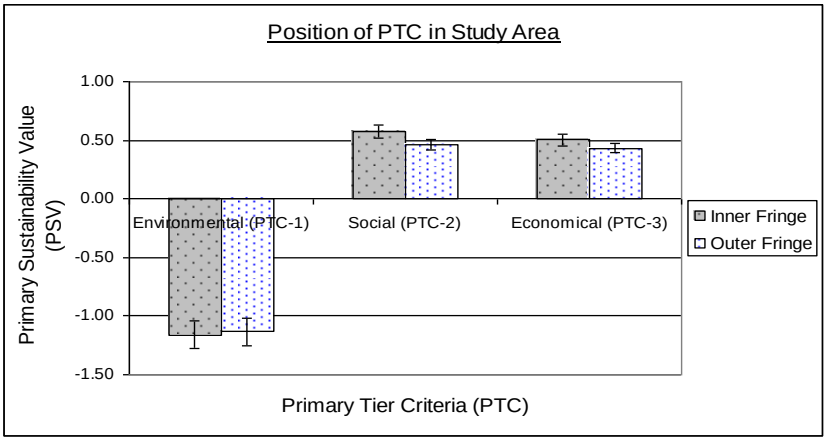


Figure 08: Position of Primary Tier Criteria in the study area

Primary Sustainability Value (PSV) of different PTC was calculated using Sustainability Impact Value (SIV) of their respective STC according to equation (2). Figure 8 shows the relative position of all the Primary Tier Criteria (PTC) in inner and outer fringe of the study area. Although both of these sites are in very low positive state in terms of social and economical sustainability, it is in a significantly negative state of environmental sustainability. For improving overall sustainability of these sites, this issue of environmental sustainability needs to be addressed adequately.

The Site Sustainability Level (SSL) of both inner and outer fringe was calculated using the Primary Sustainability Level (PSL) of all the Primary Tier Criteria (PTC) according to equation (3). It was found that SSL of Site-1 (inner fringe) is 0.026 and Site-2 (outer fringe) is –0.08 which indicate that both the sites are in a 'very low negative state' of sustainable development (according table 4).

Generic Sustainability Level (GSL) of the whole study area was calculated by using the Site Sustainability Level (SSL) of the two sites according to equation (4). It was found that, the study area has a GSL value of '-0.053'. It indicates that the study area is in a 'very low negative state' of sustainability in its development process. It means that, if the development trends of the study area continue in the same manner as it occurred for last 10-15 years, it would proceed further towards an unsustainable situation. For achieving sustainable development in this area, some sensible and planned initiatives need to be taken here. Some recommendations in this regard are discussed in following sections.

3. Proposals for Promoting Sustainability

From the findings of the study results, some proposals are made here that will promote overall sustainability of development trends in the study area.

3.1 Promoting environmental sustainability

For promotion of environmental sustainability adequate focus should be given on following issues:

- *Balu* river, that flows through the periphery of the study area is highly polluted by the effluents of the industries located in the northern bank of it. This pollution is highly deteriorating the overall environmental condition of the study area. So, pollution control mechanism need to be improved to combat adverse impact of water pollution and air pollution in the study area. It is also necessary for improving overall public health situation in the area.

- Detail Area Planning (DAP) is the tool for implementing the policies set out by the Dhaka Metropolitan Development Plan (DMDP, 1995-2015). But, delay in preparation of DAP has already caused huge damage to the environmental quality of the study area. Unplanned earth filling of wetlands are not only deteriorating the overall environment of the study area but also posing threat to the drainage system of the core urban area. Proper development control measures need to be taken here for discontinuing this trend of filling of wetlands.

- Although the study area have gained some improvement regarding sanitation situation in recent years, its progress is not so satisfactory for advancing towards environmental sustainability. Steps should be taken locally in this regard to improve the sanitation situation of the whole area.

3.2 Promoting social sustainability

For promotion of social sustainability of the area focus should be given on the followings:

- For attaining social sustainability, public participation is one of the vital issues that need to be addressed sufficiently. Although public participation in development decision making in the study area has increased to some extent (as can be seen through its positive sustainability level), any formal structured public participation process is yet to be developed here due to weak local government system. To promote social sustainability here, strong local body should be formed.

- Although the study area have improved to some extent in recent years in terms of community facilities like education, healthcare etc. it still need to have a lot of progress in this aspect for proceeding towards social sustainability of a satisfactory level.

- Promotion of gender equity is one of the most vital issues for attaining social sustainability. Although in recent years there have been some formidable progresses in this regard in the study area due to extensive government initiatives, still lots need to be done in this regard for attaining social sustainability to a satisfactory level. Awareness program among the women need to be taken focusing on the issue of women rights for equal opportunity in work place, education, health care and other community facilities.

- The issue of disaster management is getting importance day by day with the increasing affect of climate change. But this issue is yet to be addressed locally at the study area that is facing the adverse affect of flood every year. For this reason, flood-warning system should be improved in the study area with wider participation of local political leaders, CBOs and NGOs.

3.3 Promoting economic sustainability

For promoting economic sustainability of the study area focus should be given on following issues:

- Poverty alleviation is one of the prime concerns for attaining economic sustainability. Although, the process of urban expansion in the study area has brought economic benefit to a significant portion of upper and middle income people (as revealed through positive sustainability level of income and employment opportunity), in some cases the poor have to face the adverse affect of this process (as indicated by the negative sustainability level of economic equity). For this reason, special credit facility for the poor need to be introduced here for enabling them to break the vicious cycle of poverty.

- Promotion of small industries will bring economic benefit to wider section of the community in the study area. For promoting small industries, convenient credit facilities need to be provided to the potential entrepreneurs.

- Although the study area has gained some progress in the sector of transport facility in recent years, still a significant part of it (in the outer fringe) is without adequate road network. Hence, road network need to be improved here with proper consideration of natural flood flow channels and water bodies. Water transport facility through the bounding rivers also needs to be improved to provide the dwellers with cheaper mode of transport.

3.4 Sustainability Appraisal Framework

Environmental Impact Assessment (EIA), Initial Environmental Examination (IEE), Socio-economic Impact Assessment (SIA) etc. are the widely used methods for assessing viability of any development plan or proposal in our country. Some economic indicators (i.e. BCR, NPV, IRR etc.) are also widely applied here for appraising any project. Although these methods have the ability to efficiently judge and compare the suitability of any project, they are narrowly focused on some limited issues. For example, EIA and IEE focuses mainly on the environmental issues, while SIA on the socio-economic issues. But, any kind of physical development have some sort of positive or negative impact on the environmental, social and economical aspect of its proposed location which need to be addressed broadly to attain the highest benefit from it. Here comes the issue of sustainability that encompasses all these aspects both at local and global scale. Sustainability appraisal would consider all these aspects of a development proposal with only one mechanism. This study has formulated a framework for appraising sustainability using Multi-Criteria Analysis (MCA). Here focus was given on the data requirement of the framework and time requirement to conduct such kind of sustainability appraisal. Through this case study it was found that this framework can be effectively applied to any on-going or proposed development initiative in the local context of Bangladesh. Lack of adequate data and lack of enough time duration for decision making processes are common phenomena in this country. This framework can be an effective alternative to appraise sustainability in these circumstances. But more research should be conducted on this framework to make it more robust and more versatile that can be applied to different development sectors.

4. Conclusion

Initiated by the Brundtland Commission Report (WCED, 1987), the issue of sustainable development or sustainability is generating wider interest among the scholars and policy makers of both developed and developing countries. This study took the issue of fringe area development for appraising the sustainability of it through its present development trends. It studied the development trends of northeastern fringe area of Dhaka city and identifies its present level of sustainability. It was revealed through the study that, this part of the city is in a negative state of sustainability due to the high negative state of its environmental sustainability situation. Unplanned urban expansion promoted by wide scale of land filling and deforestation is causing the major damages to its environment. Although it experienced a very low level of progress in its social and economical aspects within last 10-15 years, it's rapidly deteriorating

environmental aspects makes its total sustainability level at a negative state. For proceeding towards sustainability in this part of the metropolitan area there need to be taken a lot of improvement programs in its social and economic sector along with adequate development control to improve its environmental condition.

References

BBS, 2001; "Bangladesh population census report, 2001: Community Series (District- Dhaka)", Bangladesh Bureau of Statistics, Dhaka

Bryant *et al,* 1982, "*The City's Countryside",* Longman 1982, cited in The Countryside Agency, 2003b

Chaudhury, A. H., 2004; "The Concept, Delineation and Planning Implications of Urban Fringe"; *Plan Plus* Volume 1 No. 2, 2004 (111-119), Urban & Rural Planning Discipline, Khulna University, Khulna, Bangladesh.

Chowdhury, J.U., Kamal M.M., Khan N.I., Akhtar M.K., Salam M.A., 2001, "*Impact of Landuse Change upon Storm Water Drainage and Wetlands in the Eastern Part of Dhaka City*", Joint study of IFCDR of BUET, DGE of D.U. and SWMC, Dhaka.

Elkington, John. 2002. *What Is Sustainable Development*. [Internet] Available from http://www.sustainability.com/philosophy/what-is-sustainable-development.asp [Accessed 15 January 2002]. Cited in Rodríguez et.al. 2002

Hamm. Brend & Muttagi. Pandurang K., 1998; "*Sustainable Development and the Future of Cities*"; Intermediate Technology Publications, London, UK.

Mendoza, Gullermo A. and Macoun, Phil., 1999, *"Guidelines for Applying Multi-Criteria Analysis to the Assessment of Criteria and Indicators"*, the Criteria & Indicators Toolbox Series, Published by Center for International Forestry Research (CIFOR), Jakarta, Indonesia

Murcott, Susan. 1997. *Appendix A: Definitions of Sustainable Development*, in *What Is Sustainability?* Presented at AAAS Annual Conference, *Sustainability Indicators Symposium*. [Internet]. Available from <http://www.sustainableliving.org /appena.htm>.

Pryor, R.J., 1968; "*The Sampling frame for Rural-Urban Fringe*", The Prof. R. Geogr., Vol.20, 1968. cited in Chaudhury, 2004.

Rodríguez, Sandra I., Matthew S. Roman, Samantha C. Sturhahn and Elizabeth H. Terry, 2002; "*Sustainability assessment and reporting for The university of michigan's Ann arbor campus*"; Unpublished MSc. in Natural Resources and Environment project paper, The University of Michigan, School of Natural Resources and Environment, April 2002.

Sinha, R.L.P., 1997; "Urban Fringe: Approaches and Policy Options", *ITPI Journal*, Vol. 15, No. 1-4 (167-170), June 1997, Institute of Town Planners, New Delhi, India

Saaty, T.L., 1980, "*The Analytic Hierarchy Process"*, McGraw Hill, New York, USA

Sustainability. 2002. *The Triple Bottom Line.* [Internet] Available from <http://www.sustainability.com/philosophy/triple-bottom/tbl-intro.asp>.
[Accessed 8 November 2001]. Cited in Rodríguez et.al. 2002

The Countryside Agency, 2003; "Overcoming barriers to better Planning and Management in Urban Fringe"; BK, Tauntfield, South Road, Taunton, Somerset, Uk; Available from- www.countryside.gov.uk

WCED (World Commission of Economic Development). 1987; "*Our Common Future*", Oxford, Oxford University Press.