

Sustainable City Design: Developing conceptual planning proposal for Eastern Fringe of Dhaka city

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Abstract: *The Eastern fringe of Dhaka city is a low lying area along the bank of Balu River. According to DMDP, 32% of the total population of Dhaka city will be living there by 2020. This area is now facing scattered private housing development projects and rapid urbanization. So this paper aims at preparing a conceptual planning proposal for a planned sustainable urban environment. Objective of this study is planning a sustainable city environment for eastern fringe for projected population (2.6 million) of 2020 and conservation of retention pond areas. Before preparing the plan various town development plans were studied (Delhi Master Plan 2021, Navi Mumbai plan, Putrajaya town development plan etc). Then population for the year 2020 in the study area is projected. Afterwards land use distribution, road network design, zoning, detailed neighbourhood design for different income groups etc is done. The study area is divided into four zones. A transit based transportation network is planned. Residential land use is the major land use in the study area. This site is planned as a polycentric urban form with hierarchy of CBDs, adapted from Delhi Master Plan 2021. 15% area is conserved for retention ponds. A regional scale hospital, university, light industrial zone and waste treatment plant is planned. Agricultural lands and land for future expansion is also planned. Thus all the planning processes are applied to design a sustainable urban environment.*

Key words: Sustainable city, Land use plan, Conservation, Eastern fringe

1.1 Background of the Study

Eastern fringe of Dhaka city is mostly undeveloped with some rural settlements along the bank of Balu River. The area is low lying and part of flood plain of Balu River. Some part of the area is covered by private developers' claims and they are taking large scale land development projects ignoring FAP-8A project requirement. The area east to Pragati Sharani is facing rapid development by low income people. This area is likely to develop sooner than anticipated as the

Eastern Bypass road might be realized earlier than expected. According to DAP of DMDP 1995, by 2020 32% of the total population of Dhaka city will be living in the eastern fringe area. As most of the part of this area is free from development it can be developed for this huge population in a planned manner. Greatest concern is that the built urban environment must be sustainable development. Now, major characteristics of a sustainable city are controlled population, efficient civic amenities, planned housing schemes, efficient transport system, waste treatment and sewerage system, health care system, honest governance, strong urban private sector and adequate employment opportunities (T. Odude, 2012).

Here objective of this paper is as following

- Planning a sustainable city environment for eastern fringe for projected population (2.6 million) of 2020
- Conservation of retention pond areas.

So that a planned urban environment can be ensured that portrays the major characteristics of a sustainable city.

1.2 Study Area Profile

The area covers 29531 acre. There are 68 moujas in the study area. It is bounded on the north by Tongi Khal, to the east by Balu River, to the South by Demra road and to the West by the Pragati Sharani. The study area is a low lying area with extensive canal networks (figure 1). There are some rural and fisheries settlements in the eastern part. On the western side Badda has already been developed as readymade garment industry zone and residential zone. To the North there is Tongi industrial area and to the South there is Demra. Close proximity to Gulshan and Baridhara makes some areas of the Eastern fringe preferred areas of development. The Begunbari Khal flows through this area up to Balu River which drains one third of Dhaka's storm and waste water. According to FAP-8A 12% of the eastern fringe should be reserved as retention pond (JICA, 1992).

1.3 SWOT Analysis

Following are the strengths, weaknesses, opportunities and threats of the area analyzed for the plan.

Strength

- Free from development.
- Sufficient amount of water retention pond and water body.
- Natural beauty.
- Extensive canal network.

Weakness

- Low lying area.
- Vast area is flooded annually.
- Large amount of earthwork (e.g; landfill) is needed for new development.

Opportunity

- Place for new planned development
- Retention pond is used for recreation.
- Provide housing for 2.65 million people.

Threat

- For new development the navigability of the existing river and the canal network may be interrupted.
- Unplanned development by private developers.
- Encroachment of canals.
- Under the earthquake threat.

1.4 Methodology

Based on the SWOT analysis land use plan is prepared. Before preparing the plan various town development plans were studied (Delhi Master Plan 2012, Navi Mumbai plan, Putrajaya town development plan etc). Then population for the year 2020 in the study area is projected. According to DMDP in year 2020 18.69 million people will live in DMDP area (DMDP, 1997). According to the projection 2.660857 million people will live in eastern fringe area. So to make eastern fringe a sustainable urban area appropriate land use planning is required.

Following plan making process was followed to prepare land use design for each type of land use.

- deriving spatial requirement for specific land use sector
- Mapping suitability of land for particular use
- Estimate space requirements for land use
- Analyze carrying capacity of suitable land supply

- Design land use pattern (Lynch, 1995)

Spatial requirement for residential zone is calculated by taking a standard value of 10600 people per neighbourhood. Projecting the population in different income group was done by taking current ratios for different income group of Dhaka's population. Data on income was collected from Bangladesh bureau of statistics. Space requirements for commercial land uses, civic facilities and amenities are determined by studying empirical evidences. Final land use plan for the satellite town is prepared. This plan included zone subdivision, transport route plan, neighbourhood design, planning of civic facilities and amenities etc.

2. Planning Philosophy

According to the objectives of this study planning philosophy has been determined. The aim of the plan is to guide the development of this area in such a way that even after the year 2020 the study area continues to work as an efficient urban environment.

- Neighbourhood design to make of provision of housing for projected 2.65 million population, while considering needs of different income groups. All neighbourhoods will be designed based on a child's maximum walking distance to school.
- Conservation of DAP identified water bodies and retention ponds.
- Development of parks by utilizing the natural water bodies (City within a garden like Putrajaya).
- Preserving existing agricultural land and pocket green spaces in urban areas. This will be done to control food prices in urban area and ensure safe food supply. Similer practice is going on in Beijing, China (CAI et al, 2011).
- This site will be developed as a polycentric urban form. There will be a major CBD, zonal CBDs, neighborhood centers and local centers. The concept of hierarchy in CBD is adopted from Draft Delhi Master Plan, 2021 (DDA, 2005) and Navi Mumbai development plan (CIDCO, 1973).The CBDs will be developed as pedestrian precinct.
- A transit based transportation network will be developed. There will be a major arterial road running through the study area from north to south. There will be major distributors, minor distributors and access roads connected to major arterial according to hierarchy.

- There will be a light industrial zone near the Tongi Industrial zone. This will provide employment for low income people. The industrial zone will be buffered with green areas and roads.
- There will be a university and a general hospital. As those will be in regional scale their locations shall be such that minimizes congestion inside the area.
- There will be a waste management plant in the periphery of this study area. There will be a buffer zone around the waste management plant.

3. Design Concepts and Details

The main goal of the study was to manage the future housing need through preparation of a sustainable plan in the Eastern Fringe area. To achieve this goal a satellite town will be created to mainly serve residential needs. The design concepts with required details are explained here in the following section.

3.1 Retention Area and Water Bodies

For a sustainable urban environment it is very important to preserve natural water bodies, to facilitate drainage, recharge ground water, preserve ecosystem etc. Now all the retention ponds of the study area are located in the Eastern side. In this plan all the retention areas and water bodies have been preserved for drainage and ecological purpose. These retention areas will also serve for recreational purpose. Linear parks have been proposed along the retention ponds. This is adopted from Putrajaya master plan where 12% of land is preserved for water bodies. (John, n.d.).

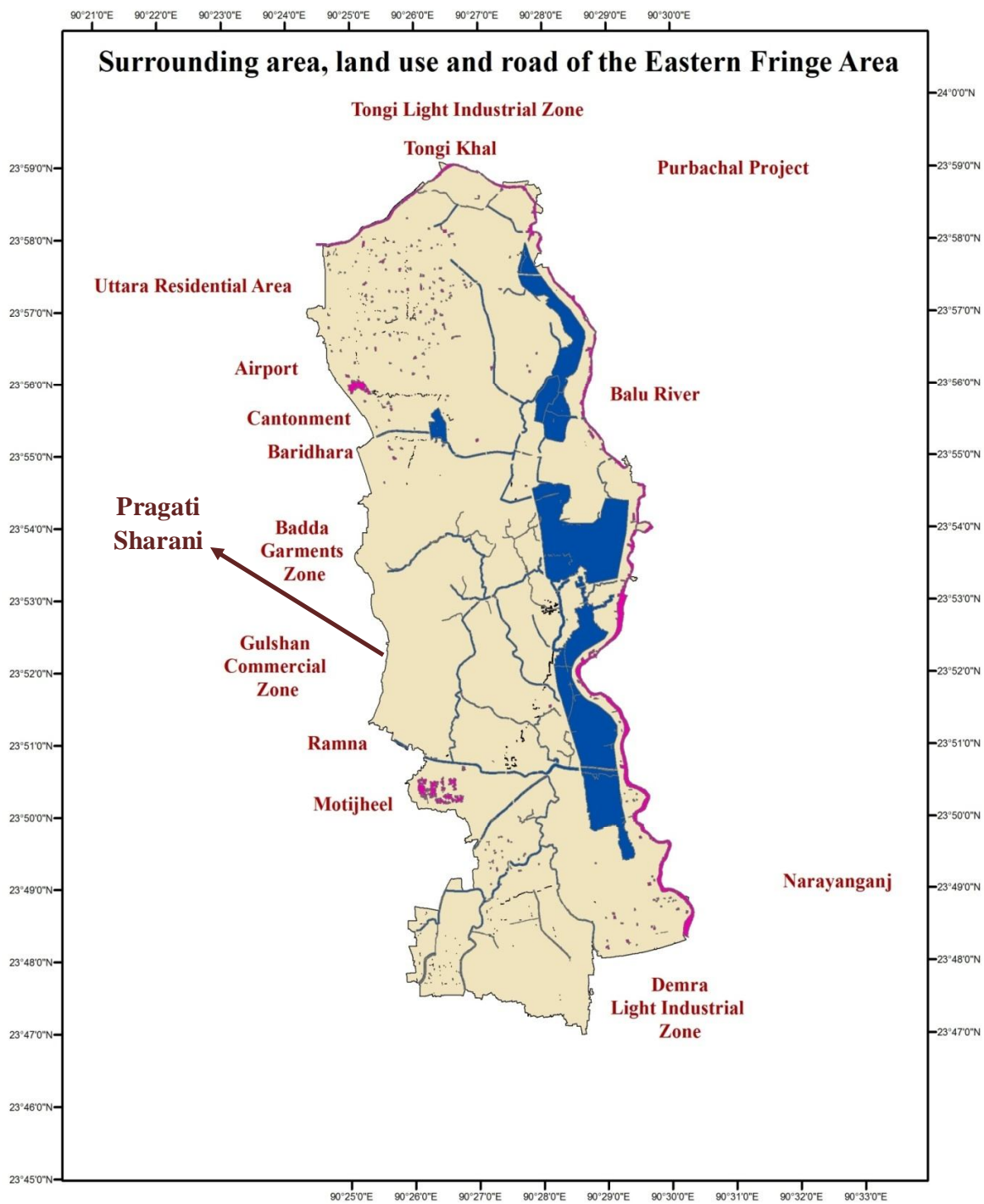


Fig 1. Map of Surrounding Land Uses of Eastern Fringe Area (source: RAJUK)

3.2 Land Use Distribution

Residential land use is the major land use in the study area. So along with residential land use, commercial, industrial, open space and agricultural land use have been provided to develop it as a self sustained satellite town. In addition adequate amount of land is kept for future expansion.

3.3 Zone

The study area have been divided into 4 zones by three roads of 60 feet width, giving due consideration to the topography, surrounding land uses and easy accessible routes.

3.4 Zonal CBDs

4 CBDs were designed for the respective zones to ensure proper distribution of facilities throughout the zones. The areas of the zonal CBDs are about 1.5% of the respective zones. (Nabi, 2008). The major CBD is about 2% of the total study area.

3.5 Zonal Facilities

Some facilities are provided to serve the zone as a whole. These zonal facilities are located around the respective zonal CBDs and are meant to serve all income groups. Zonal facilities include Commercial facilities, Utilities, Services and Social Amenities. In every zone, facilities like Shopping Malls, Maternity Clinic and Sports Complex are provided for the convenience of people. Some other necessities like Graveyards, Post Office, Petrol Pump, Gas and Fire stations are also provided to serve the zonal population.

3.6 Neighborhoods

The main purpose of the plan was to design a sustainable living environment for all income groups of people through focusing on residential land use. The unit of a residential land use is a Neighborhood. 4 types of Neighborhoods are designed which serves four different types of income groups. Namely, lower, lower-middle, middle and higher income neighborhood.

3.6.1 Population Calculation according to Income Group

The projected population for the study area is 2660858. Among them 11.1% are low income, 48.99% are lower-middle, 29.59% are middle and 10.22% are high income group of people. According to this classification, 4 types of neighborhoods have been proposed with 10600

populations per neighborhood on average. In total 273 neighborhoods are suggested for design purpose considering the presence of canals and other natural features. All the neighborhoods are placed considering the surrounding land uses of the study area. For example, low income neighborhoods are kept close to Badda garments area and Tongi to ensure easy accessibility to work place.

3.6.2 Design considerations for neighbourhood

Flat sizes for different income groups are varied due to affordability concerns. Here for low income group flat size of 200 sq. ft with communal toilet and kitchen is proposed. For other income groups increasing flat size is proposed with rise in income. For high income group there is also provision for few vacant plots.

Pedestrian facility is given highest priority while designing neighbourhood. It is assumed that apart from high income neighbourhoods car occupancy will be relatively low. So mostly brick paved roads are proposed, where if need arises motorized vehicles can also move.

Every neighbourhood is provided with basic civic facilities and services. Necessary facilities like Primary School, Secondary School, Neighborhood Complex, Mosque, Madrasa, Vocational Institute, Corner Shops and Kitchen Market etc are provided to make it a self-sustained neighborhood. Car occupancy rate for low income people has been assumed to be zero and for this, brick paved roads have been suggested throughout the neighborhood. Play lots and Play Grounds have been provided for active recreation especially for children. Neighborhood parks and Water bodies are designed for passive recreation of all age groups. Plantation Strip surrounding the neighborhood serves as the buffer from outer area and delineates the boundary of the neighborhood. To make it a secured neighborhood community police boxes are provided at every entrance.

3.6.3 Neighborhood Center

Some facilities are designed for a cluster of neighborhoods and these facilities are grouped under the category of Neighborhood center. Facilities like colleges and waste dumping zone are provided for a cluster of 4 neighborhoods as they require a larger population. Water, Electricity pump and Fuel Stations are placed in the neighborhood center to provide supply to the

households of each of the 4 neighborhoods. A health complex is also provided to serve for the medical needs of the neighborhood cluster.

3.7 Roads

The whole road network of the study area has been planned considering the surrounding roads and areas. Eastern-Bypass is in the eastern side of the study area and will connect the area with Tongi and DND area in North and South. Pragati Sarani, a major thoroughfare, is in the west side of the study area and Demra road falls in the south side. A 100 ft wide major arterial connecting the North and South part will pass through the mid section of the area to serve both East and West part equally. To avoid traffic conflict a section from the Arterial road is provided around the CBD. The traffic mode on this road will be mainly public transit based. Good quality Bus Services will be available to serve lower and middle income group who are the major part of the study area population.

The major distributors are connected with the major arterial. These distributors link the major arterial with the surrounding roads and are designed considering the canals and other natural features. The neighborhoods are interconnected by 40ft wide roads. The access road in a neighborhood is 25 ft and 15 ft wide.

All the roads are planned in such a way that they do not hamper the natural features and in most cases roads are purposefully aligned along the canals to protect them from encroachment.

3.8 Major CBD

The major CBD of the town falls under the middle zone-2. It is given to reduce the dependence on other CBDs of Dhaka city along with serving for study area population. To provide suitable location to CBD and its surrounding land uses and topography have been considered. The central hub is designed with such facilities that can make the town lively. A regional scale hotel is provided in the major CBD. Major administrative units with a public library, an auditorium, a gallery have been provided within the CBD. Major branches of government and private banks are also planned to be located in this major CBD. A regional scale Hospital, a University and Shopping Mall are planned to be provided in the surrounding area of CBD .

3.9 Agricultural Land Use

Agricultural land use is provided to make the town a self sustained one. The Eastern part contains the entire agricultural zone. This placement of agricultural zone is given to ensure the close proximity of low and lower-middle income groups to make it easy for them to work there. These agricultural zones will serve as the urban kitchen for Dhaka city and the town itself. Some of this agricultural land can be used for future expansion if needed.

3.10 Recreational Facilities

A hierarchy is maintained to provide recreational facility, that neighbourhood scale, metro scale and regional scale. A metro scale park and zoo is provided in the surrounding areas of CBD to facilitate the whole town with recreational facilities. Small scale open spaces are created near the neighborhoods to serve the locality. All the recreational facilities, especially the zoo are planned considering the main drainage channels and natural features. Linear parks are created along the canals and a regional scale park around the retention pond is created to serve the whole Dhaka city and surroundings.

3.11 Light Industrial Zone

The light industrial zone is located in the northern portion considering the location of Tongi Industrial Area and relatively higher land topography. Low and lower income neighborhoods are located near the light industrial zone to give better accessibility to their workplace.

3.12 University

A University requires a huge amount of space for its proper operational purpose. For the availability of adequate space in fringe areas a University is located near the CBD of the study area. The location of the University is chosen near the Pragati Sharani road as the University will generate a huge amount of traffic.

3.13 Waste Management Plant

To manage the waste of the study area a waste management plant has been proposed at the southern east part. It is placed in such a way that it can be close to major roads for easy accessibility to Matuail Waste Management Plant Demra. Each household waste will be collected through community waste collection van to the waste dumping zone of a neighborhood

cluster. Then a truck will carry the community waste to the Waste Management Plant and it will be sorted and recycled to produce organic compost to use it in the adjacent urban kitchens. JICA study has been followed while designing the waste management plant .

3.14 Land for Future Expansion

Land for future expansion is demarcated after providing all the land uses required for the study area. This is provided to serve the future demand of land after the projected time period (2020). A handsome amount land around the CBD is kept for the future expansion of the commercial activities. Some part of the agricultural zone can also be used for future development as necessity arises.

3.15 Overall Review of Land Use

In figure 3 conceptual plan for eastern fringe area is provided in map. A pie chart is given below showing the distribution of land uses (figure 2).

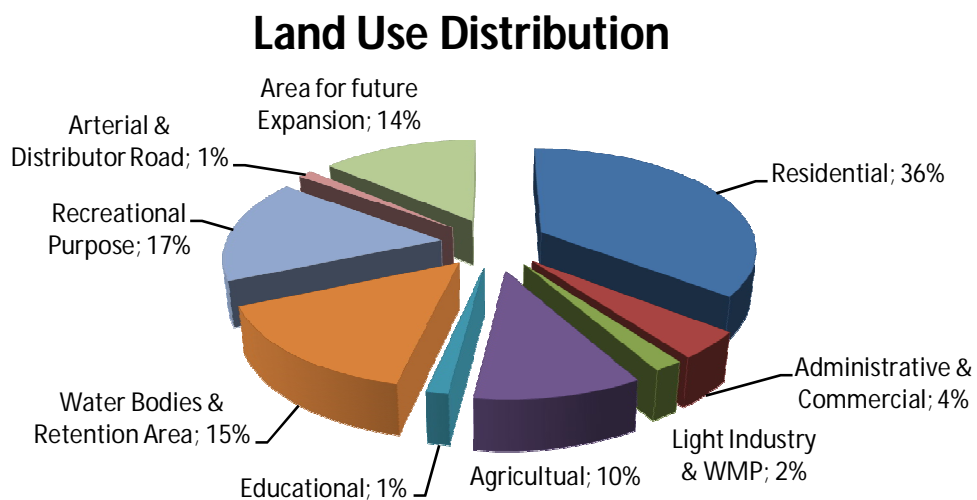


Fig 2. Land Use distribution of Eastern Fringe



Figure 2: Conceptual plan for Eastern Fringe

4.1 Policy Recommendations

Some policies are recommended for this conceptual plan so that it can be sustainable. To preserve the essence of the plan following recommendations are necessary to abide by:

- The retention areas and the canals throughout the area must be preserved and development in these areas should be strictly prohibited
- All the natural features should be protected as far as possible
- Heavy industry should never be allowed inside the study area and there should be restriction on other industrial development too
- Major arterials will not provide access to any establishments
- Agricultural land i.e. the urban kitchen should be protected from encroachment
- Proper management of the wet lands is needed to keep them pollution free
- Development alongside the canals should be strictly prohibited with a plantation buffer
- Pedestrian movement and public transits should be promoted
- After implementation, a system of monitoring the plan has to be ensured for a three to five year assessment

4.2 Conclusion

After the projected time period 2020, a large share of population of Dhaka will be living in the Eastern fringe area. A properly planned town is needed to fulfill their residential need. So a satellite town is planned for them in the eastern fringe area following the new town development concept. The plan was designed with a view to accelerating a sustainable development preserving the natural characteristics of the area. Land use plan is proposed to fulfill the needs of a sustainable city that is proper housing, health, environmental friendly design, good transportation system etc. Finally it can be said that such a plan will allow peaceful collaboration of urban development and natural features.

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